APPENDIX M

MCAS 2019 STANDARD SETTING REPORT

MCAS Standard Setting Meeting

Grade 10 English Language Arts and Mathematics

Grades 5 and 8 Science, Technology, and Engineering

August 2019

Pearson

Version 1.0

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Executive Report

This report summarizes the process and results of setting achievement levels for the Massachusetts Comprehensive Assessment System (MCAS) assessments for grade 10 English language arts (ELA), grade 10 mathematics, and grades 5 and 8 science and technology/engineering (STE). The Massachusetts Department of Elementary and Secondary Education (DESE) partnered with Cognia and Pearson (the MCAS assessment contractors) to collect recommendations for cut scores associated with the achievement levels for the MCAS assessments.

MCAS Standard Setting Process and Results

Achievement levels are used to classify student achievement on an assessment. In order to classify student achievement into the four different levels, the following components are required: 1) policy-level definitions, 2) Achievement Level Descriptors (ALDs), and 3) cut scores. Policy-level definitions provide general descriptions of the knowledge, skills, and abilities students must demonstrate to be classified into each achievement level and apply to all courses or subject areas. ALDs illustrate the achievement levels in terms that are specific to a course or subject area. Cut scores represent the lowest boundary of each achievement level on the scale.

The process of recommending performance standards for the MCAS tests was based on standard setting procedures that were used for the MCAS tests for grades 3 through 8 ELA and mathematics, are in line with national best practice, and with review and approval of the MCAS technical advisory committee (TAC). Results and details of that process are presented in the following sections.

Policy-level Definitions

Policy-level definitions for the MCAS achievement levels are shown in Table 1. The titles and descriptions of the achievement levels were defined to be part of a cohesive assessment system. The achievement levels indicate a student's ability to demonstrate proficiency in relation to subject- and grade-specific expectations, as indicators of a student's readiness for the next grade-level or college and career, as defined in the Massachusetts curriculum framework.

The Commissioner and the Board of Elementary and Secondary Education approved the final policy-level definitions for MCAS assessments in September 2019.

Table E1. Policy-level definitions for MCAS Achievement Levels

Achievement Level	Policy-level Definition
Exceeding Expectations	A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.
Meeting Expectations	A student who performed at this level met grade-level expectations and is academically on track to succeed in the current grade in this subject.
Partially Meeting Expectations	A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.
Not Meeting Expectations	A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

Achievement Level Descriptors (ALDs)

Draft sets of ALDs for the grade 10 ELA, grade 10 math, and grades 5 and 8 STE, shown in Appendix A, indicate the knowledge and skills that students performing at a given achievement level should be able to demonstrate within each specific content area and at each grade-level. A multi-step process was used to develop, review, and approve the ALDs for each assessment. Prior to the standard setting meeting, the DESE content staff worked in cooperation with staff from the Center for Instructional Support (CIS) to create a draft set of ALDs for each content and grade-level specific course. Educators from the DESE's Assessment Development Committees also reviewed the drafts. The set of ALDs for each grade within each subject was created, such that they represented a gradual increase in expectations across the achievement levels within a grade and across grades. Descriptors were developed for the *Partially Meeting Expectations, Meeting Expectations,* and *Exceeding Expectations* only. A student classified as *Not Meeting Expectations* has not demonstrated the knowledge, skills, and abilities necessary to achieve *Partially Meeting Expectations.*

Teachers who participated in the standard setting committees had the opportunity to provide suggestions and edits to the draft set of ALDs, based on their recommended cut score for each achievement level and the items they reviewed during the standard setting meeting. To produce the final set of ALDs, the DESE content staff will edit the set of draft ALDs based on suggestions generated by the participants in the standard setting meeting.

Cut Scores

The cut scores that were recommended for adoption for the MCAS assessments are based on a standardized set of procedures implemented during the standard setting meetings. Details pertaining to the general methods used during the meetings for obtaining the recommended cut scores and the resulting recommendations are provided below.

Standard Setting Meeting

From August 5 to August 7, 2019, after the first year of operational administration in spring 2019, a standard setting meeting was conducted to obtain cut score recommendations for each test. There were four committees, with each recommending cut scores for one assessment:

- ELA grade 10
- Math grade 10
- STE Committees
    - STE grade 5
    - STE grade 8

Each committee was composed of between 18 to 20 individuals, including teachers and non-teacher educators (e.g., administrators, curriculum specialists, professors of higher education). The participants were selected for the standard setting committee to provide content and grade-level expertise during the committee meeting and be representative of the state teaching population, including geographic region, gender, ethnicity, educational experience, community size, and community socioeconomic status.

The Extended Modified (Yes/No) Angoff standard setting method was used for the standard setting meeting (Davis & Moyer, 2015; Plake, Ferdous, Impara, & Buckendahl, 2005). This is a content- and item-based method that leads participants through a standardized process through which they consider student expectations, as defined by ALDs, and the individual items administered to students to recommend cut scores for each achievement level. The standardized process was used by the committees for each grade/subject.

The process started with participants experiencing the test from the spring 2019 administration within the online testing system. Based on their experience with the test items and a review of the draft ALDs, panelists created borderline descriptions. During this process, participants worked within their committees to modify the draft ALDs to create descriptors of the knowledge, skills, and abilities that “borderline” students, or those students who just barely enter an achievement level, would be expected to demonstrate.

During the judgment process, participants reviewed each item on the test, referencing the borderline descriptions, and answered the following question for each achievement level:

> “How many points would a student with performance at the borderline of the [specific] achievement level likely earn if he or she answered the question?”

The cut score recommendation for each individual participant was the expected raw score a borderline student at the respective achievement level would likely earn, calculated as the sum of the individual item judgments. For the purposes of the standard setting, “likely” was defined as 2 out 3 students at the borderline level. Each recommended cut score from the standard setting committee was the median of the recommendations from the individual participants in the committee.

Additionally, the percentage of students who would be classified into each achievement level based on committee recommendations—also known as impact data—was calculated. The impact data were determined using student data from the spring 2019 online administration. As part of the discussion of the round 2 judgments, the impact data were presented, based on the round 2 recommendations, so the participants could see the resulting student achievement level

classifications prior to making their round 3 recommendations. For the grade 10 ELA and math committees, the panelists were also presented the impact data for grades 7 and 8, from the 2017 standard setting process, to review in conjunction with the impact data from their recommendations to evaluate the alignment across grades. This information was also presented after the round 3 cut score recommendations were calculated.

The results (Round 3 recommendations) from the standard setting meeting for the STE and grade 10 committees are presented in Tables E2 and E3, respectively.

Table E2. Standard Setting Recommendations for STE Tests (Grades 5 and 8)

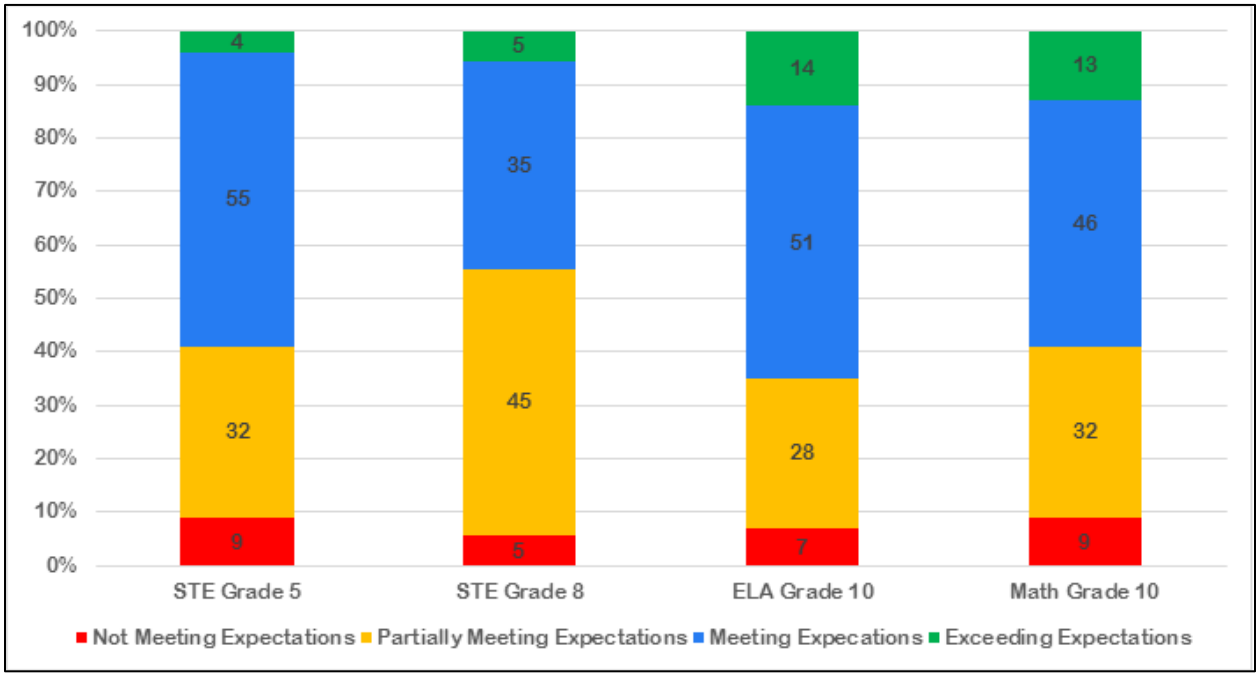
Grade	Achievement Level							
	Not Meeting Expectations		Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level
5	0 to 15	9	16 to 29	32	30 to 46	55	47 to 54	4
8	0 to 16	5	17 to 32	45	33 to 45	35	46 to 54	5

Table E3. Standard Setting Recommendations for Grade 10 Tests (ELA and Mathematics)

Subject	Achievement Level							
	Not Meeting Expectations		Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level
ELA	0 to 20	7	21 to 36	28	37 to 46	51	47 to 51	14
Math	0 to 12	9	13 to 31	32	32 to 52	46	53 to 60	13

Figure E1 presents the impact data from the final recommendations from the standard setting meeting as stacked bar graphs.

Figure E1. Impact Data for STE, ELA and Math Tests based on Standard Setting Recommendations



Vertical Articulation Meeting

Subsequent to the standard setting meeting, on August 7, 2019, a vertical articulation meeting was convened. The meeting consisted of one committee that reviewed the STE cut score recommendations from grades 5 and 8. The participants of the vertical articulation meeting consisted of table leaders from each of the standard setting committees and other committee members selected prior to the standard setting meeting. The focus of the vertical articulation meeting was to review the cut score recommendations from the standard setting meeting along with impact data to consider whether and to what extent adjustments to the recommended cut scores might be warranted based on both content and policy. The adjustments to the recommendations made by the vertical articulation committees were influenced by a desire to honor the content-based recommendations of the standard setting process, maintain high expectations for achievement across the MCAS assessments, and ensure the relationship among standards was coherent and defensible.

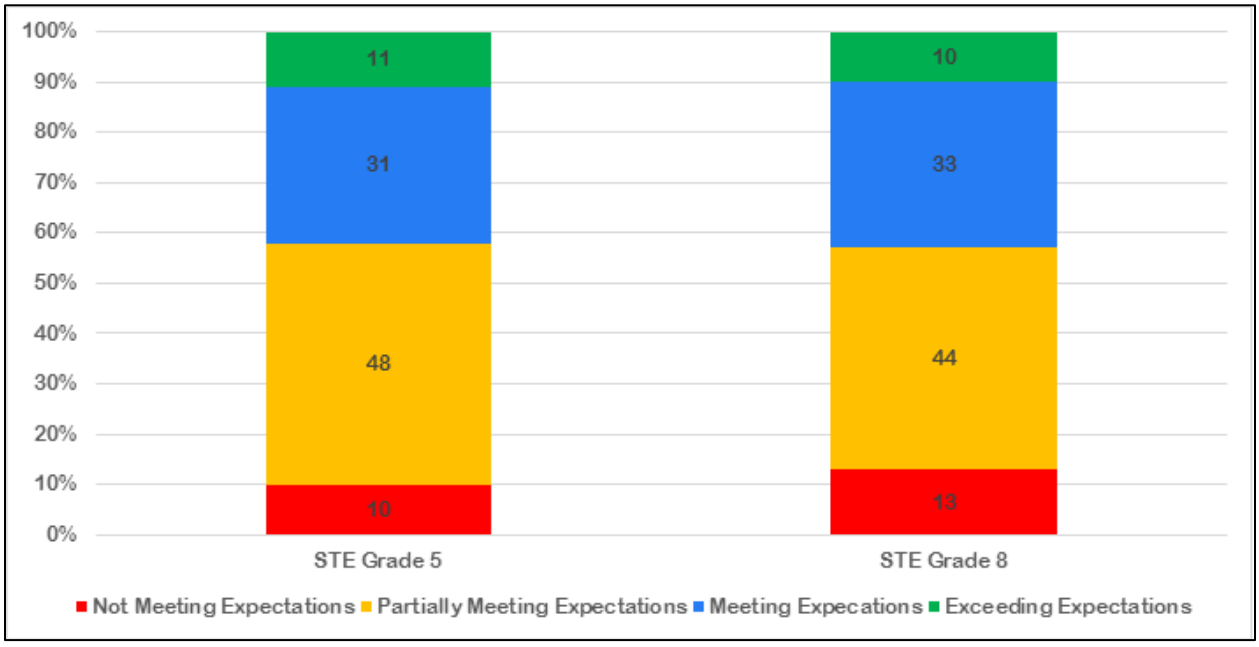
Tables E4 presents the results from the vertical articulation meeting for STE.

Table E4. Vertical Articulation Recommendations for STE Tests (Grades 5 and 8)

Grade	Achievement Level							
	Not Meeting Expectations		Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level
5	0 to 16	10	17 to 34	48	35 to 43	31	44 to 54	11
8	0 to 15	13	16 to 31	44	32 to 42	33	43 to 54	10

Figure E2 presents the impact data from the final recommendations from the vertical articulation meeting as stacked bar graphs.

Figure E2. Impact Data for STE Tests based on Vertical Articulation Recommendations



Reporting Scale

The process of determining the transformation rules from the Item Response Theory (IRT) scale to the final reporting scale was guided by several principals identified by DESE:

1. The final cut scores achieved through the scaling solution should respect the cut score recommendations from the standard setting and vertical articulation committees as closely as possible.

2. The impact data from the final scaling solution should reflect a coherent assessment system across the grades.
3. The reporting scaled scores for the three achievement level cuts should be the same across grades and tests.
4. The scaling solution should involve a single linear transformation, from the IRT scale to the reporting scale.
5. The reporting scaled score range should be the same across grades and tests.

An iterative process involving Pearson, Cognia, and DESE was used to determine a final reporting scale and transformation rules for each test. First, based on the recommended raw score cuts for the three achievement levels, the IRT scale cuts were adjusted so that the differences between every two IRT scale cuts were the same, allowing for a single linear transformation rule. Based on the adjusted IRT cut scores, scaling constants for the linear transformation were determined. Using the scaling constants, look-up tables for each grade and test were created, displaying the relationship between the raw scores and reporting scaled scores. Based on the look-up tables, adjusted raw score cuts for each achievement level were determined. Finally, the resulting impact data based on the adjusted raw score cuts were calculated and reviewed to ensure a coherent system across grades. This process was repeated several times until a final scaling solution was determined.

The recommended reporting scale ranges from a lowest obtainable scale score (LOSS) of 440 to a highest obtainable scale score (HOSS) of 560. In order to create common points of reference across the assessments, the same scaled score cuts for each achievement level were defined, with a *Partially Meeting Expectations* cut of 470, a *Meeting Expectations* cut of 500, and an *Exceeding Expectations* cut of 530. While the cut scores were defined with the same scaled scores and descriptions across the grades, they are not identical, and direct comparisons through averaging and aggregation across grades should not be made without study and/or statistical adjustments. The scaled scores and distributions of students resulting from the cuts set for STE, ELA, and mathematics were not designed for direct comparison.

Tables E5 and E6 present the results from the final scaling solutions for the STE and grade 10 tests, respectively.

Table E5. Final Recommendations for STE Tests (Grades 5 and 8)

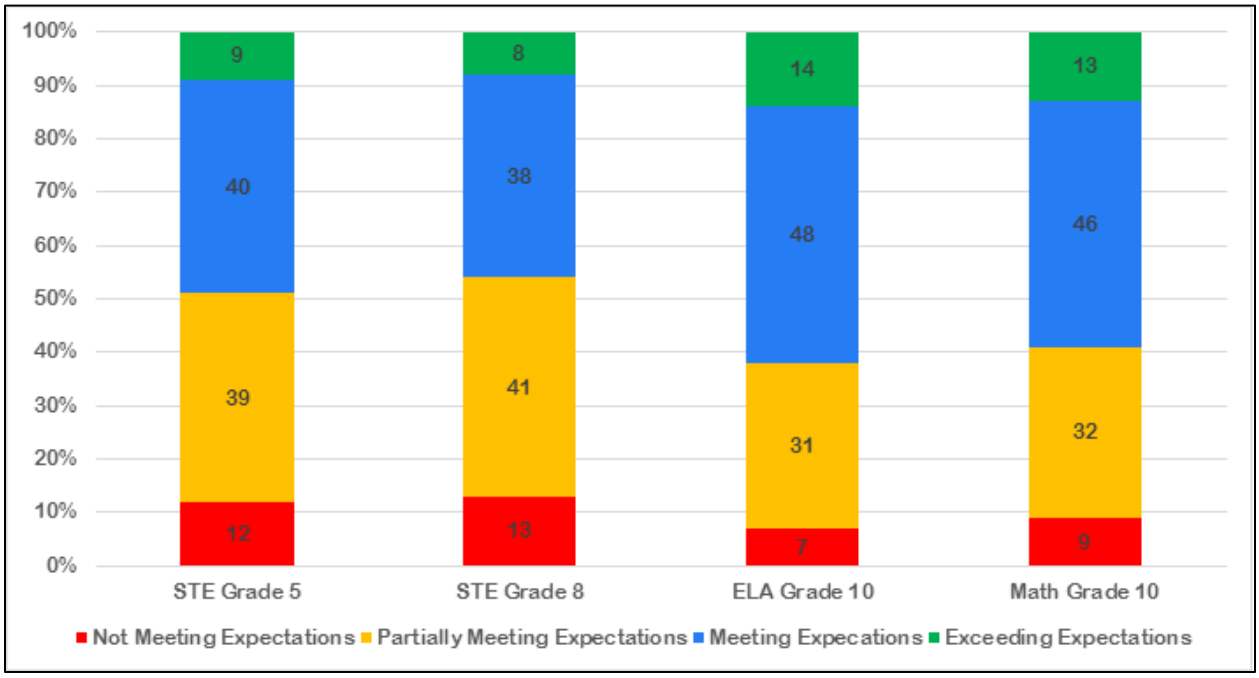
Grade	Achievement Level							
	Not Meeting Expectations		Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level
5	0 to 17	12	18 to 32	39	33 to 44	40	45 to 54	9
8	0 to 15	13	16 to 30	41	31 to 43	38	44 to 54	8

Table E6. Final Recommendations for Grade 10 Tests (ELA and Mathematics)

Subject	Achievement Level							
	Not Meeting Expectations		Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level	Raw Score Range	% in Level
ELA	0 to 20	7	21 to 37	31	38 to 46	48	47 to 51	14
Math	0 to 12	9	13 to 31	32	32 to 52	46	53 to 60	13

Figure E3 presents the impact data from the final recommendations as stacked bar graphs.

Figure E3. Impact Data for STE, ELA, and Math Tests based on Final Recommendations



The final approved result from this standard setting will be used for future administrations of the MCAS grade 10 ELA and math tests, and grades 5 and 8 STE tests, to classify student results into achievement levels for reporting until it is determined that new standards need to be established for the MCAS by the DESE.

Interim Legacy Achievement Cut Score Validation

On the previous ("legacy") version of the grade 10 MCAS tests, a student was required for graduation to earn a competency determination by receiving a score of 240 (Proficient) or receiving a score between 220 and 238 and fulfilling the requirements of an Educational Proficiency Plan (EPP). As part of the transition to the next-generation MCAS, the Board of Elementary and Secondary Education voted to establish an interim competency determination standard for high school graduation. Interim standards would be defined as a similar level of achievement to the required standards on the legacy tests. Students taking the next-generation MCAS during 2019 and 2020 would be evaluated against the interim standards on each test.

The interim legacy achievement level standards were first identified through a statistical linking process. An equipercentile linking method was used to statistically establish an association between the raw scores from the spring 2018 and spring 2019 administrations of the MCAS tests. The statistically defined interim cuts on the next-generation MCAS would likely represent similar levels of achievement by establishing similar impact levels across assessments. This is accomplished through determining the raw scores on the spring 2019 administration of the next-generation MCAS which would result in percentiles equal to those associated with the raw scores for each of the achievement levels from the spring 2018 administration of the legacy MCAS tests. The equipercentile linking process was completed using a matched sample from the spring 2018 and spring 2019 populations, to ensure that the populations used in the process were similar across various categories, including ability, gender, ethnicity, and economic status. Recommended interim legacy achievement level cut scores were determined for each achievement level for both the grade 10 ELA and grade 10 math tests.

After the standard setting committees completed their cut score recommendations, a subset of panelists from the grade 10 committees were convened to review and validate the recommended interim legacy MCAS achievement level cut scores that were statistically established. The panelists reviewed the performance of students from the spring 2018 administration on the legacy MCAS to determine general descriptions of the achievement of students at the borderline of each legacy achievement level. The general descriptions were then used by the panelists to review the performance of students from the spring 2019 administration on the next-generation MCAS at the recommended interim legacy cut scores. Based on their review, the panelists completed a validation judgment survey where they answered the following question:

"Based on your review, does the recommended interim cut score on the spring 2019 next-generation MCAS for the achievement level represent similar expectations as on the spring 2018 legacy MCAS?"

If the panelist responded "no" to the question, they were provided the opportunity to select a raw score that they determined represented similar expectations. If half or more of the panelists responded "yes" to the question, the interim cut score was validated by the panelists. If less than half of the panelists responded "yes" to the question, the interim cut score recommendation was defined as the median of the panelist recommendations.

The result of the panelists' recommendations was that each of the interim legacy cut scores were validated by the committees. Table E6 displays the interim cut score recommendations for the legacy achievement levels on the next-generation MCAS.

Table E6. Validated Recommended Cut Scores for the Legacy Achievement Levels

Subject	Legacy Achievement Levels		
	Needs Improvement	Proficient	Advanced
Grade 10 ELA	13	22	38
Grade 10 Math	12	21	35

Chapter 1 – Overview of the Standard Setting Process

This chapter provides an overview of the standard setting process used for the MCAS ELA and mathematics assessments for grade 10 and STE assessments for grades 5 and 8, and includes the following sections:

- Goals of setting cut scores
- MCAS achievement levels
- MCAS cut score setting process

Goals of the Standard Setting Meeting

Once students are administered an assessment, various groups, including students, parents, educators, administrators and policy makers, want to know how the students performed on the assessment and how to interpret that performance. By establishing achievement levels associated with different student performance on the assessment, a frame of reference is developed for interpreting student scores. Setting the level of achievement on an assessment sufficient for student performance to be classified into each achievement level is one of the most critical steps in developing an assessment program.

For a criterion standards-based assessment, such as the next-generation MCAS program, achievement on the assessment is compared to a set of predefined content standards. The standards communicated within the *Massachusetts Curriculum Framework* define a set of knowledge, skills, and abilities the students taking the assessment are expected to demonstrate upon completion of each course or grade. The cut scores established represent the level of competence students are expected to demonstrate on the assessment to be classified into each achievement level.

MCAS Achievement Levels

Federal statute requires that any statewide assessment used for accountability purposes includes at least three achievement levels. The achievement levels relate student performance on the MCAS assessments directly to what students are expected to learn, based on the standards in the *Massachusetts Curriculum Framework*. Student achievement on all MCAS assessments is classified into four achievement levels that delineate the knowledge, skills, and abilities for which students are able to demonstrate mastery.

The policy-level ALDs for the achievement levels provide general expectations for student achievement on the MCAS assessments to be classified into each achievement level. These do not differentiate student performance between content areas and grade levels. The achievement levels and policy ALDs for the next-generation MCAS assessments were developed with input from the Standard Setting Policy Committee. This 14-person committee is comprised of Massachusetts educators and policy makers representing K–12 education and higher education constituency groups (including MASS PTA, MASC and BESE, among others). Language for these levels was refined by the Massachusetts BESE at its monthly meeting in December 2016, and after eliciting public feedback, final Next-Generation MCAS Achievement Levels and Descriptors were adopted by BESE in March 2017.

The four achievement levels with their respective policy description are shown in Table 1.

Table 1. Policy Level Achievement Level Descriptors for the Next-Generation MCAS Tests

Label	Description
Exceeding Expectations	A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.
Meeting Expectations	A student who performed at this level met grade-level expectations and is academically on-track to succeed in the current grade in this subject.
Partially Meeting Expectations	A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.
Not Meeting Expectations	A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

The MCAS Standard Setting Process

The recommendations by the standard setting committees represent the level of competence students are expected to demonstrate to be classified into each of the achievement levels. To establish the achievement levels for each assessment, the Extended Modified (Yes/No) Angoff Method (Davis & Moyer, 2015; Plake, Ferdous, Impara, & Budkendahl, 2005) was used to guide participants as they determined their achievement level cut score recommendations. This standard setting procedure is a systematic method for combining various considerations into the process for recommending cut scores for the different achievement levels, including content standards and educator judgments about what students should know based on the *Massachusetts Curriculum Framework* and be able to demonstrate at each achievement level.

The following steps were used for the MCAS standard setting process.

- Pre-meeting development – In anticipation of the standard setting meetings, various tasks were completed, including the development of draft ALDs for each grade and subject assessed, the development of materials for the participants, preparation of the Pearson standard setting website for participants and facilitators, presentation materials for the facilitators, and development of data analysis sources and procedures.
- Standard setting meetings – Committees of participants referenced the grade- and subject-specific ALDs to make recommendations for cut scores that define the different achievement levels for each assessment.
- Vertical articulation meeting – The recommended cut scores for each assessment were reviewed for reasonableness and alignment of achievement-level expectations across grades by select members of the standard setting committees.
- Competency determination validation meeting – The statistically determined cut scores associated with the previous MCAS assessments for grade 10 ELA and mathematics

were reviewed for consistency of content expectations by select members of the standard setting committees.

- Linear scaling – Using the recommended cut scores from the vertical articulation meeting, a scaling transformation process was conducted to transform the IRT scale scores to MCAS scale scores.

The following chapters will describe the specific procedures and activities that occurred during each of these steps.

Chapter 2 – Pre-meeting Development

This chapter provides an overview of the work that was completed prior to the standard setting meetings for the next-generation MCAS ELA and mathematics assessments for grade 10 and STE for grades 5 and 8, and includes the following sections:

- MCAS achievement level descriptors
- Development of participant materials
- Development of presentation materials
- Facilitator training
- Preparation for data analysis during the meetings

MCAS Achievement Level Descriptors

ALDs are statements that articulate the knowledge, skills, and abilities that students classified into a particular achievement level should be able to do to demonstrate competency at that achievement level. All assessments within MCAS, grades 3–8 and 10, have four achievement levels, as defined in Table 1. The achievement levels range from *Not Meeting Expectations,* representing the lowest level of student achievement, to *Exceeding Expectations*, representing the highest level of student achievement.

The ALDs are associated with the achievement levels in the following way.

- *Achievement levels* indicate a student's level of competency of the standards defined in the *Massachusetts Curriculum Framework* through classification of their achievement on an assessment for a specific grade and subject as *Not Meeting Expectations*, *Partially Meeting Expectations*, *Meeting Expectations*, and *Exceeding Expectations*.
- *Achievement level descriptors* indicate the knowledge, skills, and abilities expected of students to demonstrate competency within each specific content area and at each grade level to be classified in each achievement level.
- *Cut scores* partition the test scale and represent the minimum test score that a student must earn on an assessment for each subject and grade level to be classified into a given achievement level.

The use of a well-defined set of ALDs is critical to ensuring the validity of the standard setting process.

The development of draft ALDs for each content area (STE, ELA and mathematics) and for each grade were completed by DESE test development staff and the Center for Instructional Support (CIS). In developing the ALDs, descriptors were written for each reporting category associated with the respective grade and subject for each of the achievement levels, *Partially Meeting Expectations*, *Meeting Expectations*, and *Exceeding Expectations*. The knowledge, skills, and abilities described at each achievement level were cumulative, assuming students at an achievement level would be able to demonstrate competency at each of the preceding achievement levels, for the same reporting category. No descriptors were developed for the lowest achievement level since the most accurate way to describe the performance of a student classified as *Not Meeting Expectations* is a student who has not demonstrated the knowledge, skills, and abilities necessary to achieve *Partially Meeting Expectations.*

The ALDs that were drafted for the standard setting meeting were finalized shortly after the

standard setting meeting.

Pearson Standard Setting Website

The Pearson standard setting website is the online platform for meeting pre-work, facilitating the standard setting meeting and collecting panelist judgments throughout the standard setting process. Because the next-generation MCAS assessments are computer-delivered and the online test form were used for the standard setting process, the standard setting website provides panelists the opportunity to access online items within Pearson's secure online testing environment, TestNav 8. During the meeting, panelists accessed the website using a notebook computer provided by Pearson and set up specifically for the meeting.

Using a similar template to the websites used for the MCAS standard setting in 2017, specific websites were created for each committee meeting by the Pearson standard setting team. The staff at DESE had the opportunity to review the website structure prior to finalizing the websites for the meeting. Additionally, members of the Pearson staff performed reviews of the websites to verify that the content on the website was correct.

Development of Participant Materials

The MCAS standard setting required a large number of materials be prepared for use by the participants during the standard setting meetings. The Pearson standard setting team worked with the content specialists at DESE to develop the materials and to ensure that all materials provided to meeting participants communicated correct information. The following materials, displayed in Table 2, were developed for use by participants during the meeting.

Table 2. Materials Prepared for Panelists

Panelist Material	Paper	Online
Meeting agenda	✓	✓
Panelist information survey		✓
Non-disclosure agreement		✓
Next-generation MCAS test forms/items		✓
"Experience the Test" response form	✓	
Test form item map/answer key		✓
Item comment form	✓	
Practice judgment form/items		✓
Practice judgment form item map/answer key		✓
Judgment round record form	✓	
Judgment round surveys		✓
Achievement level descriptors (ALDs)	✓	✓
ALD comment form	✓	
Process evaluations		✓

Using approved templates, documents were created for each specific committee meeting by the Pearson standard setting team. All documents developed for the website were reviewed and approved by DESE staff before being finalized for publication for the meetings. A sample set of materials for a committee are provided in Appendix C.

Development of Presentation Materials

PowerPoint presentations were developed to guide facilitators through the presentation of information and materials throughout the standard setting meetings. The Pearson standard setting team developed the initial PowerPoint presentations using the DESE presentation template. Staff from DESE had the opportunity to review and provide suggested edits to the presentations, which were resolved by the Pearson standard setting team. The following PowerPoint presentations were created for the standard setting meetings.

- MCAS Plenary Session Presentation – Presented by DESE staff
- General Session/Standard Setting Overview
- Standard Setting Table Leader Training
- Standard Setting Breakout Meeting – Day 1
- Standard Setting Breakout Meeting – Day 2
- Vertical Articulation Meeting
- Competency Determination (CD) Validation Meeting

The PowerPoint presentations for the breakout meetings, Day 1 through Day 2, were customized to reflect the specific information for the subject and grades for each committee. Additionally, specific information was added to the notes section within each presentation to guide the facilitators through the presentations.

Facilitator Training

Procedures employed in the standard setting meeting are specific to the goals and objectives of the project. So, even though the facilitators for the MCAS standard setting meeting had prior experience in facilitating standard setting meetings, a training session was held to discuss the unique aspects of the MCAS standard setting and to walk through the process utilized for this meeting, demonstrate the use of the Pearson Standard Setting website, and display and discuss the PowerPoint presentations used during the standard setting meetings. The facilitator training meeting was held for 60 minutes on July 30, 2019. Additionally, there was a final training and discussion held on-site on Sunday, August 4, 2019, the day before the meeting, to address any final topics.

Preparation for Data Analysis during the Meetings

Creation and testing of analysis programs and the calculation of impact data lookup tables were conducted prior to the standard setting meeting. To facilitate the independent analysis for each judgment round during the meeting, each analyst independently completed the programming necessary to conduct all analysis using the SAS statistical software. A trial was run with mock-data to ensure that each independent analysis generated the same results.

Impact data is the percent of students that fall within an achievement level based on the recommended cut scores at the given judgment round for a particular grade, subject test, and testing mode. The impact data is provided to participants during the standard setting meeting to present the expected results of their recommendations on student achievement level classifications. The analysis programs use impact data lookup tables to produce this output during the meetings, which need to be created prior to the standard setting meetings.

The impact data lookup tables were created using the data from students taking the online form

of each subject and grade assessment during the spring 2019 administration. The impact data lookup tables were created using a sample of students that would be representative of the overall state student population, based on the following demographic variables:

- Gender
- Race/Ethnicity
- Economically disadvantaged
- Limited English Proficient (LEP)
- Special Education

The data analysts created the impact data lookup tables by calculating, for each possible raw score associated with the test, the percent of overall students in the sample that earned that specific raw score or greater.

For the competency determination validation meetings for grade 10 ELA and math, there were additional analysis that were performed in preparation for the meeting. Pearson worked with Cognia and DESE to statistically identify interim cut scores for the legacy achievement levels, Needs Improvement (220), Proficient (240), and Advanced (260), for the CD validation meeting using an equipercentile process. This process determined cut scores on the next-generation MCAS tests which would result in similar impact data from the 2018 administration of the legacy MCAS

Based on MA TAC recommendation, the equipercentile process was implemented on both the entire populations from the spring 2018 and 2019 administrations of the legacy MCAS and next-generation MCAS, respectively, and a matched sample population. The matched sample population for the analysis was calculated using coarsened exact matching (CEM: Iacus, King, & Porro, 2012). The matching variables included demographic variables (i.e., gender, race, and economic disadvantaged status) and the coarsened prior grade scale score on the legacy MCAS assessment, divided into 20 groups. The result was a maximum of 840 student groups into which students could be assigned, where it is possible that some groups may not have any assigned students, due to data sparseness. Tables 3 and 4 display the resulting matched sample analysis for grade 10 ELA and grade 10 mathematics, respectively.

Table 3. ELA Matched Sample Results

	2018 Legacy MCAS Population				2019 Next-generation MCAS Population				Matched Sample			
	Grad 10 Legacy ELA		Grade 7 Legacy ELA		Grade 10 Next-gen ELA		Grade 7 Legacy ELA		2018		2019	
Variable	n-count	%	Matched n-count	Matched %	n-count	%	Matched n-count	Matched %	N-count	%	N-count	%
Grade 7 MCAS SCORE	--	--	27458	244.51	--	--	17385	248.39	16547	247.60	16547	247.63
Economic Dis	21060	30.2%	6884	25. 1%	17673	25.7%	2797	16.1%	2709	16.4%	2709	16.4%
Female	34498	49.6%	13713	49.9%	34092	49.6%	8636	49.7%	8270	50.0%	8270	50.0%
Male	35132	50.4%	13735	50.0%	34604	50.3%	8739	50.3%	8274	50.0%	8274	50.0%
White	44436	63.8%	19512	71.1%	43670	63.5%	13627	78.4%	13087	79.1%	13087	79.1%
Asian	4573	6.6%	1925	7.0%	4724	6.9%	1308	7.5%	1178	7.1%	1178	7.1%
Black	6126	8.8%	1291	4.7%	6056	8.8%	569	3.3%	537	3.2%	537	3.2%
Hispanic	12333	17.7%	3904	14.2%	11932	17.4%	1294	7.4%	1261	7.6%	1261	7.6%

Table 4. Math Matched Sample Results

	2018 Legacy MCAS Population				2019 Next-generation MCAS Population				Matched Sample			
	Grad 10 Legacy Math		Grade 7 Legacy Math		Grade 10 Next-gen Math		Grade 7 Legacy Math		2018		2019	
Variable	n-count	%	Matched n-count	Matched %	n-count	%	Matched n-count	Matched %	N-count	%	N-count	%
Grade 7 MCAS SCORE	--	--	27485	241.44	--	--	17300	244.19	16440	243.63	16440	243.40
Economic Dis	20809	30.0%	6901	25.1%	17719	25.8%	2773	16.0%	2726	16.6%	2726	16.6%
Female	34316	49.5%	13696	49.8%	34113	49.6%	8596	49.7%	8170	49.7%	8170	49.7%
Male	34957	50.4%	13778	50.1%	34597	50.3%	8694	50.3%	8268	50.3%	8268	50.3%
White	44290	63.9%	19546	71.1%	43526	63.3%	13551	78.3%	12934	78.7%	12934	78.7%
Asian	4552	6.6%	1922	7.0%	4719	6.9%	1304	7.5%	1184	7.2%	1184	7.2%
Black	6095	8.8%	1280	4.7%	6078	8.8%	565	3.3%	544	3.3%	544	3.3%
Hispanic	12191	17.6%	3920	14.3%	12072	17.6%	1293	7.5%	1285	7.8%	1285	7.8%

The results of the equipercentile analysis using both samples were calculated and reviewed with DESE to determine the results that would be used for the competency determination meetings. It was determined that the results from the matched sample analysis would be used. The resulting percentiles for each of the legacy achievement levels that were used are displayed in Table 5.

Table 5. 2018 Percentiles for Legacy Achievement Levels

Subject	Legacy Achievement Level		
	Needs Improvement	Proficient	Advanced
ELA	1st	4th	33rd
Math	4th	14th	39th

Chapter 3 – Standard Setting Meetings

This chapter provides details about the cut score setting meeting process. The sections of this chapter include:

- Purpose of standard setting meetings
- Committee participant composition
- Standard setting meeting facilitators and staff
- Standard setting meeting proceedings
- Recommended achievement level cut scores

Purpose of the Standard Setting Meetings

Standard setting is based, to a large degree, on the judgment of educators. Committees of educators make expert recommendations about the level of performance expected for each achievement level based on their experience with different groups of students and knowledge of the assessed content. A specific process, or standard setting method, is used to capture the educator judgments and to translate these into cut scores for the achievement levels. The purpose of the next generation MCAS standard setting meetings was to gather expert recommendations from groups of educators from across Massachusetts for the cut scores that define the different achievement levels on each MCAS assessment for grade 10 ELA, grade 10 math, and grades 5 and 8 STE.

Student performance on each of the MCAS assessments is classified into one of four achievement levels. Each committee was asked to recommend three cut scores that would define the boundaries between the different achievement levels. These recommended cut scores represent the performance on each assessment that a student would need to meet or exceed to be classified into the specific achievement level.

Committee Participant Composition

All participants for the standard setting committees were selected by the DESE, then recruited and invited to participate in the standard setting meeting by Cognia. The process of selecting committee participants included selecting a sample of participants that would be as representative of the state as possible, including demographic variables (gender, race, etc.), geographic representation, and background (educational experience, education, etc.). When selecting participants, DESE placed an emphasis on those educators who had relevant content knowledge as well as experience with a variety of student groups.

There was a total of 76 participants at the standard setting meetings, who were divided between four committees. Each committee focused on providing cut score recommendations for one assessment. The participants were assigned to the committee prior to the meetings based on their teaching experience. The tables in Appendix D summarize the characteristics and experience of the participants in each committee. These tables provide demographic information about the committee participants as well as information about the participant's current positions in education, their experience working with various types of student populations, and the types of districts they represent. Participant's responses to the gender and ethnicity questions was voluntary.

The participants in each committee were assigned to table groups. The table groups were selected prior to the meeting to ensure that, to the greatest extent possible, the participants at each table were representative of the committee. The participants were placed into table groups to facilitate discussions during the standard setting meeting and ensure that each participant had the opportunity to fully engage in the process.

Prior to the standard setting meeting, individuals were selected from the participants to serve as table leaders for each committee. One table leader was assigned to each table group. The table leaders assisted the process facilitator during the meeting by helping to facilitate the table group discussions, ensuring that all participants had the opportunity to participate, and ensuring that the discussion remained relevant to the meeting. To assist the table leaders in understanding and fulfilling their role during the meeting, a specific table leader training was provided on the first day of the standard setting, facilitated by Eric L. Moyer, Ph.D., the lead facilitator for the meeting.

Standard Setting Meeting Facilitators and Staff

Staff members from DESE, Cognia, and Pearson collaborated to conduct the MCAS standard setting meeting. These staff members worked in facilitative and observational roles and did not contribute to the cut score recommendations during the meeting.

Meeting Facilitators

The lead facilitator of the standard setting meeting was Eric L. Moyer, Ph.D., from Pearson. For each of the four breakout committees there were two facilitators assigned, a process facilitator and a content facilitator. The process facilitator was a member of the Pearson psychometric staff with experience in facilitating standard setting meetings and was responsible for leading the participants through the standard setting process. The content facilitator was a content specialist familiar with the content for the MCAS assessment from DESE or Coginia was responsible for leading the participants through the information associated with the development of the test and procedures for scoring the items. Table 6 presents the process and content facilitators for each standard setting committee.

Table 6: Process and Content Facilitators for Standard Setting Committees

Committee		Facilitators	
Subject	**Grade**	**Process Facilitator**	**Content Facilitator**
ELA	10	Bob Schwartz, Ph.D.	Amy Carithers (DESE)
Math	10	Ye Tong, Ph.D.	Simone Johnson (DESE)
STE	5	Ha Phan, Ph.D.	Philip Durham (Cognia)
	8	Jenna Copella, Ph.D.	Isadel Eddy (DESE)

Meeting Data Analysts

For the standard setting meeting, two data analysts performed all of the analysis for all four committees. The data analysts were Andrew Owens and George Liao. During the meeting, the analysts collected participant judgment data, performed independent analysis to verify analysis

results, and prepared participants feedback. Andrew Owens was the lead analyst and performed the analysis onsite, while George Liao was the replicator and completed the analysis offsite.

DESE Staff

DESE staff members attended the standard setting meeting to observe the process, answer assessment and curriculum questions, and address policy questions. DESE staff also monitored the cut score recommendations for each achievement level throughout the standard setting meetings. DESE was represented at the cut score setting meeting by Michol Stapel, the Associate Commissioner for Student Assessment, and Robert Lee, the MCAS Chief Analyst. These were assisted by additional DESE staff to monitor the standard setting meeting, including content and assessment specialists.

Technical Advisors

A technical advisor, Charlie DePascale, Ph.D., a member of the MA Technical Advisory Committee (TAC), monitored the standard setting meetings for DESE. The technical advisor observed the standard setting meetings and gave his advice and findings to the DESE after the meeting. The technical advisor did not participate in the meeting or contribute to the cut score recommendations during the meeting.

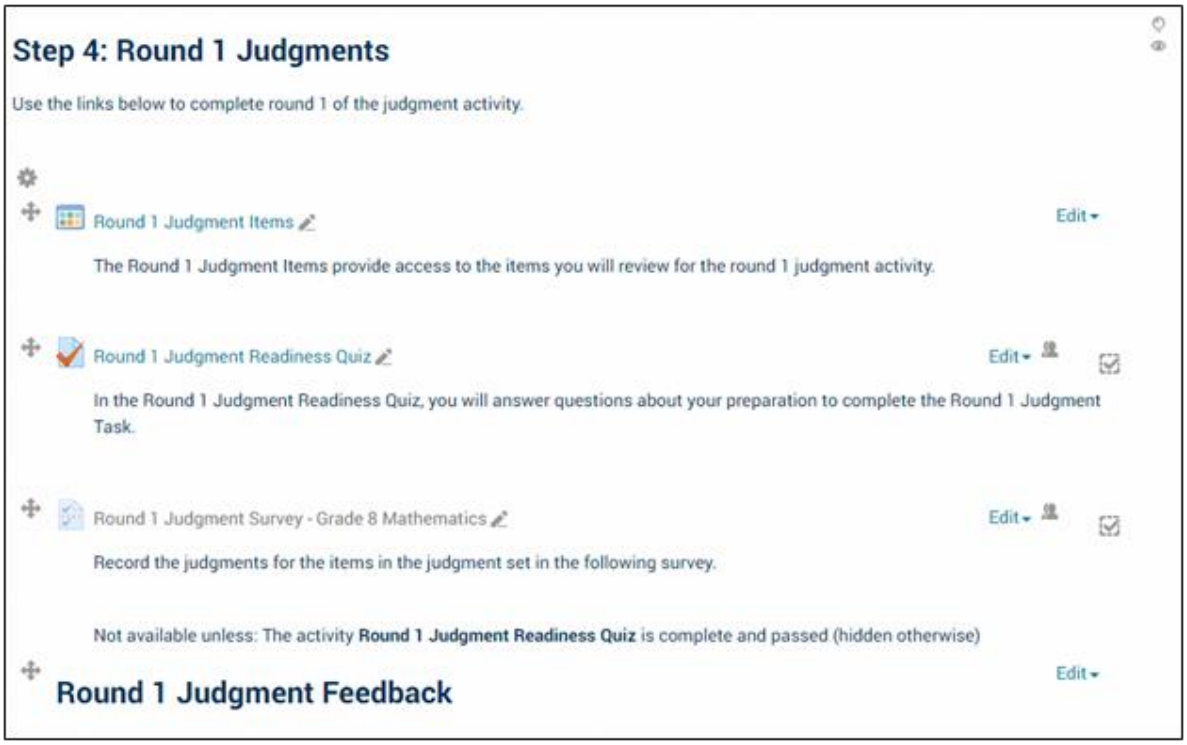
Materials

The following section describes the materials used by the committee members during the standard setting breakout sessions. Separate materials were developed for each committee.

Pearson Standard Setting Website

The Pearson standard setting website served as the online platform during the standard setting meetings. The website provided panelists access to the standard setting meeting materials and tools used to collect panelist judgments (see Figure 1). The website was built using Moodle, an online, open-source collaboration and learning tool. Each panelist was given unique login credentials that allowed secure access to the website. Panelists' access was restricted to only sections of the website associated with the standard setting meeting, as defined by their assigned subject area. Because the next-generation MCAS assessments are computer-delivered using TestNav 8, the standard setting website allowed panelists to view items as students did during the spring 2019 administration.

Figure 1. Example website interface with links to standard setting materials



The website enabled participants access to online documents that provided background information about the next-generation MCAS assessments prior to the standard setting meeting. The preparation materials on the website included:

- Standard setting orientation video
- MCAS curriculum framework for each grade level
- Subject- and grade-level ALDs
- MCAS standard setting non-disclosure agreement

The website also provided panelists access to materials and tools necessary for completing activities during the standard setting meeting. The standard setting materials and tools on the website included:

- Subject- and grade-level ALDs
- Test item map and answer key
- Borderline descriptions worksheet
- Practice judgment activity items
- Practice judgment readiness survey
- Practice judgment survey
- Judgment items for rounds 1, 2, and 3
- Judgment readiness survey for rounds 1, 2 and 3
- Judgment survey for rounds 1, 2, and 3
- Judgment feedback folders for rounds 1, 2, and 3
- Process evaluations 1 and 2
- Participant information survey

A unique course site was created for each assessment associated with the committee in the Pearson standard setting website. The meeting facilitator controlled panelist access to each section of the website. Website access was disabled at the end of each meeting day to prevent panelists from viewing secure website materials outside of designated meeting times. Following the meetings, the online materials were archived.

Committee Panelist Folders

In addition to the online resources provided through the website, panelists were given a meeting folder to organize a variety of hard copy materials they used throughout the meeting. The materials provided to committee panelists in their folders included:

- Meeting agenda
- Non-disclosure agreement
- Subject- and grade-specific ALDs
- ALD comment form
- "Experience the assessment" activity response form
- Item comment form
- Practice judgment record form
- Rounds 1, 2, and 3 judgment record form

The panelist folders were prepared in advance of the standard setting meetings. Panelists were required to check-in at the start of each day and to return their folders and check-out at the end of each day of their meetings. Panelists were provided additional materials throughout the meeting, which they were instructed to insert into their folders.

Computers

Each participant was provided a laptop computer in his or her meeting room to access the online resources through the Pearson standard setting website. The laptops were Dell latitudes with 15.6" screens, standard keyboards with full-size number pad, and an external mouse. Participants were not provided with external keyboards, numeric keypads, or external monitors. Participants were seated in table groups in pod configuration to provide each participant with enough space to work with the computer and binder materials. The power supplies were centrally located in the middle of each table. The participants used Google Chrome to access the Moodle site, which was programmed with a white list of websites to restrict participants use of the computers to work associated with the cut score setting meeting.

Procedure

The Extended Modified (Yes/No) Angoff Method (Davis & Moyer, 2015; Plake, Ferdous, Impara, & Budkendahl, 2005) was used during the standard setting meeting to assist participants in recommending achievement level cut scores for each assessment. This standard-setting procedure operates as both a content- and item-based method that leads panelists through a standardized process in which they consider student expectations, as defined by the ALDs, and the individual items administered to recommend cut scores for each performance level. This method asked participants to review each item from the operational administration and answer the following question:

"How many points would a borderline student at the [specific] achievement level likely earn if he or she answered the question?"

For the standard setting meeting, “likely” was defined statistically as the student having at least a 2/3 chance of earning the number of points. The participants completed the task for each achievement level.

The same standardized process was used by all committees and resulted in cut score recommendations. Participants completed three rounds of item judgments. Between the item judgment rounds they were provided feedback information including data relative to participant agreement, student performance on the items, and student performance on the test as a whole.

Standard Setting Meeting Proceedings

The standard setting meetings were conducted across three days, August 5-7, 2019, in Wakefield, Massachusetts. Appendix E includes the complete agenda for the standard setting meetings. The following sections will describe the steps used to guide the participants through the entire standard setting process.

Standard Setting Meeting Pre-Work

The standard setting meeting participants were provided access to a set of activities prior to attending the onsite meetings. The purpose of the pre-work was to expedite the training of the participants by providing the participants an opportunity to familiarize themselves with information that would be used throughout meeting. The pre-work included:

- Standard setting website – The pre-work was provided via documentation or links embedded within the secure website developed for the standard setting meeting. This allowed participants to access the website and gain some familiarity with navigation in the site prior to the meeting.
- Participant information survey – Participants were provided a survey to document their demographic information as well as current teaching position, experience, and school information. Participants were able to access this survey before and during the meetings.
- *MCAS Curriculum Framework* – Participants were provided access to the current version of the *MCAS Curriculum Framework* for the subject associated with their meeting.
- ALDs - Participants reviewed policy level and achievement level descriptors for the specific grade and course, which is a key set of information that was used throughout the cut score setting meeting.
- Security and Non-disclosure – Participants were provided access to the security and non-disclosure agreement for the standard setting meeting so they would be familiar with its content before signing the agreement at the meeting.

To provide the participants access to the pre-work materials prior to the meeting, they were supplied their unique login and a temporary password for the website to the email they provided when they registered for the meeting. This login provided them access to the specific section of the website associated with the standard setting meeting for which they were registered. Participant access was restricted to only the respective site for the standard setting meeting they were attending.

General Session

The purpose of the general session was to welcome the participants, provide background information about the next-generation MCAS assessment system, and introduce the standard setting process. A single general session including all 76 standard setting participants was conducted on Monday morning at the beginning of the standard setting meeting. Jeffrey C. Riley, the Commissioner of Elementary and Secondary Education, provided a welcome to the

Massachusetts educators and an overview of history of the MCAS assessment program. The official charge for the meeting along with a review of related student performance statistics was provided by Michol Stapel and Robert Lee. An overview of the cut score setting process was provided by Eric Moyer, the lead research scientist from Pearson facilitating the standard setting process.

Breakout Session

After the general session, participants moved into grade- and subject-specific breakout sessions for the remainder of the standard setting meeting. Each committee was responsible for providing recommendations for cut scores for each of the achievement levels for the test associated with the committee. The committee provided recommendations using each of the activities described below.

Experience the Test. Participants experienced the specific operational test form that the students were administered during the spring 2019 administration. The participants experienced the test just as students did, online administered through the TestNav 8 system, which was accessed through the standard setting website.

Since the version of the online testing system used during the standard setting meetings did not store and score participant responses, participants recorded their responses on a separate item response form, provided in the participant folder. During this activity, if the participants wanted to provide any comments regarding items on the test form, they were asked to record the comments on an Item Comment Form, which was collected at the end of the meeting.

After the participants completed the Experience the Test activity, the content facilitators provided instruction on how to score the items based on the scoring rules used for MCAS. A test map document, accessed through the standard setting website, provided information about each item on the test, including a unique item number, reporting category, maximum possible score, the correct response for the item, and any specific scoring rules for the item. For open-ended items, the test map provided a reference to the open-ended item rubric and exemplar documents so the participant could see what was expected to earn each possible score point. Participants were also provided training on characteristics that make an item difficult, in addition to how to use the rubric to score responses for open-response items and how these corresponded to the student exemplar response scores.

Borderline Achievement Level Descriptions. An essential component to the standard setting process is the development of borderline descriptions. The purpose of the borderline descriptions activity was for panelists within a committee to develop a common understanding of student achievement at the threshold, or borderline, of each achievement level.

To help inform this activity during the standard setting meeting, the process facilitators reviewed the achievement levels and the achievement level descriptors for the respective grade and subject. Panelists were informed that the ALDs provided a snapshot of the typical characteristics at each achievement level, including the breadth and depth of the knowledge, skills, and abilities expected to be demonstrated by students within each level. The participants reviewed the grade- and subject-specific ALDs, providing them with a common understanding of expectations for what students should demonstrate within each achievement level for the respective assessment.

The participants were then introduced to the difference between a *typical* student performance and *borderline* student performance within an achievement level. The borderline student performance was described as the performance to be minimally qualified to be classified within

a particular achievement level, possessing just enough knowledge, skills, and abilities to achieve the specific achievement level classification. The facilitator then led the panelists through a modeling activity. A collaborative and guided approach was used to draft one or two borderline statements for the *Meets Expectations* achievement level that served as examples for the committee. The facilitator asked guiding questions during the modeling activity to help panelists develop an appropriate understanding of how to create borderline descriptions.

Panelists were then split into their table groups to review the ALDs for a specific reporting category within each achievement level. Each small group created draft borderline descriptions for their specific reporting category using a borderline descriptions worksheet accessed through the standard setting website. The borderline descriptions from each group were collected into a master document and reviewed/discussed together by the whole committee. Revisions to the master document were made during the whole-group discussion to create a common set of borderline descriptions.

The final list of borderline descriptions were printed and provided to each participant to place in his or her folder as a reference for subsequent activities.

Item Judgment Process Training. The process facilitator for the committee provided the participants with training on the Extended Modified (Yes/No) Angoff standard setting process (Davis & Moyer, 2015; Plake, Ferdous, Impara, & Budkendahl, 2005) and how to record their individual item judgments within the standard setting website. They were instructed to review each item from the assessment, which was accessed through the website, review the borderline descriptions, the answer key, and, if needed, the rubric and student exemplars for the item. Based on their review of the item and the related materials, the participants answered the following question for each achievement level:

"How many points would a borderline student at the [specific] achievement level likely earn if he or she answered the question?"

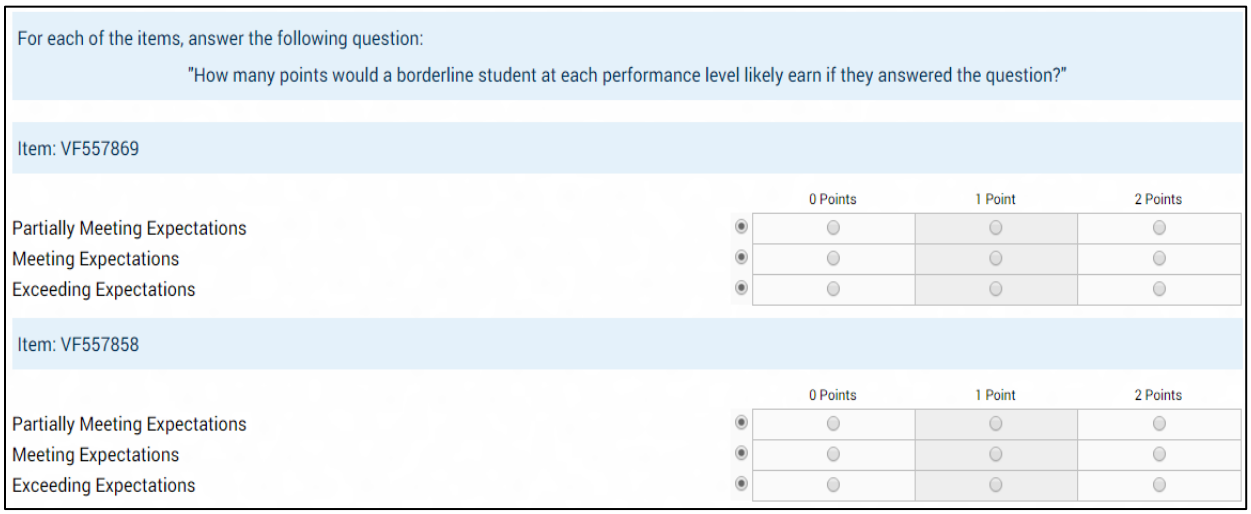
Significant time was spent describing the thought process the panelists should go through using parts of the question.

- "would…" — When envisioning expected student response to an item, the panelists were asked to consider how a student would respond. Where "should" is an aspirational expectation, "would" is a more realistic expectation of a student response to an item.
- "...a student performing at the borderline of the [specific] performance level…" — The panelists were reminded to reference the borderline descriptions to determine how a student performing at the borderline of that performance level would be expected to respond.
- "...likely..." — In this context, likely was defined as 2 out of 3 times, or 67%. To make this concrete for panelists, facilitators asked them to think about three students at the borderline of a performance level. If a panelist believed 2 of 3 students with performance at the borderline would correctly answer the item, they would respond "yes" to the question. If a panelist did not believe 2 of 3 students with performance at the borderline would correctly answer the item, they would respond "no" to the question.
- "...earn if he or she answered the question." — Panelists selected the number of points a student with performance at the borderline would be expected to earn if he or she answered the item.

The response to judgment question for each item was recorded within the judgment survey in the website. Figure 4 presents an example item judgment survey in the website. Participants

completed the item judgments for each achievement level for an item before moving on to the next item.

Figure 4: Example Item Judgment Survey from Moodle Site



The participants also kept a record of their item judgments on the Judgment Record Sheet. This document was provided to them as part of the materials in their folder. It included the unique item number, reporting category, and maximum possible points for the item. The participants were shown how to use the unique item number to ensure that they were referencing the correct item on all documents within the judgment survey and in the online system.

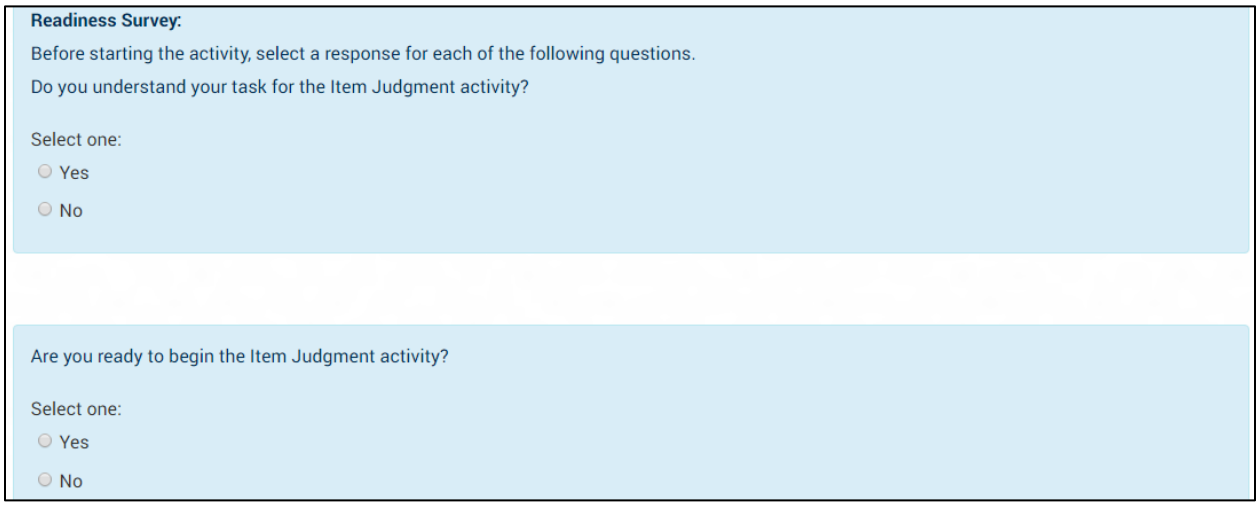
Practice Judgment Activity. Panelists completed a practice judgment activity prior to beginning the actual judgment rounds. The goals of this activity were to:

- Give panelists experience reviewing and making judgments about different types of items.
- Familiarize panelists with the judgment survey on the standard setting website.
- Build confidence in panelists' understanding of the task to be completed.

The practice items selected for the activity were a subset of those panelists ultimately reviewed in the actual judgment rounds and included examples of different item types, difficulty, and score points. After all panelists completed their practice judgments, the facilitator presented item-level judgment results interactively through the standard setting website. Group discussion was initiated to review the judgment process and panelist responses, demonstrate how their judgments are used to determine a cut score recommendation, and answer any questions.

Item Judgment Rounds. After receiving training on the standard setting process, the participants participated in three rounds of judgments. Before starting each of the three judgment rounds, the participants were required to complete a readiness survey in the website indicating that they understood the task and process used to complete the item judgments. The participants had to answer "yes" to all readiness survey questions before continuing with the judgment round. If they responded "no" to any question, they were asked to notify a facilitator for additional assistance. Figure 5 presents an example of the readiness quiz participants needed to complete before starting the judgment task.

Figure 5: Example Readiness Quiz Before Judgment Task



Each judgment round consisted of a review of the judgment process by the process facilitator, with explicit instruction on which materials would be needed to complete the task, followed by participants working independently on their item judgments. Participants were required by the website to provide judgments for each item before they could submit their judgment survey.

Judgment Feedback. Once all the participants had completed their item judgments, data analysts from Pearson collected the data from the website and performed the analysis to determine an aggregate recommendation for the committee. The participants were provided feedback after each judgment round which could be used to inform subsequent judgments. Feedback data included the following:

- Individual item judgment record: A record of each panelists' individual item judgments for each achievement level. This was provided for the panelists to check their individual judgments against what was recorded in the website survey.
- Information about panelists' cut scores for each achievement level:
    - Individual cut scores: Judgments were summed across items to obtain a cut score for each level. The panelists were provided individual paper handouts showing their judgments and recommended cut score for each achievement level.
    - Committee cut score recommendations and statistics: Committee-level recommendations were the median cut score across all panelists for each achievement level. Panelists were provided the committee-level cut score recommendations and cut score statistics for each achievement level.
    - Panelist agreement data: Bar graphs showing the frequency of individual recommended cut scores for each achievement level and across adjacent achievement levels.
- Item-level judgment agreement across panelists: Distribution of panelist judgments for each item and achievement level.
- Item means (p-values) and score-point distributions: The average score earned by students for each item and the distribution of score points, for polytomously scored items, calculated from operational test data.
- Impact data: Percentage of students that would be classified into each achievement level, based on the committee's current recommended cut scores and the results of students who took the assessment during the spring 2019 administration.

Table 7 displays the type of feedback that was provided to participants after each round of judgments.

Table 7: Feedback Data Provided to Participants After Each Judgment Round

Feedback	Round		
	1	2	3
Individual item-level judgment record	Yes	Yes	Yes
Individual test-level recommendations	Yes	Yes	No
Table test-level recommendations	Yes	Yes	No
Committee test-level recommendations	Yes	Yes	Yes
Item-level participant agreement	Yes	Yes	No
Test-level participant agreement	Yes	Yes	No
Item score mean and score distribution	Yes	Yes	No
Impact data	Yes	Yes	Yes

Appendix F provides examples of each of the feedback data provided to participants, along with a brief description of the feedback presented.

Before the discussions of feedback data, panelists were given guidance regarding the independence of their judgments. That is, they were encouraged to listen to other panelists and consider the rationales given for their judgments, but they should not feel pressured to reach consensus. Following Rounds 1 and 2, panelists shared the rationale for their judgments during table-group and whole-group discussions. Items with the highest level of disagreement amongst the committee were revisited for each achievement level. Committee members discussed a range of topics, such as item difficulty, student strategies when responding to the items, their individual rationale for a judgment, and, importantly, the borderline descriptions the group crafted. The goal of the discussions was to demonstrate to panelists how their judgments compared to the rest of the committee and to guide them toward a common and shared understanding of the borderline descriptions and judgment task. Since the round 3 judgments were the participants' final judgments, the feedback data was provided to facilitate the participants' evaluation of the final recommendation by the committee.

Process Evaluations. The validity of standard setting outcomes relies partially on the procedural validity of the meeting. Evidence of the procedural validity was gathered through evaluation surveys administered during the standard setting. An evaluation survey was administered in the website in each committee after the practice judgment activity and the after round 3 judgments. The purpose of these surveys was to collect information about each participants' experience in recommending cut scores for the achievement levels associated with the MCAS assessments. The survey asked participants to provide feedback on the following:

- The level of success of the various components of the meeting
- The usefulness of the activities conducted during the meeting
- The adequacy of the various components of the meeting
- The adequacy of opportunities to ask questions, etc., at the meeting
- How confident participants were that the recommended cut scores accurately reflected student performance at each achievement level

- Whether committee members thought that their judgments and opinions were treated with respect by facilitators and fellow participants

All participants were also allowed to provide any additional information concerning their evaluation of the process of the standard setting meeting through an open response question.

Recommended MCAS Cut Scores from Standard Setting Committees

During the cut score setting meeting, it was expected that there would be variation between participants' cut score recommendations for each achievement level. To determine a single cut score recommendation for an achievement level for a committee, the cut score recommendations for the achievement level were averaged across participants. Specifically, the median cut score from a set of participants' cut score recommendations was used to determine the recommended cut score for an achievement level for the committee. The recommendation resulting from the round 3 judgments was considered as the committee's recommendation for the standard setting meeting. Table 8 displays the recommended cut scores for each achievement level based on the round 3 recommendations for each course and subject. Figures 6 and 7 display the impact data for STE grades 5 and 8 and grade 10 ELA and math, respectively, based on the recommended cuts scores from round 3 from each committee.

The recommended cut scores for each achievement level from the three judgment rounds for each standard setting committee, represented as raw scores, are presented in Appendix G. The summary statistics for the recommended cut scores for each achievement level from the three judgment rounds for each standard setting committee are shown in Appendix H. The participant agreement data for each performance level for judgment rounds 1 and 2 for each standard setting meeting are shown in Appendix I. The estimated impact data after judgment round 3 for each achievement level for each standard setting committee are shown in Appendix J.

Table 8: Cut Score Recommendations from Standard Setting Committees

Subject	Grade	Maximum Score	Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
			Raw Score	% Correct	Raw Score	% Correct	Raw Score	% Correct
STE	5	54	16	29.6	30	55.6	47	87.0
	8	54	17	31.5	33	61.1	46	85.2
ELA	10	51	19	37.3	35	68.6	46	90.2
Math	10	60	13	21.7	32	53.3	53	88.3

Figure 6: STE Grades 5 and 8 Impact Data from Round 3 Recommendations

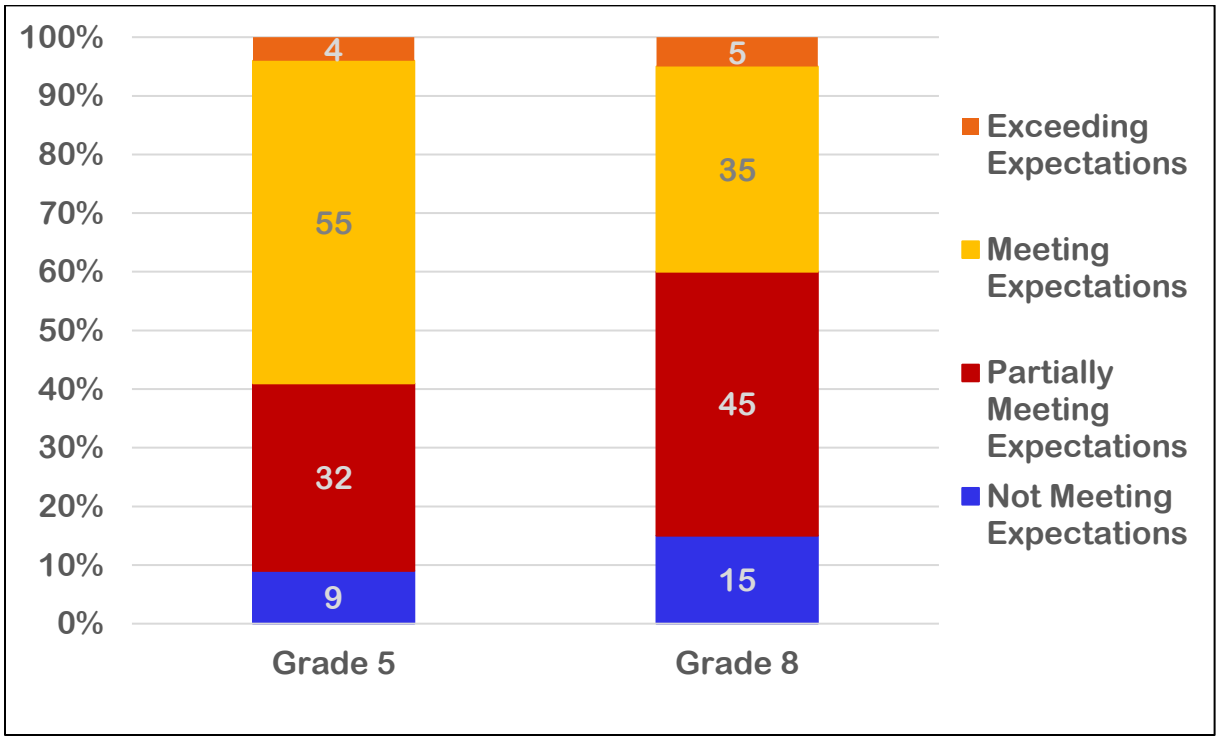
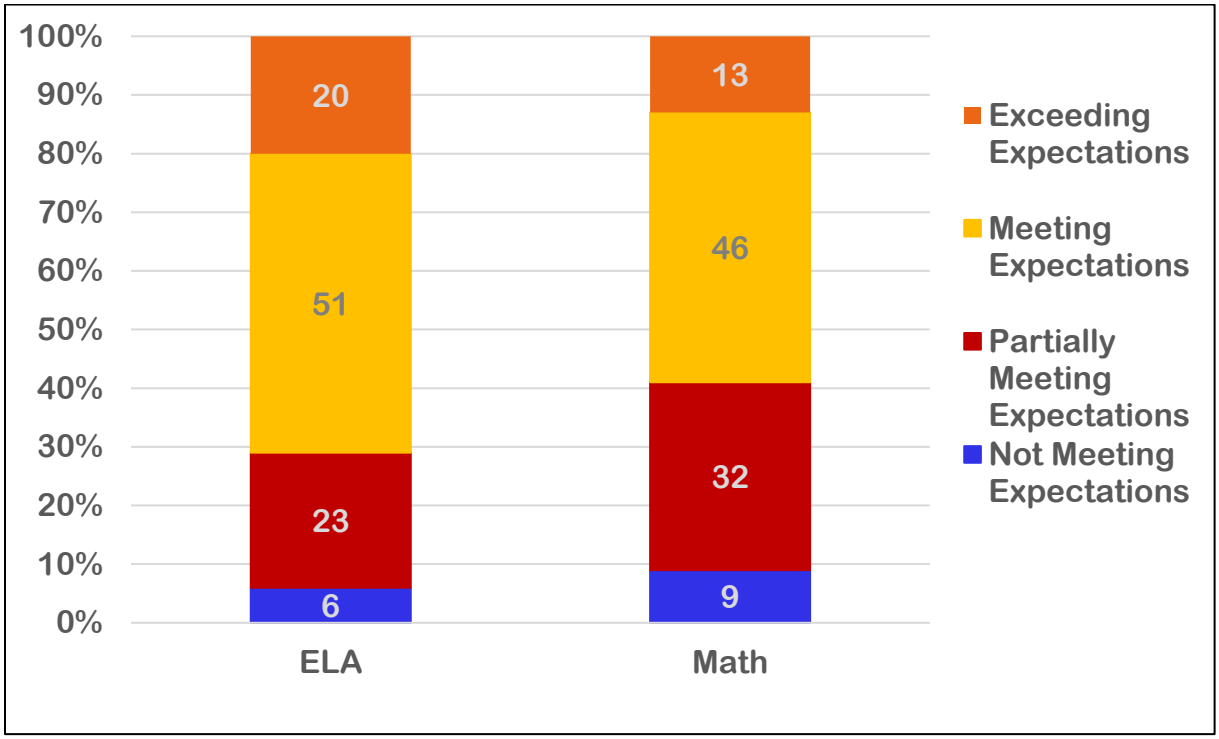


Figure 7: Grade 10 ELA and Math Impact Data from Round 3 Recommendations



Chapter 4 – Post-Standard Setting

This chapter provides details about the work completed after the standard setting committee meetings. The sections of this chapter include:

- Vertical articulation
- Linear scaling process
- Competency Determination Validation

Vertical Articulation

The purpose of the vertical articulation meeting was to review the cut score recommendations from the standard setting committees within a content area and evaluate the reasonableness of the recommendation. Where the recommendations from the standard setting committees were made with a specific focus on the respective content for this committee, the focus of the vertical articulation committee was to view the cut score recommendations across grades within a content area to evaluate whether the recommendation resulted in a cohesive assessment system. The participants of the vertical articulation were guided through a specific process where they would review the recommendations from the standard setting committee and, if necessary, recommend and review changes to the recommendation, resulting in a set of recommended cut scores from the vertical articulation committee.

For ELA and math grade 10 committee, the vertical articulation occurred with all committee participants after the round 3 judgment recommendations. The vertical articulation committee for STE was convened as a separate meeting after the standard setting committee concluded on Wednesday, August 7, from 8 to 12. The participants of the vertical articulation for STE were the table leaders from the individual standard setting committees for grades 5 and 8. The facilitators for the vertical articulation are shown in Table 9.

Table 9: Process Facilitator for Standard Setting Committees

Subject	Process Facilitator
ELA	Eric Moyer, Ph.D.
Math	Ye Tong, Ph.D.
STE	Jenna Copella, Ph.D.

Meeting Process

The vertical articulation process involved three steps:

- ALD cross-grade review activity
- Review and discussion of the cross-grade impact data
- Review and recommendation to recommended cut scores

At the beginning of the process, the participants were instructed to the purpose of the vertical articulation process, as the opportunity to review the recommended cut scores from the standard setting meetings across the grades within the same subject, ensuring that they represented a cohesive assessment system. In the previous standard setting meetings, they

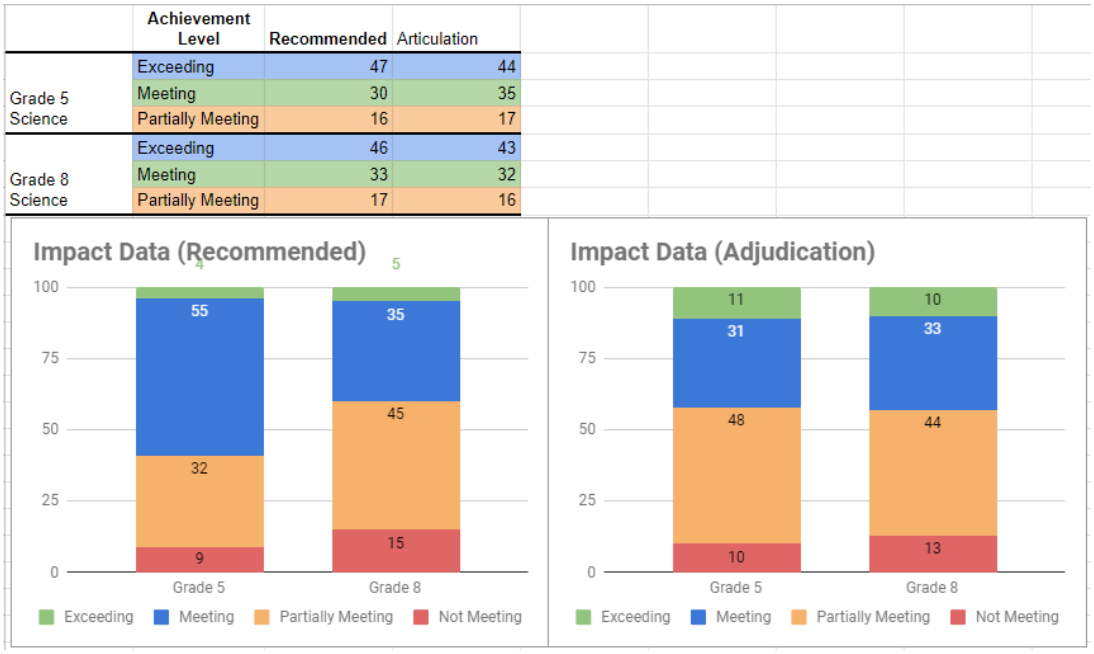
were focused primarily on the content related to the grade within their committees, where in this meeting they would review the recommendation from across grades from a policy perspective.

To start the vertical articulation process, the participants were provided the opportunity to independently review the ALDs across grades for their respective subject. The instructions for this activity were to look for differences or similarities in student expectation across grades that could be used to explain the articulation of student impact across grades. After looking at the ALDs independently, the participants had the opportunity to discuss the ALDs as a table group. During a whole group discussion, the participants discussed what their expectation would be of the articulation of the impact data across grades. The focus of this discussion was to establish a content-based expectation for the impact data across grades.

The participants were then presented with the cross-grade impact data chart reflecting the results from the round 3 judgments of all standard setting committees for their subject area. For STE, the impact data they were presented for grades 5 and 8 is shown in Figure 6. For grade 10 ELA and math, the participants were presented with the grade 10 impact data from round 3 along with the final impact data for grades 7 and 8 for respective subject from the 2017 standard setting meeting. The groups had the opportunity to discuss how the results looked across grades based on their initial expectations.

Based on their expectations of student impact relative to their review of the ALDs, the participants were provided the opportunity to investigate changes to the recommended cut scores from round 3 using an interactive spreadsheet, which was accessed through the standard setting website. Figure 8 presents the interactive spreadsheet for the STE vertical articulation meeting.

Figure 8: Interactive Spreadsheet for SE Vertical Articulation Meeting



	Achievement Level	Recommended	Articulation
Grade 5 Science	Exceeding	47	44
	Meeting	30	35
	Partially Meeting	16	17
Grade 8 Science	Exceeding	46	43
	Meeting	33	32
	Partially Meeting	17	16

The interactive spreadsheet allowed participants to investigate possible changes to the cut scores from their committee by adjusting the current cut scores and simultaneously viewing the change to the impact data. The participants were instructed to investigate changes to the recommended cuts scores if they felt that the pattern of the impact data across grades was

inconsistent with what they expected, based on their review of the ALDs and their understanding of a cohesive assessment system. The changes would be made directly at the cut score level and did not involve changes to the item level judgments. The range of individual participant's cut score recommendations from round 3 were used as a guide when evaluating how much change would be reasonable to make. The participants were aware of the need to honor the work the standard setting committees had done and were judicious in making changes. The individual table group activity only occurred for the STE vertical articulation meeting.

The committee had the opportunity to recommend changes to cut scores for achievement levels for the grades which they determined had inconsistent results. When a change in cut score was recommended, it was entered into a master interactive spreadsheet by the meeting facilitator for the entire committee to view the change in cut score and pattern of impact data across grades and achievement levels. One recommended change at a time was viewed, discussed, and then either accepted or rejected by the vertical articulation committee. This process was repeated until all recommended changes were discussed and the vertical articulation committee agreed with the entire set of cut score recommendation across all grades.

Participants were aware of the need to honor the work the standard setting committees had done and were selective in making changes so that the number and magnitude of changes were limited to only those changes necessary to support the articulation across grades. Table 10 displays the changes made to the recommended cut scores from the standard setting committees.

Table 10: Changes to the Cut Score Recommendations by the Vertical Articulation Process

Subject	Grade	Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
STE	5	+1	+5	-3
	8	-1	-1	-3
ELA	10	+2	+2	+1
Math	10	0	0	0

Table 11 displays the recommended cut scores for each achievement level based on the final vertical articulation recommendations for each course and subject. Figures 9, 10, and 11 display the impact data for STE grades 5 and 8 and grade 10 ELA and Math, respectively, based on the recommended cuts scores from the vertical articulation process.

Table 11: Cut Score Recommendations from the Vertical Articulation Process

Subject	Grade	Maximum Score	Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
			Raw Score	% Correct	Raw Score	% Correct	Raw Score	% Correct
STE	5	54	17	31.5	35	64.8	44	81.5
	8	54	16	29.6	32	59.3	43	79.6
ELA	10	51	21	41.2	37	72.5	47	92.2
Math	10	60	13	21.7	32	53.3	53	88.3

Figure 9: STE Grades 5 and 8 Impact Data from Vertical Articulation

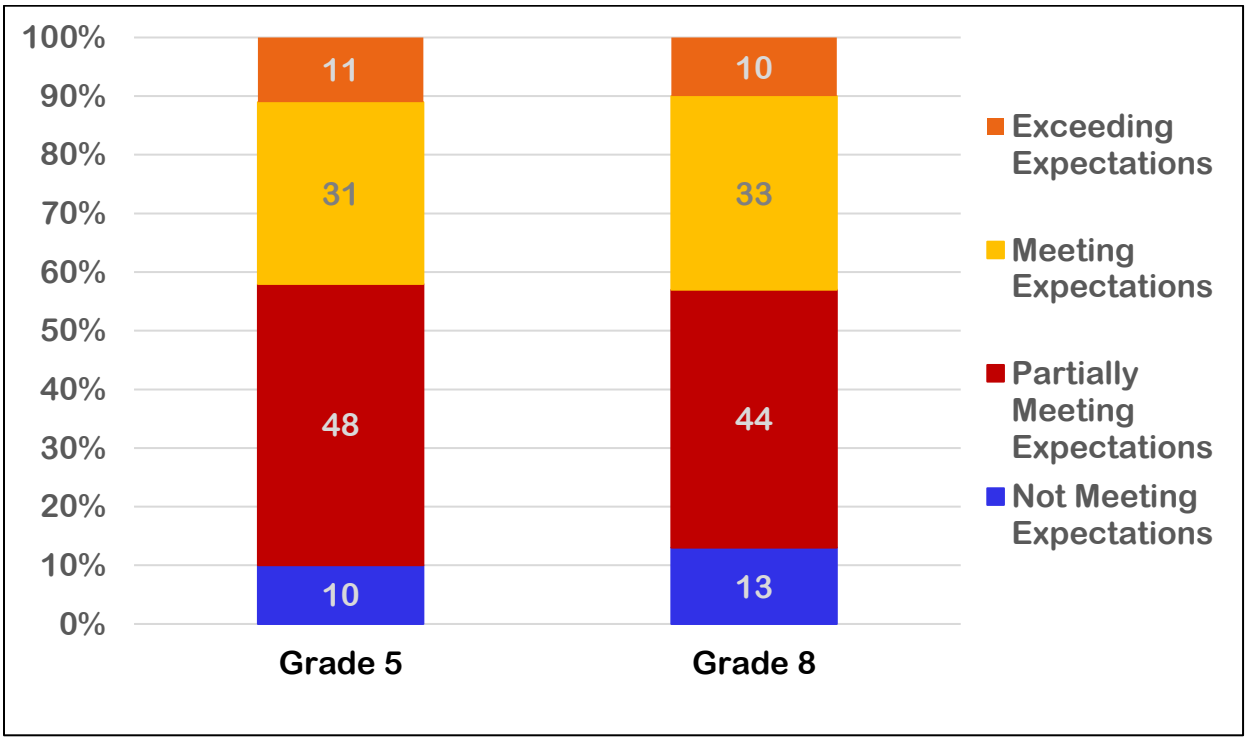


Figure 10: ELA Grade 10 Impact Data from Vertical Articulation

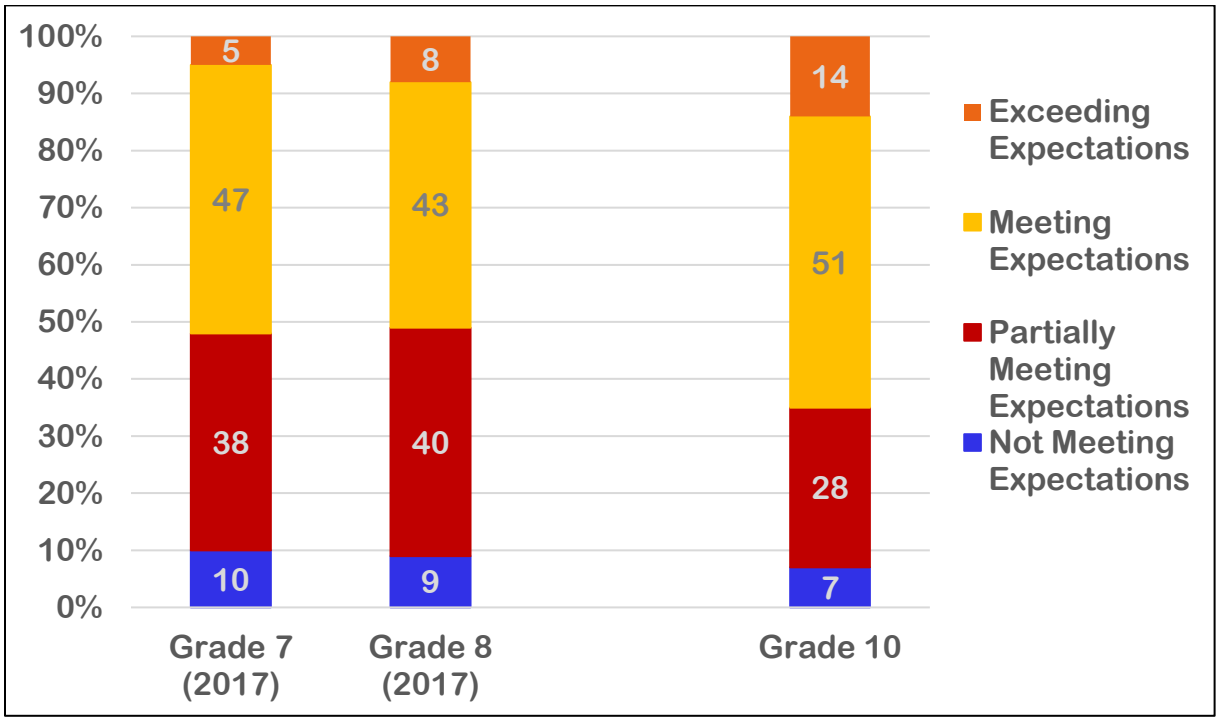
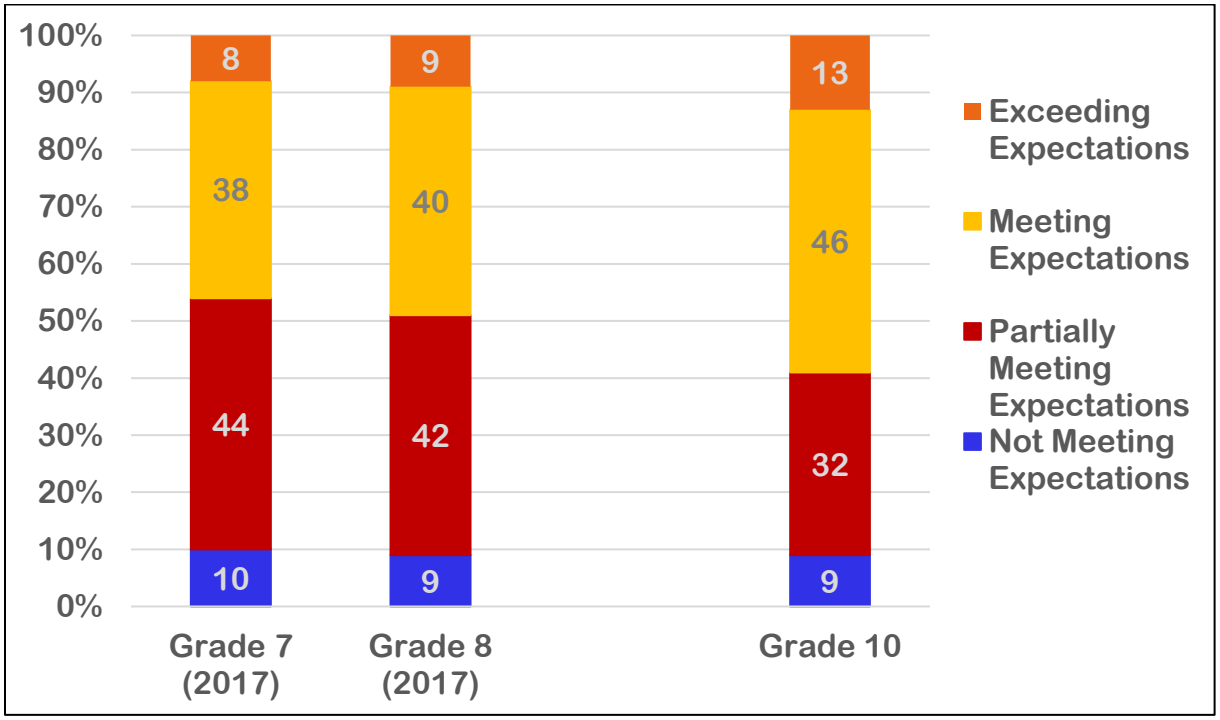


Figure 11: Math Grade 10 Impact Data from Vertical Articulation



Process Evaluation Survey

At the end of the vertical articulation process for STE, participants were asked to complete a process evaluation survey in the website. The purpose of the evaluation was to collect information about each participants' experience in the vertical articulation meeting. The evaluation asked participants to provide feedback on the following:

- The level of success of the various component of the meeting
- The usefulness of the activities conducted during the meeting
- The adequacy of the various components of the meeting
- The level of support the participants had in setting the recommended cut scores for each achievement level across all grades

All participants were also allowed to provide any additional information concerning their evaluation of the process of the vertical articulation meeting through an open response question.

Linear Scaling Process

The recommendations from the standard setting and vertical articulation committees were cut scores in terms of raw scores on the test. Student results are not reported as raw scores, since the overall difficulty of tests may change from year to year, so results would not be able to be compared across years. To address this, student results on the MCAS are reported using scale scores, which are comparable across administration years. After the vertical articulation process, a method was implemented to determine the process for transforming the raw scores from the spring 2019 administration to MCAS scale scores.

The process of determining the rules for transforming the raw scores to the final MCAS reporting scale was guided by several principles identified by DESE:

1. Respect the cut score recommendations provided by the vertical articulation committee by preserving the final cut scores while also establishing a coherent system of measurement across grades
2. The impact data from the final scaling solution should reflect a coherent assessment system across the grades
3. The reporting MCAS scaled scores for the three achievement level cuts should be the same across grades and tests
4. The scaling solution should involve a single linear transformation, from the underlying IRT scale to the reporting MCAS scale
5. The reporting MCAS scaled score range should be the same across grades and tests.

This process, involving Pearson, Cognia, and DESE, was used to determine a final reporting scale and transformation rules for each test. A more extensive description of the development of the scaling process will be included in the overall MCAS technical report.

The following iterative process was used to determine the final cut scores for the achievement levels for the MCAS assessments, starting with the raw score cuts recommended from the vertical articulation meeting:

- The raw score cuts for the three achievement levels were translated to cuts on the IRT scale using the raw score to theta (IRT) lookup table for the specific assessment.
- The cuts on the IRT scale were adjusted so that the differences between consecutive

cuts were the same, allowing for the use of a single linear transformation rule.
- Based on the adjusted IRT cut scores, scaling constants for the linear transformation from the IRT cuts to MCAS scale score cuts were determined.
- Using the scaling constants, lookup tables for each grade and test were created, displaying the relationship between the raw scores and reporting MCAS scaled scores.
- Based on the lookup tables, adjusted raw score cuts for each achievement level were determined.
- Finally, the resulting impact data based on the adjusted raw score cuts was calculated and reviewed to ensure a coherent system across grades.

This process was repeated several times until a final scaling solution was determined, which met, as closely as possible, ESE's requirements.

For this process, the LOSS of 440 and HOSS of 560 were held constant for all assessments across grades and subjects. Additionally, in order to create common points of reference across the assessments, the same cuts on the MCAS scale for each achievement level were defined, with a *Partially Meeting Expectations* cut of 470, a *Meeting Expectations* cut of 500, and an *Exceeding Expectations* cut of 530. These requirements were established through discussion between ESE and Cognia (previously Measured Progress) psychometric staff, after the 2017 standard setting.

As with the vertical articulation committees, the participants honored recommendations made by the vertical articulation committees by making selective changes so that the number and magnitude of changes were limited to only those changes necessary to meet the ESE requirement for scaling and reasonableness across grades. Table 12 displays the changes made to the recommended cut scores from the vertical articulation committees.

Table 12: Changes to the Cut Score Recommendations for Linear Scaling

Subject	Grade	Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
STE	5	+1	-2	+1
	8	0	-1	+1
ELA	10	0	+1	0
Math	10	0	0	0

Table 13 displays the final recommended cut scores for each achievement level based on the results of this process for each course and subject. Figures 11 and 12 display the impact data for STE grades 5 and 8 and grade 10 ELA and math, respectively, based on the final recommended cuts scores from the results of this process.

Table 13: Final Cut Score Recommendations from the Linear Smoothing

Subject	Grade	Maximum Score	Partially Meeting Expectations		Meeting Expectations		Exceeding Expectations	
			Raw Score	% Correct	Raw Score	% Correct	Raw Score	% Correct
STE	5	54	18	33.3	33	61.1	45	83.3
	8	54	16	29.6	31	57.4	44	81.5
ELA	10	51	21	41.2	38	74.5	47	92.2
Math	10	60	13	21.7	32	53.3	53	88.3

Figure 11: STE Grades 5 and 8 Impact Data from Final Recommendation

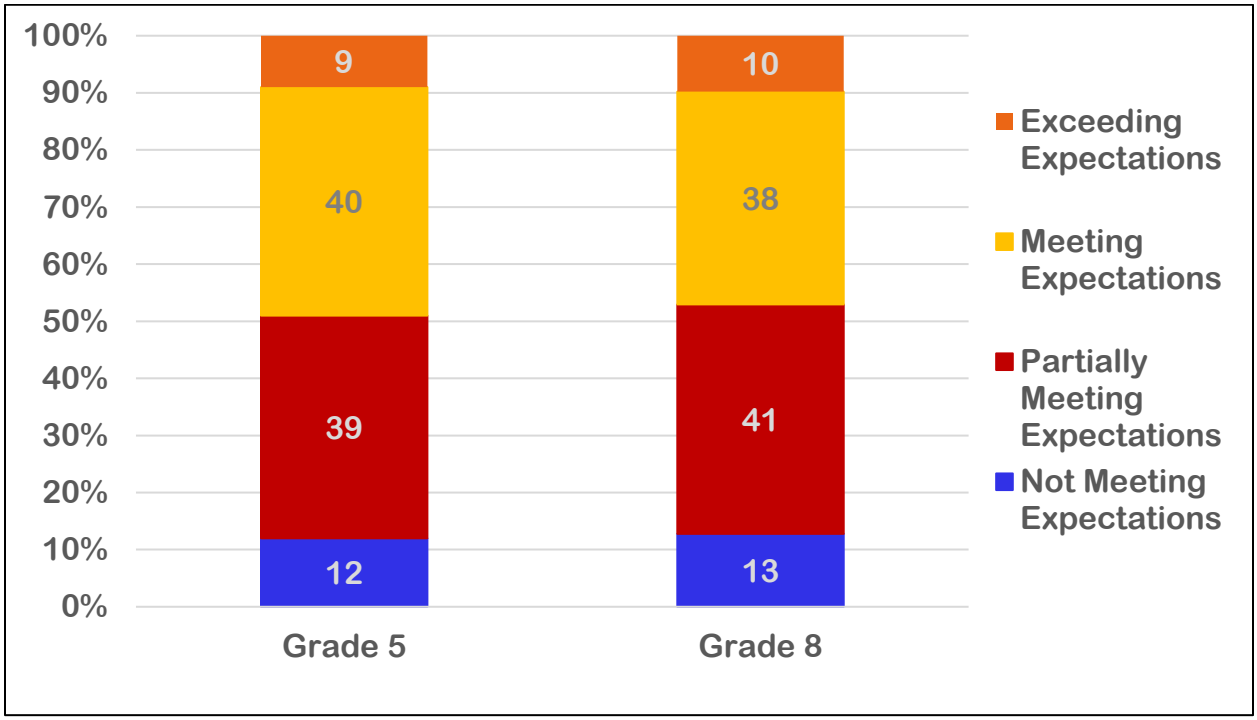
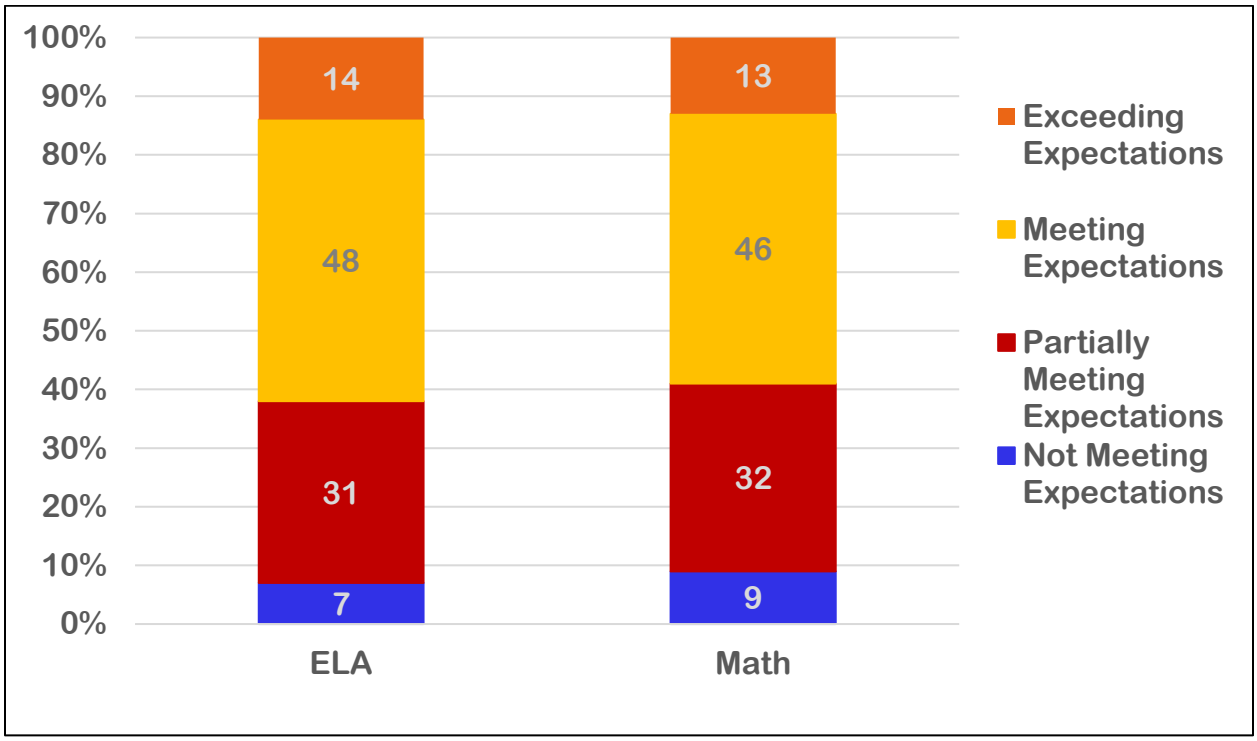


Figure 12: Grade 10 ELA and Math Impact Data from Final Recommendation



Competency Determination Validation

A competency determination validation meeting was convened to review and either validate or adjust competency determination cuts on the next-generation MCAS assessments for grade 10 ELA and math. The competency determination cuts on the next-generation MCAS are interim cut scores that correspond to the scale score cuts for each of the achievement levels on the previous (legacy) MCAS assessments for grade 10 ELA and math. The identification and validation of the interim competency determination cuts was legislatively mandated to provide students, parents, and educators with sufficient time to become familiar with the new assessment and expectations before the next-generation passing standards are established.

Prior to the competency determination meetings, the Pearson standard setting team worked to statistically identify interim cuts for the achievement levels on the legacy MCAS assessments, Needs Improvement (220), Proficient (240), and Advanced (260). An equipercentile process with a matched sample was used to statistically identify the interim cut scores for each achievement level. The statistically determined interim cut scores were established so they result in similar impact data on the spring 2019 administration of the next-generation MCAS as on the spring 2018 administration of the legacy MCAS. Table 14 provides the statistically defined interim cut scores for each subject.

Table 14: Statistically Defined Interim Cut Scores

Subject	Needs Improvement	Proficient	Advanced
Grade 10 ELA	13	22	38
Grade 10 Math	12	21	35

There were two competency determination validation meetings, one for grade 10 ELA and one for Grade 10 math. The competency determination committees were convened as a separate meeting after the standard setting committee concluded on Wednesday, August 7, from 8 to 12. The panelists for the competency determination meetings were a subset of the panelists from the standard setting committee, including the committee table leaders. The facilitators for the ELA and math competency determination meeting were Eric L. Moyer and Ye Tong, respectively.

Meeting Process

The competency determination validation process involved three steps:

1. Determine content expectations for previous (legacy) MCAS achievement levels
2. Review student performance on next-generation MCAS around statistically determined interim cut scores
3. Provide individual judgments about interim cut scores for each achievement level

For the panelists to review whether the content expectations defined by the interim cut scores on the next-generation MCAS was similar to the expectation on the legacy MCAS assessment, they first had to define the content expectations for each achievement level. Prior to the meeting, the Pearson standard setting team created score profiles for each scale score associated with the achievement level cut scores. The score profile presented student performance on each of the items for students that received the associated scale score. Figure 13 displays an example of a score profile for grade 10 ELA.

Participants reviewed the score profiles for each achievement level on the legacy MCAS in table groups to create an outline of student expectations for each achievement level. For each item on the score profile, the participants were provided item keys and scoring information, accessed through the standard setting website. Based on the panelist review of the items and the score profiles, the facilitator guided the group through a discussion to develop an outline of student expectations for each achievement level.

The panelists then reviewed score profiles for each interim cut score on the next-generation MCAS assessment. The score profiles were based on student performance on the next-generation MCAS assessment administered in spring 2019. Access to the score profiles for the interim cut scores, items and scoring information for items was provided to the panelists through the standard setting website. For each interim cut score the participants were also provided access to score profiles for three cut scores greater than and less than the interim cut score. For each score profile, the participants were comparing the expectations defined by student performance on the items and how they compared to the content expectations defined for the legacy achievement level.

Figure 13: Example student profile for legacy assessment

Scale Score: 220

Raw Score Distribution:

Raw score	21	22
Number of students	183	162
Percentile	2nd	2nd

Composition Score Distribution

Score	0	2	3	4	5	6	7	8	9	10	11	12
Topic Dev.	39%	7%	4%	31%	8%	11%	0%	0%	0%	0%	0%	0%
Conv.	39%	1%	2%	45%	6%	6%	0%	0%				

Open Repsonse Score Distribution

Item Sequence	Item ID	Max Points	0	1	2	3	4
9	EL315010	4	26%	50%	22%	3%	0%
18	EL316592	4	21%	50%	23%	5%	0%
27	EL309870	4	35%	51%	13%	1%	0%
36	EL315350	4	18%	51%	27%	4%	0%

Selected Response Score Distribution:

Item Sequence	Item ID	Max Points	% correct
Percentage of students with correct response greater than 75%			
Percentage of students with correct response between 60% and 74%			
Percentage of students with correct response between 40% and 59%			
1	EL314958	1	40%
3	EL314971	1	45%
4	EL314992	1	56%
5	EL314981	1	40%
6	EL314984	1	44%
10	EL316630	1	41%
11	EL316629	1	57%
12	EL316631	1	47%
13	EL316636	1	47%

Based on the panelists' review of the score profiles associated with each interim cut scores and the scores around them, the panelists then provided an individual judgment for each achievement level. For each achievement level, the panelist responded to the following question:

Based on your review, does the recommended interim cut score of ## on the spring 2019 next-generation MCAS for the achievement level represent similar expectations as on the spring 2018 legacy MCAS?

Panelists provided either a "Yes" or "No" judgment for each achievement level through an online judgment survey. Table 15 displays the percentage of panelists that responded "Yes" for each achievement level.

Table 15: Percentage of Participants with Agreement Judgments

Subject	Needs Improvement	Proficient	Advanced
Grade 10 ELA	60%	60%	100%
Grade 10 Math	70%	80%	80%

Since the percentage of panelists that provided agreement with the interim cut scores was greater than 50%, the interim cut scores for each achievement level were considered as validated by the committees.

Chapter 5 – Evidence of Procedural Validity of the Standard Setting Process

This chapter details various evidence for the validity of process used during the standard setting meetings. The sections in this chapter include the following:

- Committee representation
- Committee training
- Participants' perceived validity of the meeting
- Technical advisors' perceived validity of the meeting

Committee Representation

As part of the standard setting evaluation, participants completed a demographic survey that collected information about their background relevant to educational experience. The results of the self-reported demographic characteristics of the participants are documented in Appendix D.

As part of the survey, participants were asked to report their highest level of education (Table D.5), their current position (Table D.1), their number of years in education (Table D.2), and the number of years teaching a course related to their standard setting meeting (Table D.3). In each of the committees, the participants that had master's or doctoral degrees composed a majority of the committee. A majority of the participants of each committee were teachers in grades K–12.

The experience of the teachers in each committee was relevant to the recommendations they were making. The teachers in the committees had a range of teaching experience, with at least 50 percent of the teachers in each committee having at least 11 years of experience in education. A large majority of participants in each committee indicating they had experience teaching the subject in the grades relevant to their committee, as presented in Table D.3. The experience of the teachers in the committees included experience teaching different populations of students, as displayed in Table D.4 A large majority of participants of each committee had experience teaching general education, mainstream special education, and English language learners.

A large majority of participants were currently working in school districts, as presented in Table D.9. The participants that worked within school districts represented the various types of districts across the state, including size, type, and socioeconomic status. For grade 8 STE and grade 10 ELA, there were no teachers from rural schools. The set of participants for this standard setting was well selected for representing the teachers across the state in this process, which was noticed consistently by the facilitators of the meeting.

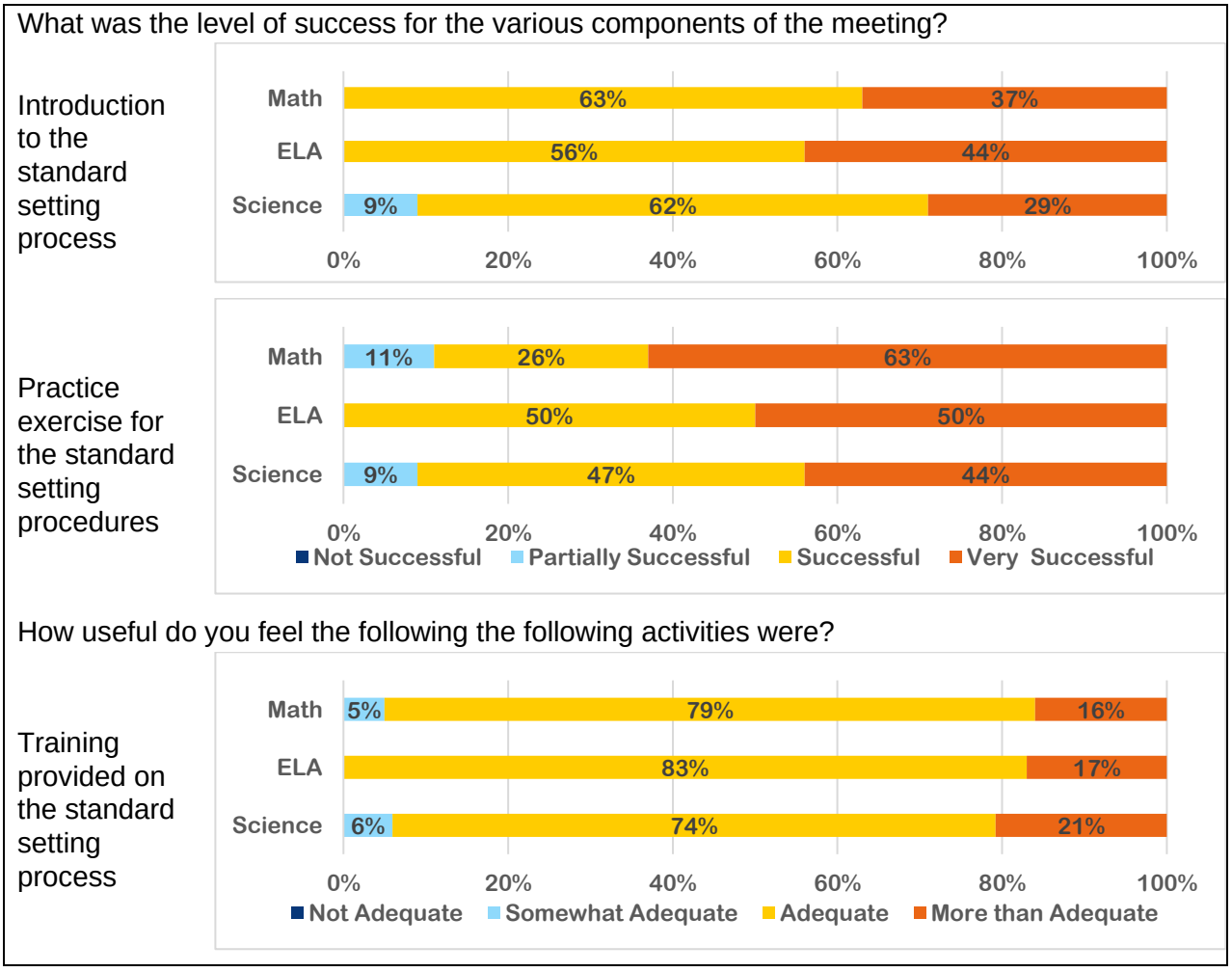
Committee Training

During the cut score setting meeting, it was essential that participants understood how to make judgments as part of the Extended Modified (Yes/No) Angoff standard setting methodology. The training on the standard setting methodology was provided during the general session and in the individual standard setting committees. The training on the implementation of the standard setting process was standardized across committees through the PowerPoint training slides.

Participants participated in a practice judgment round as an opportunity to implement the standard setting methodology without consequence, including making judgments within the standard setting website. During the practice judgment round, the participants reviewed a reduced set of items and provided judgments for the three achievement levels, *Partially Meeting Expectation*, *Meeting Expectations*, and *Exceeding Expectations*. After the practice round, the process facilitator led a whole-group discussion to identify and respond to any questions or issues participants encountered while implementing the standard setting process. Before each judgement round, participants responded to a readiness survey that asked whether participants were prepared for making their judgments. Participants were not able to continue to the judgment survey unless they answered yes to both questions on the readiness survey. They were encouraged to ask the facilitator questions if they responded "no" to either question.

At various points within the standard setting meeting, participants completed a process evaluation survey to record their impressions of the effectiveness of the materials and methods employed throughout the process. Figure 13 displays the results of the evaluation survey across subject-level committees for several questions related to the training on the standard setting process. The results of these process evaluations for each individual committee are presented in Appendix K.

Figure 13: Evaluation results on standard setting process training activities

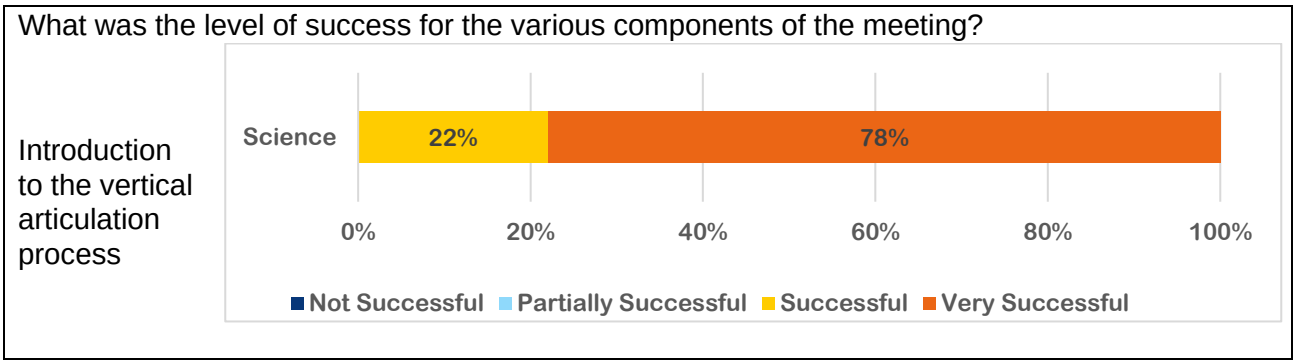


As part of the evaluation survey, the participants were specifically asked about the effectiveness

of the training they received on the standard setting process. One question asked participants to rate the level of success of the initial introduction to the standard setting process during the general session. Overall, the initial introduction to the standard setting process was perceived as successful with over 90 percent of participants in the committees responding that it was either *Successful* or *Very Successful*. The perception of the training on the standard setting process in the breakout groups was also good, where more than 80 percent of participants in the committees responded that it was either *Useful* or *Very Useful*. More than 90 percent of participants in the committees indicated that the practice judgment activity for the standard setting process was either *Successful* or *Very Successful*. These responses indicate that, overall, most participants believed that the training provided prepared them to implement the standard setting procedure, providing cut score recommendations for each assessment for which they were responsible.

During the vertical articulation meeting for science, the participants were provided training on the process and tools used during the meeting. At the end of the meeting, the participant completed a process evaluation form to record their opinion on the training provided. The results of this process evaluation are presented in Appendix K. For each committee, all participants indicated that the introduction to the vertical articulation process was either *Successful* or *Very Successful.*

Figure 14: Evaluation results on vertical articulation process training activities



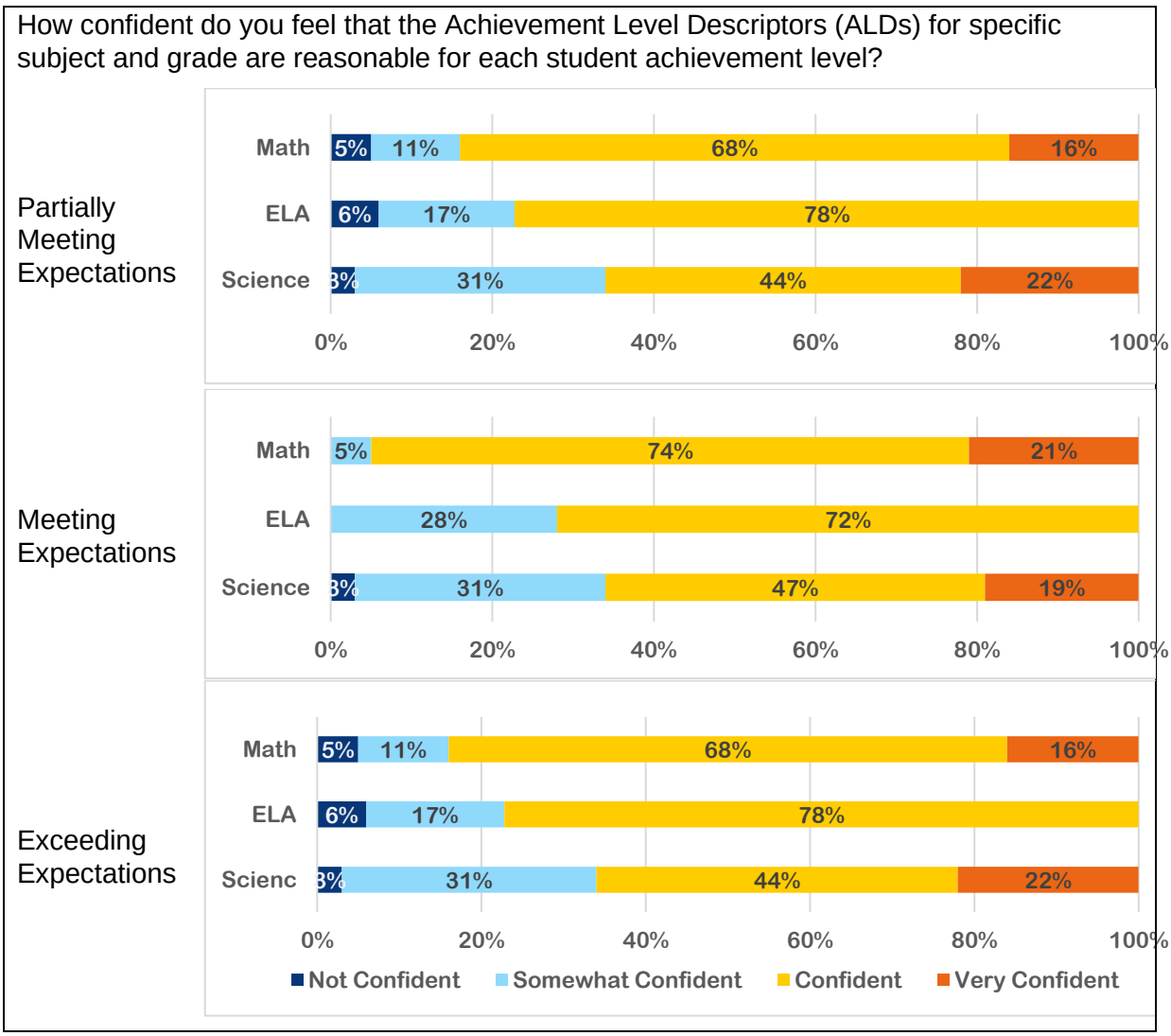
Perceived Validity of the Workshop

Participants and reviewers communicated their perceived validity of the workshop and the recommended cut scores. Participants indicated their perceived validity of the workshop as part of the workshop evaluation. Evaluations are important evidence for establishing the validity of recommended cut scores for the achievement levels.

Participant Evaluations

Generally, the participants were satisfied with their recommendations and with the workshop as a whole. As part of the process evaluation from each committee, the participants had the opportunity to indicate their confidence that the Achievement Level Descriptors were reasonable for each of the achievement levels. Figure 15 displays the results of the evaluation survey across subject-level committees, and indicates that the ALDs were reasonable for each of the achievement levels. The results for each subject and grade are presented in Appendix K.

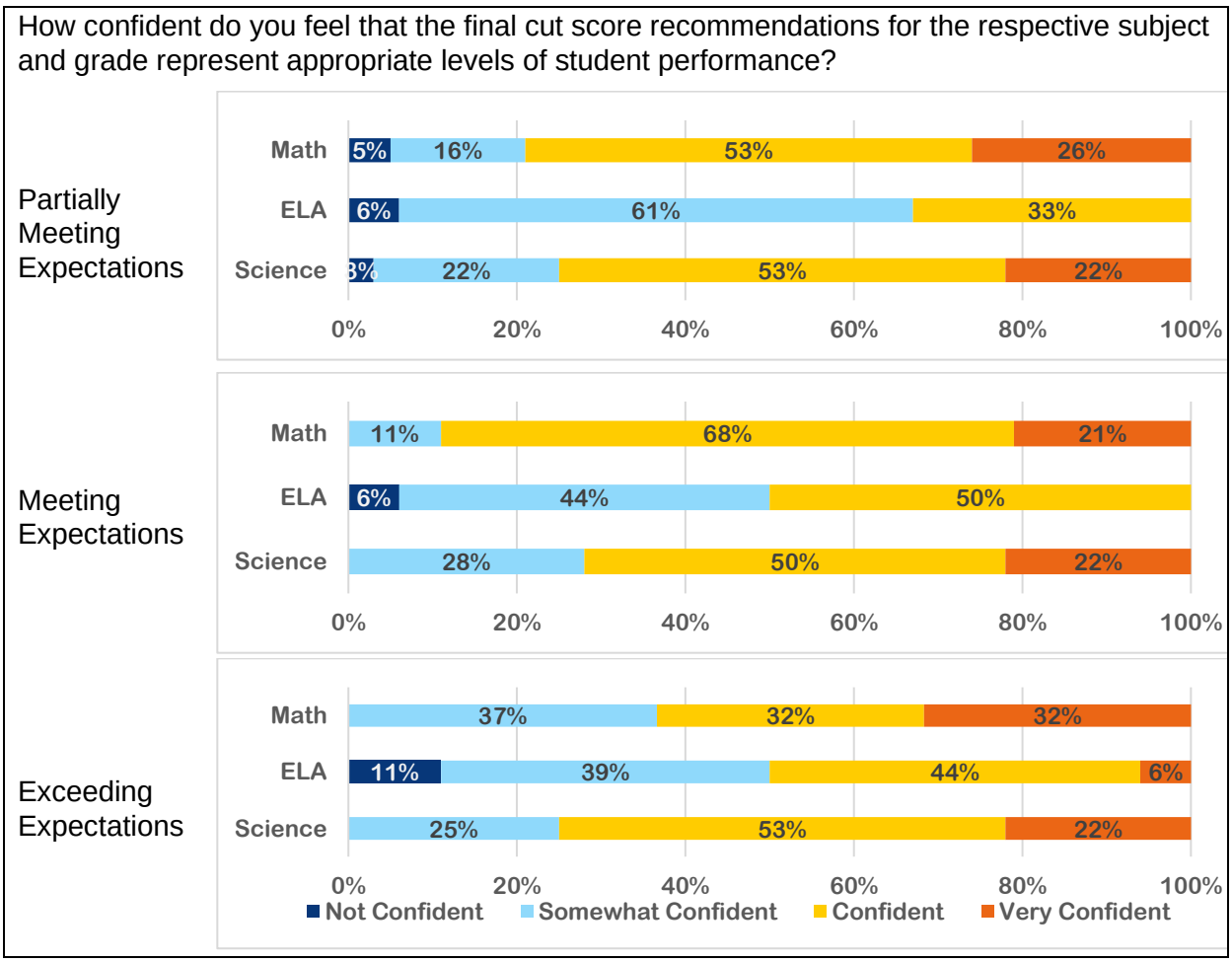
Figure 15: Evaluation results on reasonableness of the ALDs for each achievement level



Overall, the majority of panelists had at least some confidence that the ALDs were reasonable for each of the achievement levels. In the majority of committees, at least 60 percent of the participants were *Confident* or *Very Confident* that the ALDs were reasonable for the achievement levels. The panelists from the mathematics committee had the greatest level of confidence, with greater than 80% of the panelists indicating they were *Confident* or *Very Confident*. The ELA panelists did not respond with *Very Confident*, but greater than 70 percent of the panelists were *Confident*. These responses provide evidence that, overall, the ALD's, a foundation for the standard setting process, were perceived by the participants as providing reasonable expectations for each achievement level.

The participants were also provided the opportunity to indicate their confidence in the cut scores recommended by the standard setting committees. Figure 16 displays the results of the evaluation survey across subject-level committees for their confidence in the recommended cut scores. The results for each subject and grade are presented in Appendix K.

Figure 16: Evaluation results on reasonableness of the cut scores for each achievement level



As with the ALDs, the majority of participants indicated that they had at least some confidence that the recommended cut scores represented appropriated levels of student performance for each achievement level. There seemed the be a difference between the level of confidence in the cut score recommendations for the different subjects. The science and math participants demonstrated a greater confidence in the cut score recommendations, with greater than 60 percent of panelists selecting *Confident* or *Very Confident* for all achievement levels. Although the ELA panelists indicated lower confidence, at least 50 percent of panelists indicated *Confident* or *Very Confident* for Meeting Expectations and Exceeding Expectations.

Overall, this feedback from the cut score setting participants provides evidence for the validity of the cut score recommendations for each of the achievement levels from the standard setting committee.

The participants in the vertical articulation meetings were also provided the opportunity to provide their opinion concerning the cut score recommendations for each achievement level resulting from the vertical articulation process. Based on the results, shown in Appendix K, the large majority of participants, at least 75 percent of panelists from the science vertical articulation committee, indicated that they were *Very Confident* of the cut score recommendations from the vertical articulation process. These results provide further evidence for the validity of the process and the results used to create the cut scores for achievement levels for each assessment.

Technical Reviewer Evaluations

After the standard setting meeting, a technical advisor, Charlie DePascale, Ph.D., provided a written review of the standard setting process used during the meetings. Dr. DePascale was asked by ESE to serve as an independent observer of the standard setting meetings. During the standard setting meetings, he was provided access to all meetings and the materials provided to each participant. The full report of his review of the standard setting process was presented to the Massachusetts TAC during their meeting held in October 2019.

His review of the standard setting meeting was that it could be described as “Meeting Expectations”, using the terminology of the MCAS assessments.

> “Based on my observations during the standard setting and CD validation meetings, my overall conclusion is that the planned procedures in both meetings were successfully implemented with sufficient fidelity by the Pearson facilitators.”

A major component to the standard setting process is the standardization process across the multiple committees being simultaneously run by different facilitators. Although there were areas indicated in Dr. DePascale’s review in which standardization could have been increased, there were no significant deviations from the procedures observed that could have impacted the final cut score recommendations. The results of this independent review of the process provides additional evidence for the validity of the process developed and implemented during the standard setting meetings.

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Appendix A – Achievement Level Descriptors

Science, Technology, and Engineering (STE) – Grade 5

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations*, *Meeting Expectations*, *Partially Meeting Expectations*, and *Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

Earth and Space Science	**Partially Meeting Expectations** *On MCAS, a student at this level:*	**Meeting Expectations** *On MCAS, a student at this level:*	**Exceeding Expectations** *On MCAS, a student at this level:*
ESS1. Earth's Place in the Universe	Identifies the Sun, the Moon, and Earth in a model. Recognizes that the Sun is a star. Recognizes that people at different locations on Earth may experience day and night at the same time. Given a pattern of moon phases, selects the Moon phase that completes the pattern. Recognizes that shadows change over the course of a day because of the apparent movement of the Sun. Supports a claim with evidence that an environment has changed over time, such as a forested area that was once covered by water. Classifies whether geologic structures were formed by erosion or deposition.	Completes a model of the Sun, the Moon, and Earth and mostly describes the movements of each. Recognizes that the Sun is the only star in our solar system. Constructs an explanation for why people on Earth experience day and night. Describes how the Moon reflects the Sun's light and makes a pattern over approximately one month. Uses a model to show the pattern of the Moon over a week or a month. Completes a model showing the relationship between a shadow's length and the position of the Sun in the sky. Generally describes the processes of erosion or deposition. Identifies the relative age of rock layers based on the position of the rock layers.	Develops a model of the Sun, the Moon, and Earth and consistently describes the movements of each. Explains why the Sun appears brighter than other stars. Constructs an explanation with evidence for why people at one location on Earth are experiencing day while people at another location on Earth are experiencing night. Explains how the Moon's reflection of the Sun's light and the orbit of the Moon are responsible for the phases of the Moon. Constructs an explanation for why the length and direction of a shadow changes during a day. Constructs an explanation with evidence of how erosion and deposition can change geologic structures or an area over time.

ESS2. Earth's Systems	Uses weather data tables or simple graphs to describe one of the following: precipitation, wind speed, or temperature for an area. Differentiates between two different types of climate. Completes a simple model of the water cycle. Identifies on a map where a volcano or earthquake is likely to occur. Recognizes evidence of weathering or erosion in a diagram or simple description. Interprets simple graphs to draw general conclusions about the relative amounts of fresh and salt water on Earth.	Analyzes simple weather data patterns to describe expected weather for an area. Analyzes climate data for several different regions and describes differences in weather patterns. Recognizes that different regions can have different climate types. Completes a model of the water cycle and describes what is happening in most of the water cycle stages. Analyzes a map to locate where mountain ranges, ocean trenches, volcanoes, and earthquakes are likely to occur. Describes the processes of weathering and erosion and applies them to common examples, such as landslides, canyons, valleys, etc. Analyzes a map to identify water sources as fresh or salt water, including fresh water stored in glaciers and polar ice caps.	Analyzes and interprets graphs and tables to draw conclusions about various weather patterns. Explains the difference between weather and climate and uses climate data to draw conclusions about the expected weather patterns of different climate types (e.g., desert, tropical, tundra). Develops a model of the water cycle, including absorption and surface runoff, and describe how heat energy is needed for water to cycle. Explains why mountain ranges, ocean trenches, volcanoes, and earthquakes occur at plate boundaries. Explains how landscapes change due to weathering and erosion and provides examples of each process. Describes different sources of fresh water and salt water and explains why it is important to understand the relative amounts of these types of water on Earth.

ESS3. Earth and Human Activity	Categorizes some common examples of renewable and nonrenewable energy resources. Identifies one way to reduce human impact on the environment for a given situation. Identifies one design solution to reduce the impact of a weather event, such as a hurricane, or other natural event, such as an earthquake, on humans. Identifies a testable question about a filter to determine how well the filter will work.	Explains why some sources of energy are considered renewable and others are not. Consistently categorizes energy sources as either renewable or nonrenewable. Describes different ways to reduce human impact on the environment for a given situation. Identifies multiple design solutions to reduce the impact of a weather event or other natural event on humans. Develops a testable question about how to improve the design of a filtering system and provides information about how to answer the question.	Explains how humans have impacted the environment in different ways and constructs explanations for how to reduce those impacts on the environment. Identifies multiple design solutions to reduce the impact of a weather event or other natural event on humans and explains how each design solution could reduce the impact. Develops testable questions about how to make several improvements to the design of a filtering system and provides evidence for how the improvements will better filter the water.

Life Science	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
LS1. From Molecules to Organisms: Structures and Processes	Completes a model of an organism's life cycle and describes the importance of one stage of the life cycle. Supports a claim with evidence about how the function of an animal or plant structure helps it to survive. Recognizes that photosynthesis is important for the survival of a plant.	Compares the life cycles of two organisms and describes similarities between the two life cycles, including the importance of some of the stages. Supports claims with evidence about how different functions of animal or plant structures helps the animal or plant to survive. Completes a model showing some of the inputs (sunlight, air, water) or outputs (sugars) of photosynthesis.	Constructs an explanation for why each stage of the life cycle is important, using example of both plants and animals. Supports claims with evidence about how several structures of animals and plants allow for the survival, growth, and reproduction of different organisms. Develops a model showing the inputs and outputs of photosynthesis and explains the importance of photosynthesis for the survival and growth of a plant.
LS2. Ecosystems: Interactions, Energy, and Dynamics	Analyzes a simple food web or other model and identifies the ecological role of some of the organisms. Recognizes that the energy organisms depend on originates from the Sun. Describes one way animals and plants use energy. Identifies the function of a composter and one design element of a composter. Identifies a type of organism (bacteria or fungi) that breaks down dead organisms.	Analyzes a food web or other model, identifies the ecological roles of several of the organisms, and describes some of the roles of the organisms. Analyzes a model and describes the flow of energy through a simple food web. Analyzes several composter designs and describes some advantages and disadvantages of each design. Describes the importance of decomposers in recycling matter back to the soil.	Analyzes food webs and other models and consistently describes the ecological roles of the organisms. Completes a model to show energy transfer through a food web and describes how energy is transferred from one organism to another. Analyzes several composter designs, describes several advantages and disadvantages of each, and explains which composter is best to use. Explains what would happen to an ecosystem without decomposers, and explains how decomposers recycle matter back into both the soil and air.

LS3. Heredity: Inheritance and Variation of Traits	Provides observable evidence that traits are inherited from a parent. Recognizes that some basic characteristics are inherited, while others are a result of the environment.	Analyzes data and draws some conclusions about familiar traits that are inherited and characteristics that are a result of the environment.	Analyzes novel data and draws conclusions about traits that are inherited and characteristics that are a result of the environment.
LS4. Biological Evolution: Unity and Diversity	Identifies the type of environment where an organism once lived based on fossilized remains. Supports a claim with one piece of evidence for how some individuals within a population may have a survival advantage over other individuals in the population. Uses evidence, such as an organism's structure, to describe how an organism is well adapted to its environment. Recognizes what may happen to an organism if its environment changes and it is unable to move away or adapt to the changing environment.	Classifies fossils based on their physical characteristics, including the type of environment where the fossilized organism once lived. Supports a claim with several pieces of evidence for how some individuals within a population may have a survival advantage over other individuals in the population. Identifies an example of how an organism is well adapted to its environment. Describes what will happen to a population if individuals within that population are unable to reproduce.	Constructs an explanation for why the fossil record is incomplete due to many organisms not being fossilized. Given data about the characteristics of a novel organism, draws conclusions and explains how the organism is well adapted to its environment. Explains, with evidence, if an organism is likely to survive environmental changes. Explains why reproduction is critical to the survival of a species.

Physical Science	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
PS1. Matter and Its Interactions	Analyzes a simple particle model of matter and identifies the phase of the substance. Completes a graph to show the masses of substances after a phase change or after a chemical reaction. Analyzes a simple set of data to determine the best material to use in a common situation, based on the material's characteristic properties. Determines if a chemical reaction occurred or if a mixture was formed during an investigation and provides one piece of evidence to support the claim.	Analyzes a particle model of a substance before and after a phase change to determine phases of the substance and the phase change that occurred. Constructs an explanation about how mass is conserved during a phase change or a chemical reaction. Analyzes a set of data about materials, identifies the best material to use in a given situation, and provides evidence for the reasoning. Develops a question to determine if a chemical reaction occurred or if a mixture was formed during an investigation and provides possible answers to the question with pieces of evidence to support the answers.	Analyzes particle models of substances before and after phase changes to determine the phase change that occurred and describes whether heat was added or removed. Describes an investigation that could be used to show that mass is conserved during a phase change or chemical reaction. Analyzes multiple sets of data to determine the best materials to use in a variety of different situations, based on the material's characteristic properties. Supports the conclusions with evidence from the data. Describes an investigation that could be used to determine if a chemical reaction will occur or if a mixture will be formed when two substances are combined and includes information about evidence that would be needed to make the determination.
PS2. Motion and Stability: Forces and Interactions	Interprets a diagram to determine if balanced forces are acting on an object. Labels a model showing the direction of the gravitational force on an object on Earth. Identifies if two magnets will be attracted to each other or repelled	Determines if the motion of an object will change, based on a diagram showing the forces acting on the object. Describes how friction affects the motion of an object. Completes a model showing the direction of the gravitational force on	Completes a diagram of the forces acting on an object based on whether the object is at rest, moving at a constant speed, or changing speed and explains the reasoning. Describes how different surface textures affect friction.

	from each other based on the magnets' orientations. Recognizes that either an attractive or a repulsive force exists between two magnets.	multiple objects that are on or near the surface of Earth. Completes a model of the poles on several magnets based on whether the magnets attract each other or repel each other.	Constructs an explanation about the gravitational force exerted by Earth on objects always being toward the center of Earth. Describes an investigation that could be used to determine the poles of magnets and explains what evidence could be used to make this determination.
PS3. Energy	Interprets a graph that shows the relationship between speed and kinetic energy. Identifies one type of energy that is produced when a collision occurs. Describes one way that energy can be moved from one place to another. Interprets a familiar situation to describe one way that stored energy is converted to another type of energy.	Describes the relationship between the speed of an object and the kinetic energy of that object. Describes the energy conversions that take place when two objects collide. Interprets a given scenario and describe one way that energy is transferred in the scenario. Describes two energy conversions in a given situation including kinetic energy being converted to electrical energy and/or stored energy being converted into another type of energy.	Completes a graph showing the kinetic energy of object as the speed of the object changes and explains why the graph should be completed in that way. Constructs an explanation about the energy conversions that take place when two objects collide and supports the explanation with evidence. Analyzes a novel scenario and describes multiple ways that energy is transferred from place to place and how energy is converted in multiple ways.
PS4. Waves and Their Applications in Technologies for Information Transfer	Recognizes that waves can cause an object to move. Uses a simple model of a wave to show that the wave has a regular pattern. Recognizes that light must be reflected off an object and enter the eye for the object to be seen. Given a communication system, identifies one component (encoder, decoder, receiver, sender) of the system.	Generally describes that waves carry energy and can cause objects to move. Completes a model showing that a wave has a regular pattern of motion. Develops a model to show how light reflects off an object and enters the eye so the object can be seen. Describes at least two components of a given communication system.	Constructs an explanation about how an object can be moved by the energy of a wave. Explains how objects are seen by the eye, using evidence from a given scenario. Consistently describes the components of a communication system for a given scenario.

Technology/ Engineering	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
ETS1. Engineering Design and ETS3. Technological Systems	Identifies a criterion for success and a constraint when given a simple design problem. Identifies one solution to a simple engineering design problem. Analyzes different representations of a simple design solution and chooses the most appropriate one for a given situation. Identifies the importance of a prototype. Identifies the difference between an innovation and an invention.	Describes several criteria for success and constraints when given a design problem. Generates a solution to an engineering design problem and generally explains how the solution could be successful based on evidence. Analyzes different representations of a design solution, chooses the most appropriate representation for the given situation, and explains the reasoning. Identifies several design features of a prototype and explains how these features are important to the design of the prototype. Analyzes a design feature of a prototype and explains the importance of a prototype. Describes one innovation to an existing technology. Provides an example of an invention, including common examples and some novel examples.	Explains how certain criteria for success and constraints will impact the solution to a design problem. Generates two or more solutions to an engineering design problem and explains in detail how the solutions could be successful, and identifies possible failure points for each solution. Describes an appropriate representation for a design solution and explains the reasoning. Describes several design features of prototypes and explains the benefits and possible limitations of each. Explains why prototypes are constructed and explains the importance of redesigning a prototype. Explains why a novel technology is an innovation or an invention, given a description of the technology.

Science, Technology, and Engineering (STE) – Grade 8

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations*, *Meeting Expectations*, *Partially Meeting Expectations*, and *Not Meeting Expectations*. The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

	Partially Meeting Expectations *On MCAS, a student at this level:*	**Meeting Expectations** *On MCAS, a student at this level:*	**Exceeding Expectations** *On MCAS, a student at this level:*
Understanding and Application of Disciplinary Core Ideas	Demonstrates a partial understanding of some scientific concepts and processes by identifying and sometimes describing or providing evidence for these concepts and processes. Uses some basic scientific terms in common scientific examples.	Demonstrates a solid understanding of many scientific concepts and processes by mostly describing, explaining, and providing evidence for these concepts and processes. Mostly applies appropriate scientific terms in a variety of applications, including common science examples and some novel situations.	Demonstrates a comprehensive, in-depth understanding of many scientific concepts and processes by consistently describing, explaining, and providing evidence for these concepts and processes. Consistently applies scientific terms in appropriate contexts in both common science examples and many novel situations.
Understanding and Application of Scientific and Engineering Practices	Identifies a testable, scientific question for an investigation. Completes a simple, commonly used model. Uses simple graphs or data to draw general conclusions about a familiar scientific investigation or phenomena. Identifies evidence to support a claim. Describes a benefit or drawback of simple design features given a familiar device or prototype.	Develops some testable, scientific questions for an investigation. Completes or uses a model and describes some strengths and weaknesses of the model. Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a familiar scientific investigation or phenomena. Provides some evidence to support a claim and constructs basic explanations for scientific phenomena or results from an investigation. Analyzes design features of a familiar device or prototype and	Consistently develops testable, scientific questions for an investigation. Creates a model, consistently describes the strengths and weaknesses of the model, and provides information for how to improve the model. Analyzes multiple sources of data, including graphs and tables, to draw conclusions about a novel or complex scientific investigation or phenomena. Provides several pieces of evidence to support a claim and constructs thorough explanations for scientific phenomena or results from an investigation. Analyzes design features of a novel device or prototype and constructs an explanation for how the design features meet criteria for success or are limited by constraints.

		describes a benefit or drawback of the design.	
Earth and Space Science	**Partially Meeting Expectations** ***On MCAS, a student at this level:***	**Meeting Expectations** ***On MCAS, a student at this level:***	**Exceeding Expectations** ***On MCAS, a student at this level:***
ESS1. Earth's Place in the Universe	Completes a model of the Earth-Sun-Moon system to show either a solar or a lunar eclipse. Identifies the basic pattern of the moon phases. Recognizes that the tilt of Earth's axis causes the seasons. Recognizes that gravity affects high and low tides, Earth's orbit, and the Moon's orbit. Recognizes that the Milky Way galaxy contains many solar systems and that Earth is one planet within our solar system. Identifies the bottom layer of rock as the oldest and the top layer of rock as the youngest. Identifies some of the processes that play a role in the formation of rock.	Develops a model showing the positions of the Sun, the Moon, and Earth during a solar or a lunar eclipse. Completes a model of the moon phases. Compares the intensity of sunlight at different locations on Earth during different seasons of the year. Analyzes models to determine where high and low tides occur based on the position of the Moon. Describes the role that gravity plays in orbital motions. Orders the planets, our solar system, the Milky Way galaxy, and the universe by their relative sizes. Analyzes a model showing several layers of rock and draws conclusions about the relative ages of the fossils found in the rock layers. Uses rock layers and fossil evidence to describe how the geology of a particular area has changed over time, such as from a sea floor to a forest.	Constructs an explanation for why people see solar and lunar eclipses on Earth. Constructs an explanation for why people on Earth observe the phases of the Moon. Analyzes a graph to describe how changes in the duration and intensity of sunlight during a year determines the seasons. Supports conclusions with evidence from the graph. Completes models showing where high and low tides occur and explains why there are high and low tides in these locations. Compares and draws conclusions about the force of gravity on planets, moons, asteroids, comets, etc. in our solar system. Analyzes a model showing several layers of rock containing a fault to draw a conclusion about the relative age of the fault. Constructs an explanation for how rock layers and geologic structures, such as canyons, volcanoes, mountains, and beaches, are formed through weathering, erosion, heat, pressure, and/or deposition.

ESS2. Earth's Systems	Uses a model to show that geologic structures, such as volcanoes and mountain ranges, are formed where plates are pushed together. Recognizes that surface structures continue to change over time due to geologic processes, such as weathering, erosion, glaciation, and the movement of Earth's plates. Completes a model showing the primary steps of the water cycle. Analyzes weather data and draws simple conclusions about the precipitation and temperature of an area. Recognizes that temperatures near the ocean are more stable than temperatures of inland locations.	Uses a model to describe the role of convection currents in the movement of Earth's plates and identifies where convection currents occur. Describes how geologic processes form and shape geologic structures, such as mid-ocean ridges, mountains, and volcanoes, and cause geologic events, including earthquakes, landslides, and volcanic eruptions. Analyzes maps and other evidence to draw conclusions about the movement of Earth's plates. Describes the role of solar energy and gravity in the water cycle. Describes the weather conditions that typically occur when cool and warm air masses collide.	Constructs an explanation for how the movement of Earth's plates causes various geologic events, such as earthquakes, volcanic eruptions, and tsunamis. Uses data to explain the relative time scales different geologic structures form over. Supports a claim about the movement of Earth's plates using several pieces of evidence, such as the shapes of continents and the locations of specific fossils and types of rock. Describes evidence that glaciers were once present in an area. Constructs an explanation for how each stage of the water cycle is dependent upon energy from the Sun and/or the Earth's gravity. Describes how air masses move and how the movement of air masses affects the weather in an area.
ESS3. Earth and Human Activity	Analyzes a basic map to draw general conclusions about the distribution of minerals or fossil fuels on Earth. Identifies one way that humans can mitigate the impact of increases in human population on natural resources and the environment.	Provides a partial explanation for why some resources, such as fossil fuels, water, and mineral/ores, are unevenly distributed on Earth. Describes various ways that humans can mitigate the overuse of Earth's resources, such as using renewable energy sources, recycling, using public transportation, etc.	Explains why natural resources are unevenly distributed on Earth. Analyzes data, including graphs and maps, to draw conclusions about how humans use natural resources and identifies some ways human can mitigate the overuse of these resources. Constructs an explanation using evidence that human activities, such as fossil fuel

	Analyzes a simple graph or data table to draw conclusions about how climate change is affecting an area.	Analyzes data to describe how climate change is affecting an ecosystem and describes one way that humans can reduce the effects of climate change on the ecosystem.	combustion, agriculture, and deforestation, have played a role in rising global temperatures over the past century. Describes several ways humans can mitigate the effects of climate change.

Life Science	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
LS1. From Molecules to Organisms: Structures and Processes	Recognizes that animal, plant, and bacterial cells have some shared characteristics and some different characteristics. Recognizes some parts of a cell and the function of some cell parts. Describes two body systems and how they work together. Identifies some behaviors and structures of plants and animals that enables them to survive and successfully reproduce. Identifies a characteristic that is inherited and a characteristic that is mostly a result of the environment. Recognizes that all organisms need an energy source and nutrients to survive.	Uses the characteristics of cells to categorize an organism as an animal, plant, or bacteria. Given a diagram of a cell, identifies the cell parts and describes most functions of the cell parts. Generally describes how different body systems work together. Provides evidence for how some organisms are able survive and reproduce more than other organisms. Analyzes information about an organism to determine which characteristics are inherited and which characteristics are mostly a result of the environment. Describes how carbohydrates, proteins, and fats are broken down to support cell growth and to release energy (cellular respiration).	Compares animal, plant, and bacterial cells and identifies both similarities and differences between them. Consistently describes the functions of cell parts. Describes how the interactions between body systems can be affected by a condition or disease based on the functions of the body systems. Expalins how various structures and behaviors can provide survival and reproductive advantages to plants and animals. Uses evidence to explain why some characteristics are inherited and other characteristics are a result of both inheritance and the environment. Using a model, explains how food molecules are broken down and rearranged to provide nutrients for cell growth and energy for cellular processes.
LS2. Ecosystems: Interactions, Energy, and Dynamics	Interprets graphs to determine whether the size of a population increased, decreased, or stayed the same. Identifies one ecological relationship (competitive, predator-prey, parasitic, or mutually beneficial)	Analyzes population data, including graphs, to describe changes in the size a particular population over time. Identifies several ecological relationships when given the interactions of organisms in an environment (including analyzing a food web).	Constructs an explanation for the reasons why populations grow versus decline over time. Analyzes a complex food web and describes the ecological roles of the organisms.

	when given a description of the interaction of two organisms. Recognizes that the biodiversity of a population is positively correlated with its size. Identifies how an ecosystem and how an organism living in the ecosystem can be helped by a human action.	Completes models to show the cycling of matter through photosynthesis, cellular respiration, and decomposition. Uses a model of an ecosystem to describe how a disruption to the ecosystem can have an effect on an organism in the ecosystem. Describes multiple ways how the biodiversity of a population can be increased. Describes several ways an ecosystem and the organisms living in the ecosystem can be helped by human actions.	Consistently describes the roles of producers, primary, secondary, tertiary consumers, and decomposers in a model. Develops a model to show the cycling of matter and energy through an ecosystem, including the role of photosynthesis, cellular respiration, and decomposition. Uses a model of an ecosystem to construct an explanation with evidence for how a natural or manmade disruption to the environment can affect multiple populations in the ecosystem. Evaluates competing designs for protecting an ecosystem and its inhabitants from threats such as climate change, habitat loss, pollution, or overharvesting of resources.
LS3. Heredity: Inheritance and Variation of Traits	Uses a model to show that chromosomes are made up of genetic information. Identifies one benefit of sexual reproduction or one benefit of asexual reproduction. Recognizes that offspring from sexual reproduction inherit genes and characteristics from two parents. Analyzes a simple Punnett square to determine the expected percentage of offspring with a certain trait.	Completes a model to show that chromosomes hold genes and genes hold the instructions for proteins. Describes mutations as changes to genes.Identifies examples of mutations that are harmful, beneficial, or neutral to changes in traits of an organism. Describes some of the benefits and drawbacks of sexual versus asexual reproduction. Completes a Punnett square to determine the expected percentage of offspring that will inherit certain genotypes (allele pairs) and phenotypes (traits).	Develops a model to show that chromosomes are made up of genes and that genes contain the instructions for proteins, which determine the inherited characteristics of an organism. Describes how a mutation may be harmful, neutral, or beneficial to an organism depending on its interactions with the environment. Constructs an explanation for why some organisms benefit from asexual reproduction while other organisms benefit from sexual reproduction. Develops a model to show that sexual reproduction results in sets of

			chromosomes (found in the nucleus) from each parent, and therefore an allele for each gene is inherited from each parent.
LS4. Biological Evolution: Unity and Diversity	Analyzes fossil evidence to draw conclusions about different organisms living at different times. Compares a structure in a living organism to a structure from a fossilized organism and draws a conclusion about their similarity. Recognizes that individuals with certain inherited characteristics have a higher probability of surviving than individuals without those characteristics. Identifies one difference between natural selection and artificial selection.	Analyzes fossil evidence to describe how the environment in an area has changed over geologic time. Explains how living and fossilized organisms can have similar body structures with similar or different functions. Identifies examples of natural selection and generally explains why they are examples of natural selection. Compares examples of natural selection and artificial selection.	Constructs an explanation using fossil evidence for how similar structures can be used to infer whether two types of organism share a recent common ancestor. Constructs an explanation for how a trait can become more common in a population over time due to natural selection. Describes advantages and disadvantages of both natural and artificial selection.

Physical Science	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
PS1. Matter and Its Interactions	Identifies that all living and non-living things are made-up of atoms. Identifies that mixtures can be separated by physical means. Using data, identifies one piece of evidence that a chemical reaction or a physical change occurred. Interprets a particle model to determine the three states of matter shown in the model. Recognizes that a new substance is formed when a chemical reaction occurs. Given data, determines if energy is being absorbed or released in a chemical reaction. Calculates the density of an object given its mass and volume.	Completes a model showing how atoms form compounds and molecules. Describes how mixtures are made up of pure substances that can be separated by physical means. Using data, identifies multiple pieces of evidence that a chemical reaction or a physical change occurred. Partially describes how particle motion, spatial arrangement, or temperature of a substance change when thermal energy is added to or removed from the substance. Completes a bar graph to show the conservation of mass in a chemical reaction or a physical change. Given a chemical reaction, identifies if it is exothermic and endothermic based on whether or not thermal energy is released or absorbed. Describes, compares, and calculates the densities of different materials.	Analyzes a chemical formula to determine the number of each type of atom that makes up a given molecule. Analyzes data to determine which substances are pure substances. Explains the difference between a chemical reaction and a physical change and provides multiple pieces of evidence to support the explanation. Consistently describes how particle motion, spatial arrangement, and temperature of a substance change when thermal energy is added to or removed from the substance. Relates temperature to a measure of average kinetic energy and recognizes that temperature/kinetic energy does not change as a substance is changing state. Supports a claim that matter is not created or destroyed during a chemical reaction or a physical change, using evidence from an investigation. Describes the difference between an endothermic and exothermic reaction. Supports the description with evidence from a chemical reaction. Determines whether an object would float or sink in water due its density and supports the answer with evidence.

PS2. Motion and Stability: Forces and Interactions	Given a model, recognizes that an object that applies a force to another object will also experience a force acting on it. Recognizes that the speed of an object will change if the mass of the object changes and the forces acting on the object are constant. Recognizes that the speed of an object will change if the forces acting on the object are not balanced. Recognizes that two positive charges or two negative charges will repel each other, and a negative charge and a positive charge will attract each other. Completes a model, to show that gravitational forces are always attractive. Using a model, describes how an object can exert forces on another object, even when the objects are not in contact with each other.	Analyzes models to draw conclusions about the forces acting on objects during a collision. Completes a graph to show how the change in speed of an object, with a constant net force acting on it, depends on the mass of the object. Completes a model to show whether the speed of an object will increase, decrease, or remain constant based on the forces acting on an object. Completes a model to show how the distance between two electric charges or the magnitudes of the charges affects the strength of the forces between the charges. Describes how the mass of objects affects the gravitational forces on the objects. Completes a model of the electric, magnetic, or gravitational field around an object.	Develops models to show the forces acting on objects before, during, and after a collision. Develops a model to show how the change in speed of an object depends on the mass of the object and the net force acting on the object. Uses data to construct an explanation about how the distance between two electric charges or the magnitudes of the charges affects the strength of the force between the charges. Develops a model showing the relative magnitudes of gravitational forces acting between two objects. Completes a model of the electric, magnetic, or gravitational field between two objects.
PS3. Energy	Interprets a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa. Interprets data to describe what will happen to an object's kinetic energy as its potential energy decreases. Identifies the flow of thermal energy from hot to cold.	Completes a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa. Analyzes information, including graphics and data, and generally describes how the kinetic and potential energies of an object compare at different heights, when energy is conserved.	Uses a graph to show how the kinetic energy of an object relates to the speed of the object, or vice versa, and explains the reasoning. Analyzes information, including graphics and data, and consistently describes how the kinetic and potential energies of an object compare at different heights, and is able to explain that energy is conserved.

	Identifies an example of conduction, radiation, or convection. Describes how it takes more time to heat an object that has more mass than an object (of the same material) with less mass. Using a graph, determines how an increase in average kinetic energy of an object results in an increase in temperature.	Analyzes the conversions of different types of potential energy into kinetic energy and vice versa to draw conclusions about energy conservation. Generally describes how thermal energy is transferred through conduction, radiation, and convection and generally describes ways this heat flow can be increased or decreased in a given situation. Analyzes data and draws conclusions to describe how certain materials will better conduct thermal energy compared to others. Describes how average kinetic energy is related to temperature.	Explains how different types of potential energies are converted to kinetic energy and vice versa. Explains how thermal energy is transferred through conduction, radiation, and convection and fully describes ways the rate of this heat flow can be increased or decreased in a given situation. Constructs an explanation to show the relationships among the amount of energy transferred between objects, how well materials of the objects retain or radiate heat, the masses of the objects, and the changes in the average kinetic energies of the object's materials.
PS4. Waves and Their Applications in Technologies for Information Transfer	Completes a model of a wave to show its frequency, amplitude, or wavelength. Given a model, sometimes identifies where waves are reflected, absorbed, or transmitted through a material. Identifies when a signal is either encoded or transmitted.	Compares two waves' frequencies, amplitudes, and wavelengths, and sometimes describes how these characteristics will affect the waves. Completes a model showing reflection, absorption, and transmission of a wave, including how waves are refracted. Describes the processes of encoding and transmitting.	Compares two or more waves' frequencies, amplitudes, and wavelengths, and consistently describes how these characteristics will affect the pattern of a wave. Develops a model to explain how waves are reflected, absorbed, or transmitted in a given situation, including how waves are refracted.

Technology/ Engineering	Partially Meeting Expectations *On MCAS, a student at this level:*	Meeting Expectations *On MCAS, a student at this level:*	Exceeding Expectations *On MCAS, a student at this level:*
ETS1. Engineering Design	Identifies criteria and constraints of a design problem. Identifies one solution to a simple problem. Uses a simple design matrix to determine the best solution. Sometimes solves simple scale problems, given the actual measurement or the scaled measurement. Analyzes a design feature of a prototype and identifies the importance of a prototype.	Describes some criteria and constraints of a design problem. Describes a solution to a problem and explains how it could be successful based on evidence. Uses a design matrix to draw conclusions about possible solutions. Solves scale problems, given the actual measurement or the scaled measurement. Generally describes appropriate design features of a prototype and describes the importance of a prototype.	Describes several criteria and constraints of a design problem. Describes several solutions to a problem and explains their limitations and benefits based on evidence. Uses a design matrix to draw conclusions about possible solutions and explains the reasoning. Explains when a scale drawing should be used, and determines an appropriate scale for a given situation. Consistently describes appropriate design features of prototypes for a given situation.
ETS2. Materials, Tools, and Manufacturing	Recognizes basic properties of common materials (such as wood, metal, and plastic). Given data, chooses a material for a design problem given its characteristics. Given a set of tools, chooses the best tool for a given task. Identifies and describes some of the manufacturing processes (forming, separating, conditioning, assembling, finishing, quality control, and safety). Identifies an advantage or a disadvantage of using a computer or a human for a given task.	Describes properties (such as flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point) of common materials and generally uses the materials for appropriate design solutions. Describes the best tools to use for a given situation. Generally describes a few steps of the manufacturing process in a given situation. Provides an advantage and a disadvantage of using a computer or a human for a given task.	Evaluates different materials and determines the best materials to use for a given design problem. Explains the reasoning, giving both drawbacks and benefits of the materials. Consistently describes several steps of the manufacturing process in a given situation. Provides multiple advantages and/or disadvantages of using a computer or a human for a given task.

ETS3. Technological Systems	Identifies and describes the functions of some components of a communication system (source, encoder, transmitter, receiver, decoder, and storage). Given a diagram, identifies and describes some of the functions of some components of a vehicle (structural, propulsion, guidance, suspension, and control subsystems). Given a diagram, identifies and describes some of the parts of a structural system (foundation, decking, wall, and roofing). Given a diagram, identifies a force (tension, torsion, compression, and shear) acting on a structure. Given a transportation, structural, or communication system, identifies some of the components of an engineering system: inputs, processes, outputs, and feedback.	Completes a model and describes the functions of several components of a communication system. Completes a model and describes most of the functions of some components of a vehicle. Identifies and describes most of the parts of a given structural system. Identifies and describes two forces acting on a shown structure. Identifies live and dead loads for a given scenario. Given a transportation, structural, or communication system, identifies and describes several components of an engineering system.	Develops a model and describes the functions of the components of a communication system. Develops a model and describes most of the functions of the components of a transportation system. Consistently identifies and describes the parts of a given structural system. Consistently identifies and describes forces acting on a shown structure. Describes live and dead loads for a given scenario. Given a transportation, structural, or communication system, consistently identifies and describes components of an engineering system.

English Language Arts (ELA) – Grade 10

General: All grades (grades 3-8 and 10)

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations*, *Meeting Expectations*, *Partially Meeting Expectations,* and *Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students' work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

	Partially Meeting Expectations ***On MCAS, a student at this level:***	**Meeting Expectations** ***On MCAS, a student at this level:***	**Exceeding Expectations** ***On MCAS, a student at this level:***
Reading	Demonstrates **partial** understanding of what a text implies and states explicitly; cites **limited** textual support for conclusions; **incompletely** summarizes key details and ideas; provides a **partial** analysis of a character, an event, or an idea in grade-appropriate texts Demonstrates **partial** understanding of words and phrases used in a text; provides **limited** understanding of how structural elements, point of view, or purpose affects the content and style in text(s) Makes **basic** comparisons between texts; shows **partial** understanding of content in diverse media; **partially** evaluates and analyzes claims and evidence in text(s)	Demonstrates **sufficient** understanding of what a text implies and states explicitly; cites **solid** textual support for conclusions; **appropriately** summarizes key details and ideas; provides a **mostly complete** analysis of a character, an event, or an idea in grade-appropriate texts Demonstrates **general** understanding of words and phrases used in a text; provides **general understanding** of how structural elements, point of view, or purpose affects the content and style in text(s) Makes **appropriate** comparisons between texts; shows **solid** understanding of content in diverse media; **appropriately** evaluates and analyzes claims and evidence in text(s)	Demonstrates **comprehensive** understanding of what a text implies and states explicitly; cites **in-depth** textual support for conclusions; **skillfully** summarizes key details and ideas; provides a **sophisticated** analysis of a character, an event, or an idea in grade-appropriate texts Demonstrates **in-depth** understanding of words and phrases used in a text; provides **sophisticated** understanding of how structural elements, point of view, or purpose affects the content and style in text(s) Makes **insightful** comparisons between texts; shows **sophisticated** understanding of content in diverse media; **insightfully** evaluates and analyzes claims and evidence in text(s)

Writing	Produces **basic** writing with **limited** selection and explanation of evidence and details related to grade-appropriate texts, topics, or subject areas Produces writing with **little** development of a central idea or sequenced events, **limited** organization, and **basic** expression of ideas Exhibits **partial** awareness of task, purpose, and audience	Produces **solid** writing with **appropriate** selection and explanation of evidence and details related to grade-appropriate texts, topics, or subject areas Produces writing with **appropriate** development of a central idea or sequenced events, **moderate** organization, and **adequate** expression of ideas Exhibits **sufficient** awareness of task, purpose, and audience	Produces **clear** writing with **skillful** selection and explanation of evidence and details related to grade-appropriate texts, topics, or subject areas Produces writing with **full** development of a central idea or sequenced events, **effective** organization, and **clear** expression of ideas Exhibits **full** awareness of task, purpose, and audience
Language	Demonstrates **limited** reading vocabulary of general academic and domain-specific words and phrases in grade-appropriate texts Demonstrates **limited** understanding of unfamiliar words in text and shows **partial** understanding of word parts and word relationships in word meanings Demonstrates **little** control of the standard English conventions of sentence structure, grammar, usage, and mechanics	Demonstrates **solid** reading vocabulary of general academic and domain-specific words and phrases in grade-appropriate texts Demonstrates **solid** understanding of unfamiliar words in text and shows **sufficient** understanding of word parts and word relationships in word meanings Demonstrates **mostly consistent** control of the standard English conventions of sentence structure, grammar, usage, and mechanics	Demonstrates **comprehensive** reading vocabulary of general academic and domain-specific words and phrases in grade-appropriate texts Demonstrates **comprehensive** understanding of unfamiliar words in text and shows **full** understanding of word parts and word relationships in word meanings Demonstrates **consistent** control of the standard English conventions of sentence structure, grammar, usage, and mechanics

DRAFT Grade 10

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations*, *Meeting Expectations*, *Partially Meeting Expectations*, and *Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students' work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

	Partially Meeting Expectations ***On MCAS, a student at this level:***	**Meeting Expectations** ***On MCAS, a student at this level:***	**Exceeding Expectations** ***On MCAS, a student at this level:***
Reading	**Partially** analyzes what a text implies and states explicitly; uses **little** evidence to support the analysis; **incompletely** identifies and analyzes the development of a central idea or theme of a text; provides a **limited** analysis of how characters, events or ideas are developed and interact across sufficiently complex texts **Partially** determines meanings (e.g., figurative, connotative, technical) of words and phrases and analyzes how they impact meaning and tone; demonstrates **limited** understanding of how structural elements and point of view contribute to the overall development of ideas or purpose Provides a **basic** analysis between texts; **partially** integrates information from different sources; **partially** analyzes and evaluates important claims, arguments, or themes in multiple texts	**Adequately** analyzes what a text implies and states explicitly; uses **sufficient** evidence to support the analysis; **appropriately** identifies and analyzes the development of a central idea or theme of a text; provides a **mostly complete** analysis of how characters, events or ideas are developed and interact across sufficiently complex texts **Appropriately** determines meanings (e.g., figurative, connotative, technical) of words and phrases and analyzes how they impact meaning and tone; demonstrates **general** understanding of how structural elements and point of view contribute to the overall development of ideas or purpose Provides an **appropriate** analysis between texts; **solidly** integrates information from different sources; **appropriately** analyzes and evaluates important claims, arguments, or themes in multiple texts	**Insightfully** analyzes what a text implies and states explicitly; uses **strong** and **thorough** evidence to support the analysis; **skillfully** identifies and analyzes the development of a central idea or theme of a text; provides a **sophisticated** analysis of how characters, events or ideas are developed and interact across sufficiently complex texts **Skillfully** determines meanings (e.g., figurative, connotative, technical) of words and phrases and analyzes how they impact meaning and tone; demonstrates **sophisticated** understanding of how structural elements and point of view contribute to the overall development of ideas or purpose Provides an **insightful** analysis between texts; **skillfully** integrates information from different sources; **insightfully** analyzes and evaluates important claims, arguments, or themes in multiple texts
Writing	Produces **basic** writing with **limited** selection and explanation of evidence and details related to sufficiently complex texts, topics, or subject areas	Produces **solid** writing with **appropriate** selection and explanation of evidence and details related to sufficiently complex texts, topics, or subject areas	Produces **clear** and **sophisticated** writing with **skillful** selection and explanation of evidence and details related to sufficiently complex texts, topics, or subject areas

	Produces writing with **little** development of a **basic** central idea, thesis, or sequenced events; **limited** organization; and **basic** expression of ideas Exhibits **partial** awareness of task, purpose, and audience	Produces writing with **adequate** development of a **solid** central idea, thesis, or sequenced events; **moderate** organization; and **appropriate** expression of ideas Exhibits **sufficient** awareness of task, purpose, and audience	Produces writing with **full** development of an **insightful** central idea, thesis, or sequenced events; **skillful** organization; and **rich** expression of ideas Exhibits **full** awareness of task, purpose, and audience
Language	Demonstrates **limited** reading vocabulary of sufficiently complex academic and domain-specific words and phrases **Partially** determines the meaning of unfamiliar words in text using a variety of strategies; shows **partial** understanding of various grammatical rules and literary devices in a text Demonstrates **little** control of the standard English conventions of sentence structure, grammar, usage, and mechanics	Demonstrates **solid** reading vocabulary of sufficiently complex academic and domain-specific words and phrases **Sufficiently** determines the meaning of unfamiliar words in text using a variety of strategies; shows **sufficient** understanding of various grammatical rules and literary devices in a text Demonstrates **mostly consistent** control of the standard English conventions of sentence structure, grammar, usage, and mechanics	Demonstrates **comprehensive** reading vocabulary of sufficiently complex academic and domain-specific words and phrases **Skillfully** determines the meaning of unfamiliar words in text using a variety of strategies; shows **full** understanding of various grammatical rules and literary devices in a text Demonstrates **consistent** control of the standard English conventions of sentence structure, grammar, usage, and mechanics

Mathematics: Grades 3 through 8 and 10

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations, Meeting Expectations, Partially Meeting Expectations, and Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

	Partially Meeting Expectations **On MCAS, a student at this level:**	**Meeting Expectations** **On MCAS, a student at this level:**	**Exceeding Expectations** **On MCAS, a student at this level:**
Conceptual Understanding and Procedural Knowledge	• Demonstrates partial understanding of the grade appropriate numeration system • Performs some calculations and estimations • Identifies examples of basic math facts or mathematical concepts • Mostly reads and sometimes constructs graphs, tables and charts	• Applies understanding of the base-ten system and fractions to interpret numbers and solve problems • Performs most calculations and estimations • Describes mathematical concepts and generates examples and counterexamples of concepts • Represents data and mathematical relationships using equations, verbal descriptions, tables, and graphs	• Performs complex calculations and estimations • Selects the best representations for a given set of data • Explains relationships between models such as equations, verbal descriptions, tables, and graphs • Applies math facts and connects mathematical concepts from various areas of mathematics, and uses the concepts to develop generalizations • Recognizes and makes use of structure, discerning patterns by seeing complicated things as single objects
Problem Solving	• Applies learned procedures to solve routine problems • Uses concrete objects or pictures to help conceptualize and solve problems.	• Applies learned procedures and mathematical concepts to solve a variety of problems, including multi-step problems • Solves problems using multiple methods Demonstrates the relationships between operations used to solve problems and the context of the problems	• Generates strategies and procedures to solve non-routine problems • Solves problems using multiple methods, evaluating reasonableness of intermediate steps leading to the standard algorithms • Draws connections between strategies • Analyzes givens, constraints, and relationships in problems, using multiple methods and appropriate tools
Mathematical Reasoning	• Applies some reasoning methods to solve routine problems	• Uses a variety of reasoning methods to solve routine and non-routine problems	• Reasons abstractly and quantitatively, using multiple reasoning methods to solve complex problems and provides justification for the reasoning

		• Uses symbols to solve routine mathematical problems	• Decontextualizes situations and represents them symbolically
Mathematical Communication	• Identifies and uses basic terms	• Uses logical forms of representation (e.g., text, graphs, symbols) to illustrate steps to a solution	• Uses logical forms of representation (e.g., text, graphs, symbols) to justify solutions and solution strategies • Constructs viable arguments and critiques the reasoning of others, attending to precision

Mathematics: Grade 10

Student results on the MCAS tests are reported according to four achievement levels: *Exceeding Expectations*, *Meeting Expectations*, *Partially Meeting Expectations, and Not Meeting Expectations.* The descriptors below illustrate the knowledge and skills students demonstrate on MCAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

	Partially Meeting Expectations **On MCAS, a student at this level:**	**Meeting Expectations** **On MCAS, a student at this level:**	**Exceeding Expectations** **On MCAS, a student at this level:**
Number and Quantity	• Rewrites expressions involving integer exponents using the properties of exponents • Uses units as a way to understand problems and chooses units consistently in formulas • Chooses the scale and the origin in graphs and data displays • Identifies significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure • Identifies appropriate quantities for the purpose of descriptive modeling	• Rewrites expressions involving radical and rational exponents using the properties of exponents • Performs operations on rational and irrational numbers • Determines whether the solution of operations on two numbers would be rational or irrational • Interprets units consistently in formulas and uses units to solve multi-step problems. • Interprets the scale and the origin in graphs and data displays • Defines appropriate quantities for the purpose of descriptive modeling • Chooses a level of accuracy appropriate to limitations on measurement when reporting quantities • Describes the effects of approximate error in measurement and rounding on measurements and on computed values from measurements	• Explains how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of radical exponents • Explains why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational numbers is irrational; and that the product of a nonzero rational number and an irrational number is irrational
Algebra	• Usually interprets parts and structures of linear expressions • Chooses an equivalent form of an expression to reveal properties of the quantity represented by the expression	• Consistently interprets parts of an expression based on real-world context • Usually interprets the structure of quadratic and exponential expressions with integer exponents • Factors polynomial expressions	• Interprets complicated expressions by viewing one or more of their parts as a single entity • Chooses and produces an equivalent form of an expression to explain properties of the quantity represented by the expression

	• Identifies, combines and expands like terms when performing operations on polynomial expressions • Creates linear equations and inequalities in one variable and uses them to solve problems • Creates equations in two variables to represent relations between quantities • Graphs the equations on coordinate axes with labels and scales • Rearranges formulas to highlight a quantity of interest using the same reasoning as in solving equations • Solves and explains each step in solving linear equations and inequalities in one variable • Solves system of linear equations exactly and approximately • Knows that the graph of an equation in two variables is the set of all its solutions • Graphs the solutions of linear inequality in two variables	• Creates quadratic and exponential equations in one variable and uses them to solve problems • Creates equations with more than two variables • Represents constraints by linear equations/ inequalities and by systems of linear equations/inequalities • Constructs viable arguments to justify or refute a solution method for linear equations/inequalities • Usually solves linear equation/inequalities in one variable involving absolute value • Solves a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically • Finds and is able to explain the solutions of linear equations y = f(x) and y = g(x) approximately, using technology to graph the functions and make tables of values • Graphs the solution set of a system of linear inequalities in two variables	• Completes the square in a quadratic expression to reveal the maximum or minimum value of the function it defines • Recognizes that the system of polynomials is similar to the system of integers in that they are both closed under certain operations • Interprets solutions of linear equations or inequalities as viable or non-viable options in a modeling context • Uses the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions • Derives the quadratic formula • Recognizes when solutions of a quadratic equation results in non-real solutions and write them as $a \pm bi$ for real numbers a and b • Proves that, given a system of equations in two variables, replacing one equation by the sum of that equation and a multiple of the other to produces a system with the same solutions
Functions	• Knows the structure of a function and uses function notation to evaluate and interpret functions • Distinguishes between an arithmetic and a geometric sequence • Interprets key features of graphs and tables for a function that models a relationship	• Interprets symmetries of graphs and tables in terms of the quantities • Relates the domain of a function to its graph • Estimates the rate of change from a graph. • Graphs functions and uses the properties of functions to create equivalent functions	• Recognizes that sequences are functions that are sometimes defined recursively • Interprets relative maximums and minimums and end behavior of graphs and tables in terms of the quantities • Uses graphs to show relative maximums and minimums; symmetries; and end behavior • Graphs piecewise-defined functions, including step functions

	• Calculates and interprets the average rate of change of a function presented symbolically or as a table • Graphs linear functions to show intercepts • Compares properties of functions each represented algebraically, graphically, numerically in tables, or by verbal descriptions • Distinguishes between situations that model linear functions and exponential functions • Constructs linear functions given a graph, a description of a relationship, or input-output pairs • Draws comparisons between exponential and linear graphs	• Interprets zeros, maximum/minimum values, and symmetry of the graph • Writes quadratic and exponential functions to describe relationship between quantities • Determines an explicit expression or steps for calculation from a context • Writes arithmetic and geometric sequences both recursively and with an explicit formula • Identifies the effect on a graph of a function by replacing $f(x)$ with $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k • Finds the inverse of a linear function • Constructs exponential functions given a graph, a description of a relationship, or input-output pairs • Draws comparisons between exponential and quadratic graphs • Interprets the parameters in a linear function	• Creates equivalent functions to explain different properties of the function • Uses process of completing the square in a quadratic function to show zeros, maximum/minimum values, and symmetry of the graph • Determines a recursive process, or steps for calculation from a context • Uses recursive and explicit formulas to model situations, and translates between the two forms • Utilizes technology to experiment with cases and illustrates an explanation of the effects on the graph of linear, quadratic, exponential, or absolute value functions • Interprets the parameters in an exponential function

Geometry	• Knows precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc
	• Represents rigid transformations in the plane
	• Compares transformations that preserve distance and angle to those that do not and identifies a sequence of transformations that will carry a given figure onto another
		• Uses geometric descriptions of rigid motions to solve problems
		• Applies properties of polygons to the solutions of problems
		• Verifies experimentally the properties of dilations given by a center and a scale factor
		• Uses congruence and similarity criteria for triangles to prove relationships in geometric figures
		• Knows that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles
		• Uses Pythagorean Theorem to solve right triangles in applied problems
		• Identifies relationships among inscribed angles, radii, and chords
			• Develops definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments
			• Explains how the criteria for triangle congruence follow from the definition of congruence in terms of rigid motions
			• Makes formal geometric constructions
			• Proves theorems about:
			  ○ triangles
			  ○ parallelograms
			  ○ circles
			  ○ polygons
			• Proves the Pythagorean Theorem using triangle similarity
			• Explains the relationship between the sine and cosine of complementary angles.

	• Finds angle sum and exterior angle of triangles, angles created when parallel lines are cut by a transversal, and angle-angle criterion for similarity of triangles • Uses congruence and similarity criteria for triangles to solve problems • Uses Pythagorean Theorem to solve right triangles • Uses coordinates to compute perimeters of polygons and areas of triangles and rectangles • Uses volume formulas for cylinders, cones, and spheres to solve problems	• Uses the fact that the length of the arc intercepted by an angle is proportional to the radius to solve problems • Uses the slope criteria for parallel and perpendicular lines to solve geometric problems • Finds the point on a directed line segment between two given points that partitions the segment in a given ratio • Uses volume formulas for pyramids to solve problems	• Uses trigonometric ratios to solve right triangles in applied problems • Uses relationships among inscribed angles, radii, and chords to solve problems • Derives the formula for the area of a sector. • Derives the equation of a circle to find the center and the radius • Derives the equation of a parabola given a focus and directrix • Uses coordinates to prove simple geometric theorems algebraically, including the distance formula and its relationship to the Pythagorean Theorem • Proves the slope criteria for parallel and perpendicular lines • Uses dissection arguments, Cavalieri's principle, and informal limit arguments to give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone
Statistics and Probability	• Represents data with plots on the real number line • Usually uses statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets • Usually interprets differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers) • Interprets relative frequencies in the context of the data	• Consistently uses statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets • Consistently interprets differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers) • Recognizes possible associations and trends in the data contained in a two-way frequency table • Fits a linear function to the data and uses the fitted function to solve problems in the context of the data	• Applies the addition rule and interprets the answer in terms of the model • Distinguishes between correlation and causation • Knows that the conditional probability of A given B is P(A and B)/P(B) and uses it to solve problems • Explains the concepts of conditional probability and independence in everyday language and everyday situations

	• Represents data on two quantitative variables on a scatter plot and describes how the data are related • Fits a linear function for a scatter plot that suggests a linear association and interprets the slope and the intercept of the model • Informally assesses the fit of a function by plotting and analyzing residuals • Describes events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events • Constructs and interprets two-way frequency tables of data when two categories are associated with each object being classified	• Computes and interprets the correlation coefficient of a linear fit • Distinguish between dependent and independent events • Uses a two-way table to approximate conditional probabilities • Recognizes the concepts of conditional probability and independence in everyday language and everyday situations • Applies the addition rule to calculate probabilities	

Appendix B – Final Recommended Cut Scores on IRT Scale and Scaling Constants

Table B.1: Final Recommended Cut Scores on IRT Scale

Subject	Grade	Cut Score (IRT)			Scaling Constants	
		Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations	A	B
STE	5	-1.62097	-0.11154	1.39789	19.87505	502.2169
	8	-1.49893	-0.02015	1.45863	20.28695	500.4088
ELA	8	-1.72777	-0.29884	1.13009	20.99473	506.2741
Math	10	-1.72060	-0.31698	1.08665	21.37327	506.7748

Appendix C – Participant Meeting Materials

The materials developed for the grades 7 and 8 mathematic standard setting committee are provided as an example of the materials developed and provided to the participants. Since the materials provided to participants contained secure information, any place where secure information would be provided, that information would be removed. Additionally, the following materials will not be not provided within the appendix:

- Test form – This was presented to participants through the online testing platform used during the spring 2019 administration, TestNav 8.
- Open-ended item rubrics – These documents presented the scoring rubrics and notes and student-produced response examples for each open-ended item presented to participants.
- Practice item judgment set – This was presented to participants through the online testing platform used during the spring 2019 administration, TestNav 8.

Participant Agenda

MCAS Standard Setting Meeting
August 2019

Agenda

Day 1 – Monday, August 5 (8:30 am – 4:30 pm)

General Session

Introductions and Meeting Orientation

Experience the Assessment

Lunch

Achievement Level Descriptors

Borderline Descriptors

Standard Setting Training

Practice Judgment Activity

Day 2 – Tuesday, August 6 (8:30 am – 4:30 pm)

Round 1 Judgments

Round 1 Judgment Feedback and Discussion

Lunch

Round 2 Judgments

Round 2 Judgment Feedback and Discussion

Round 3 Judgments

Round 3 Judgment Feedback and Discussion

Next Steps and Closing

Massachusetts Department of Elementary and Secondary Education

75 Pleasant Street, Malden, Massachusetts 02148-4906

Telephone: (781) 338-3000
TTY: N.E.T. Relay 1-800-439-2370

Jeff Wulfson
Acting Commissioner

Massachusetts Comprehensive Assessment System
NON-DISCLOSURE AGREEMENT

In order to preserve and ensure the security, validity, and integrity of Massachusetts Comprehensive Assessment System (MCAS) tests, the Massachusetts Department of Elementary and Secondary Education (the Department) requires that all individuals whom the Department authorizes to participate in the development, review, and production of MCAS tests and reports accept the terms of the following non-disclosure agreement.

- With the exception of test items released by the Department for informational purposes, all MCAS test items are deemed secure instruments. The materials are specifically excluded from the Massachusetts Public Records Law. **(G. L. c. 4, § 7(26) (l))** As a result, I agree not to reproduce, discuss, or in any way release or distribute test items and associated materials to unauthorized persons (i.e., persons not specifically authorized by the Department to have access to secure MCAS materials and information).
- All information about MCAS English language arts passages and English language arts, mathematics, history and social science, and science and technology/engineering graphics under consideration for inclusion in current or future MCAS tests is confidential. Therefore, I agree not to share this information in any way with unauthorized persons.
- Details about MCAS test construction, including the positions of items in test forms, must be kept secure. Consequently, I agree not to share MCAS test blueprints or any information related to MCAS test blueprints with unauthorized persons.
- Discussions and materials related to all technical aspects of the MCAS program, including possible new models and future directions, are confidential. Therefore, I agree not to reveal information regarding discussions and deliberations that take place in committee meetings to unauthorized persons.
- I further understand and agree that all MCAS test items, ideas for items, and related test materials developed, reviewed, and produced by authorized persons working in collaboration with the Department are and will forever remain the exclusive property of the Massachusetts Department of Elementary and Secondary Education.

By signing below, I, as a member of the MCAS Standard Setting Committee, Assessment Development Committee, or Technical Advisory Committee, acknowledge and accept that I am bound by the terms of this agreement prohibiting the disclosure of information regarding secure materials and discussions. I also acknowledge and accept that my failure to abide by any term of this non-disclosure agreement will result in serious consequences, including but not limited to action to limit or revoke my Massachusetts educator license.

NAME: _____

COMMITTEE (include subject & grade): _____

AFFILIATION: _____

SIGNATURE: _____ **DATE:** _____

Participant Information Survey

Next Generation Massachusetts Comprehensive Assessment System (Next-Gen MCAS)

Standard Setting Meeting

Participant Information Survey

English Language Arts - Grade 10

Professional Experience

* What is your current position?

- Teacher (K-12 Education)
- Teacher (Higher Education)
- Administrator (School)
- Administrator (District)
- Other Position:

* How many years of professional experience in education do you have?

- None
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- 16 to 20 years
- More than 20 years

For which grades do you have experience teaching English Language Arts?

* Grade 9

Yes No

* Grade 10

Yes No

* How many years of professional experience do you have teaching English Language Arts for Grade 10?

None
1 to 5 years
6 to 10 years
11 to 15 years
16 to 20 years
More than 20 years

* For which of the following populations do you have educational experience with? (Check all that apply.)

Students receiving mainstream special education services
Students receiving self-contained special education services
Students who are English language learners
Students who are receiving general education instruction
Students who are receiving vocational technical instruction

* What is the highest degree you have completed?

High School Diploma
Associates degree (A.A., A.S.)
Bachelors degree (B.A., B.S.)
Masters degree (M.A., M.S.)
Doctoral degree (Ph.D., Ed.D.)

Page 2

Demographic Information

What is your gender?

Male Female No answer

What is your ethnicity?

Hispanic or Latino Not Hispanic or Latino No answer

What is your race?

American Indian or Alaskan Native
Asian
Black or African American
Native Hawaiian or Pacific Islander
White
No answer

* Do you currently work in a school district?

Yes
No

Page 3

School District Information

* Which word best describes the size of the school district where you work?

Small
Medium
Large

* Which word best describes the type of school district where you work?

Rural
Metropolitan/Urban
Suburban

Which word best describes the socioeconomic status of the school district where you work?

- Low
- Moderate
- High

Close this window

MCAS Standard Setting Meeting
August 2019

Experience the Assessment Record Sheet
ELA Grade 10

Sequence	Item ID	Passage	Domain*	Max Point	Response	Notes
1	EL713524463	Dracula, Rebecca, Station Eleven	Reading	1		
2	EL713480754		Reading	1		
3	EL713476495		Reading	1		
4	EL713449204		Reading	1		
5	EL713350461		Reading	1		
6	EL713525312		Language	1		
7	EL713367461		Reading	2		
8	EL713526564		Reading	2		
9	EL713447252		Language, Writing	8		
10	EL702544597	from Plastic: A Toxic Love Story; from High Tech Trash	Reading	1		
11	EL702537404		Reading	1		
12	EL700380367		Reading	1		
13	EL700559402		Reading	1		
14	EL702538198		Reading	1		

Note: Only the first page of this document is presented as an example.

MCAS Standard Setting Meeting
August 2019

Item Comment Form
ELA Grade 10

Directions: If you have any comments or suggestions about specific items, please record them here.

Item	Comment

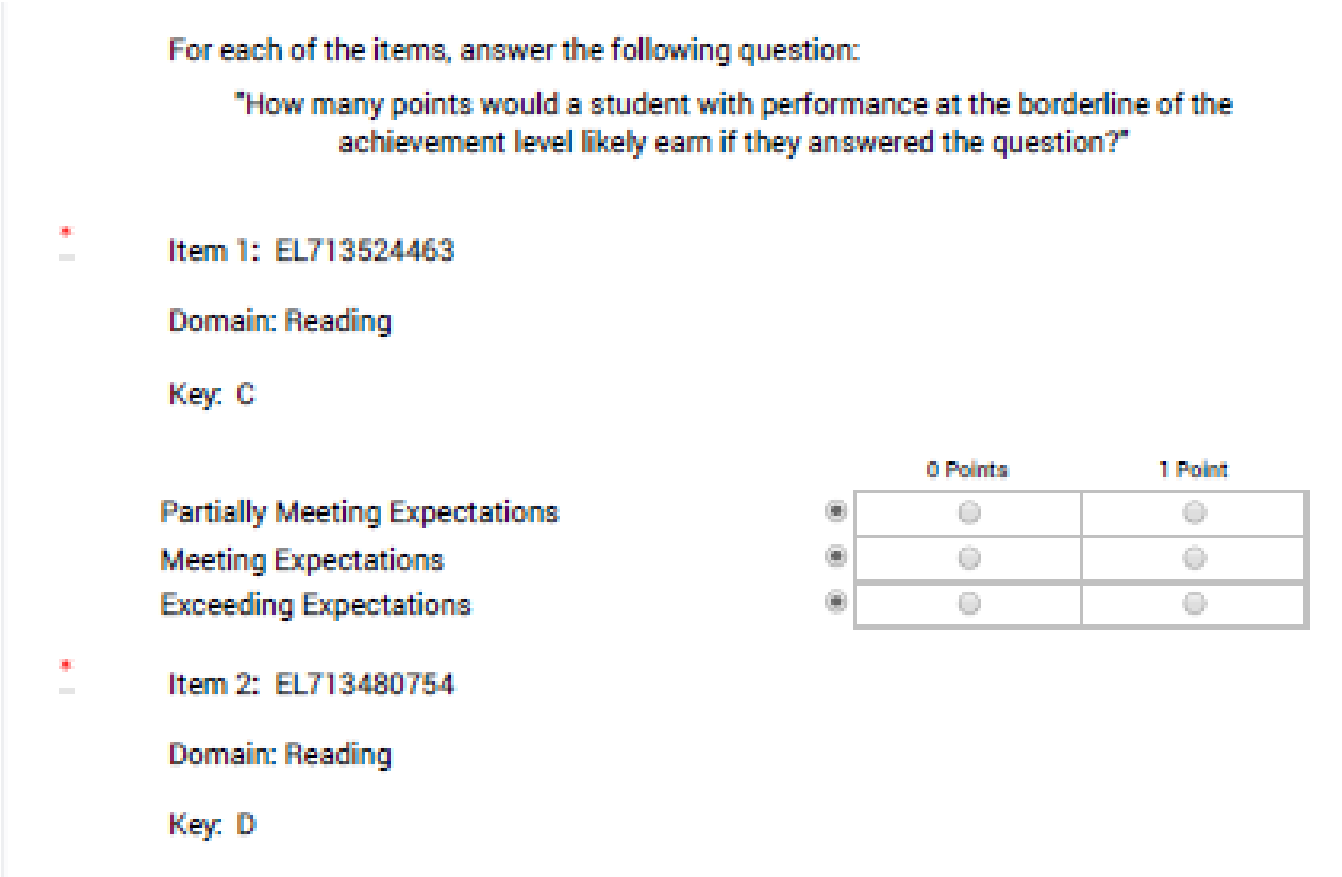
MCAS Standard Setting Meeting
August 2019

Judgment Record Sheet
ELA Grade 10

Seq	Item ID	Passage	Domain*	Max Score	Judgment Round								
					1			2			3		
					PME	ME	EE	PME	ME	EE	PME	ME	EE
1	EL713524463	Dracula, Rebecca, Station Eleven	Reading	1									
2	EL713480754		Reading	1									
3	EL713476495		Reading	1									
4	EL713449204		Reading	1									
5	EL713350461		Reading	1									
6	EL713525312		Language	1									
7	EL713367461		Reading	2									
8	EL713526564		Reading	2									
9	EL713447252 Idea Development		Writing	5									
10	EL713447252 Conventions		Language	3									
11	EL702544597	from Plastic: A Toxic Love Story; from High Tech Trash	Reading	1									
12	EL702537404		Reading	1									
13	EL700380367		Reading	1									

Note: Only the first page of this document is presented as an example.

Item Judgment Survey



For each of the items, answer the following question:

"How many points would a student with performance at the borderline of the achievement level likely earn if they answered the question?"

* Item 1: EL713524463

Domain: Reading

Key: C

	0 Points	1 Point
Partially Meeting Expectations	○	○
Meeting Expectations	○	○
Exceeding Expectations	○	○

* Item 2: EL713480754

Domain: Reading

Key: D

Note: The survey for only the first two items is shown.

MCAS Standard Setting Meeting
August 2019

Achievement Level Descriptor (ALD) Comment Form
ELA Grade 10

Directions: If you have any comments or suggestions about the Achievement Level Descriptors, please record them here.

Achievement Level	Comment
Exceeding Expectations	
Meeting Expectations	
Partially Meeting Expectations	

Process Evaluation #1

Process Evaluation Day 1

Next Generation Massachusetts Comprehensive Assessment System (Next-Gen MCAS)

Standard Setting Meeting

Process Evaluation Survey #1

The purpose of this evaluation is to collect information about your experience in recommending cut scores associated with the achievement levels for the MCAS assessments. Your opinions provide an important part of our evaluation of this meeting.

* Select the option that best reflects your opinion about the level of success of the various components of the meeting in which you participated. The activities were designed to help you both understand the process and be supportive of the recommendations made by the committee.

	Not Successful	Partially Successful	Successful	Very Successful
Meeting pre-work	○	○	○	○
General session training	○	○	○	○
Overview of the MCAS assessments	○	○	○	○
Introduction to the standard setting process	○	○	○	○
Experiencing the actual assessment	○	○	○	○
Discussion of the scoring of items on the assessment	○	○	○	○
Discussion of achievement level descriptors (ALDs)	○	○	○	○
Development and discussion of the borderline descriptions	○	○	○	○
Overview of the standard-setting procedure	○	○	○	○
Practice exercise for the standard-setting procedure	○	○	○	○

* How useful do you feel the following activities or information were in assisting you to make your recommendations?

	Very Useful	Useful	Somewhat Useful	Not Useful
Achievement Level Descriptors (ALDs)	○	○	○	○
Borderline Descriptions	○	○	○	○

* How adequate were the following elements of the session?

	Not Adequate	Somewhat Adequate	Adequate	More Than Adequate
Total amount of time to create and discuss borderline descriptions	○	○	○	○
Training provided on the standard-setting process	○	○	○	○
Amount of time spent training	○	○	○	○
Total amount of time to discuss the practice judgment activity	○	○	○	○

Close this window

Process Evaluation #2

Next Generation Massachusetts Comprehensive Assessment System (Next-Gen MCAS)

Standard Setting Meeting

Process Evaluation Survey #2

The purpose of this evaluation is to collect information about your experience in recommending cut scores associated with the achievement levels for the MCAS assessments. Your opinions provide an important part of our evaluation of this meeting.

* Select the option that best reflects your opinion about the level of success of the various components of the meeting in which you participated. The activities were designed to help you both understand the process and be supportive of the recommendations made by the committee.

	Not Successful	Partially Successful	Successful	Very Successful
Judgment rounds	○	○	○	○
Judgment round feedback - committee-level statistics	○	○	○	○
Judgment round feedback - panelist cut score agreement data	○	○	○	○
Judgment round feedback - panelist judgment agreement data	○	○	○	○
Judgment round feedback - impact data	○	○	○	○
Discussions after each round	○	○	○	○

* How useful do you feel the following activities or information were in assisting you to make your recommendations?

	Very Useful	Useful	Somewhat Useful	Not Useful
Committee-level statistics after Rounds 1 and 2	○	○	○	○
Panelist agreement data provided after Round 1	○	○	○	○
Panelist agreement data provided after Round 2	○	○	○	○
Impact data after Round 2	○	○	○	○
Discussion after each judgment round	○	○	○	○

* How adequate were the following elements of the session?

	Not Adequate	Somewhat Adequate	Adequate	More Than Adequate
Amount of time to make judgments	○	○	○	○
Visual presentation of the feedback provided	○	○	○	○
Number of judgment rounds	○	○	○	○

* In applying the standard-setting method, you were asked to recommend cut scores (separating four achievement levels) for student performance on MCAS assessments.

How confident do you feel that the Achievement Level Descriptors (ALDs) for grade 10 ELA are reasonable for each student achievement level?

	Not Confident	Somewhat Confident	Confident	Very Confident
Exceeding Expectations	○	○	○	○
Meeting Expectations	○	○	○	○
Partially Meeting Expectations	○	○	○	○

* How confident do you feel that the final cut score recommendations for grade 10 ELA represent appropriate levels of student performance?

	Not Confident	Somewhat Confident	Confident	Very Confident
Exceeding Expectations	○	○	○	○
Meeting Expectations	○	○	○	○
Partially Meeting Expectations	○	○	○	○

Page 2

* How adequate were the following elements of the session?

	Not Adequate	Somewhat Adequate	Adequate	More Than Adequate

Facilities used for the general session				
Facilities used for the breakout session				
Computers used during the meetings				
Standard Setting website for accessing materials and making judgments				
Materials provided in the folder				
Work space in table groups during the meeting				

* Did you have adequate opportunities during the session to:

	Not Adequate	Somewhat Adequate	Adequate	More Than Adequate
Express your opinions about student achievement levels				
Ask questions about the cut scores and how they will be used				
Ask questions about the process of making cut score recommendations				
Interact with your fellow panelists				

* Do you believe your opinions and judgments were treated with respect by:

	No	Sometimes	Yes
Fellow panelists			
Facilitators			

* Please use the space below to provide any additional comments you have regarding the standard setting process, facilitators, materials, etc.

Paragraph

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Close this window

Appendix D – Committee Participant Composition

Table D.1: Participant Position

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Teacher (K–12)	13	16	13	13
Teacher (Higher Ed.)	0	1	0	0
Administrator (School)	1	0	1	2
Administrator (District)	1	0	3	0
Other	1	2	1	0
Total	16	19	18	15

Table D.2: Years of Teaching Experience

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
1 to 5 years	0	0	1	1
6 to 10 years	4	5	0	3
11 to 15 years	3	4	5	3
16 to 20 years	4	3	6	4
More than 20 years	5	7	6	4
Total	16	19	18	15

Table D.3: Years of Teaching Experience Subject Within Grade

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
None	2	2	1	0
1 to 5 years	4	4	4	4
6 to 10 years	6	6	7	6
11 to 15 years	3	2	4	2
16 to 20 years	1	4	2	1
More than 20 years	0	1	0	2

Table D.4: Experience Teaching Student Populations

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Mainstream special education	14	19	18	14
Self-contained special education	6	7	8	5
English language learners (ELL)	13	17	17	14
General education	16	19	17	14
Vocational technical education	1	2	6	2

Table D.5: Highest Education Degree

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Bachelor's degree	1	0	0	1
Master's degree	15	18	16	14
Doctorate degree	0	1	2	0

Table D.6: Demographic: Gender

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Female	16	11	14	11
Male	0	8	3	2
No response	0	0	1	2

Table D.7: Demographic: Race

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Hispanic or Latino	0	16	2	0
Not Hispanic or Latino	16	0	14	14
No response	0	3	2	1

Table D.8: Demographic: Ethnicity

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Asian	1	0	1	1
Black or African American	2	1	1	0
White	13	17	14	12
No response	0	1	2	2

Table D.9: Currently Work in a School District

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Yes	15	16	18	15
No	1	3	0	0

Table D.10: Size of School District

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Small	2	3	5	4
Medium	9	6	4	7
Large	4	7	9	4
No response	1	3	0	0

Table D.11: Type of School District

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Rural	4	0	0	4
Metropolitan/Urban	7	8	10	5
Suburban	4	8	8	6
No response	1	3	0	0

Table D.12: Socioeconomic Status of School District

	STE		ELA	Math
	Grade 5	Grade 8	Grade 10	Grade 10
Low	8	10	9	7
Medium	6	5	8	6
High	1	1	1	2
No response	1	3	0	0

Appendix E – Standard Setting Meeting Agenda

Facilitator Agenda
ELA Grade 10

Day 1

8:00 - 8:30 am ***Breakfast***

General Session

8:30 - 9:00 am Welcome
- Who is here? Why are we here?
- Overview of NextGen MCAS

9:00 - 9:45 am Achievement Level Setting Overview
- What is Achievement Level Setting?
- Overview of the judgment task

9:45 - 10:00 am ***Break***

Breakout Session

10:00 - 10:15 am Breakout Session Introductions
- Introductions
- Orientation to materials
- Meeting security

10:15 - 10:30 am Overview of NextGen MCAS
- NextGen MCAS items and item types
- Testing times

10:30 - 11:45 pm Experience the Assessment
- Orientation to activity and purpose
- Review scoring rules for MCAS items
- Individual activity

11:45 - 12:30 pm ***Lunch***

12:30 - 1:00 pm Item Difficulty Comparison

1:00 - 1:45 pm Review and Discuss Achievement Level Descriptors (ALDs)
- Introduction to ALDs
- Table-group discussions
- Whole-group discussion

1:45 - 2:15 pm Borderline Descriptor Training
- Introduction to Borderline ALDs Modeling of borderline ALD development

2:15 - 3:45 pm Borderline ALD Development
- Table Group Discussion

Whole Group Discussion

3:45 - 4:30 pm — Achievement Level Setting Training
- Training
- Practice Judgment Activity
- Group Discussion

Day 2

8:00 - 8:30 am — ***Breakfast***

8:30 - 10:00 am — Round 1 Item Judgments
- Round 1 Readiness Form
- **Panelists work independently to make Round 1 item judgments**

10:00 - 10:30 am — ***Break (Data Analysis)***

10:30 - 11:45 am — Round 1 Item Judgment Feedback
- Introduction to feedback data
- Table Discussion - Round 1 Feedback

11:45 - 12:30 pm — ***Lunch***

12:30 - 1:30 pm — Round 2 Item Judgments
- Round 2 Readiness form
- Panelists work independently to make Round 2 item judgments

1:30 - 2:00 pm — *Break (Data Analysis)*

2:00 - 3:00 pm — Round 2 Judgment Feedback
- Table Discussion - Round 2 Feedback
- Whole Group Discussion - Round 2 Feedback Impact Data
- Articulation with Grades 3-8 (Math and ELA only)

3:00 - 3:45 pm — Round 3 Item Judgments
- Round 3 Readiness form
- **Panelists work independently to make Round 3 item judgments**

3:45 - 4:15 pm — ***Break (Data Analysis)***

4:15 - 4:30 pm — **Present Round 3 Results**

4:30 - 4:45 pm — **Next Steps and Close-out**

Appendix F – Examples of Feedback Data

Feedback data was provided to participants after each judgment round. The following are examples of feedback data provided to participants.

Individual Item—Level Judgments

This provided the participant with the actual item-level judgments that were recorded in Moodle for the participant. This was provided so that the participant could check that the system recorded the judgments correctly.

MATH Grade 03 - Individual Score Points - Round 1

Table=1 Name=

UIN	PME	ME	EE
MA283002	1	1	1
M03387P	0	0	1
MA306301	1	1	1
MA203641	0	1	1
M00003	0	1	1
MA306310	0	1	1

Individual Test—Level Recommendation

This provided the participant with the recommendations for test-level cut scores based on their item judgments for the Partially Meeting Expectations, Meeting Expectations, and Exceeding Expectations achievement levels.

MATH Grade 03 - Individual Score Points - Round 1

Table=1 Name=

PME Raw Score	ME Raw Score	EE Raw Score
14	33	46

Table-level Test—Level Recommendations

This provided the participant with the aggregate test-level recommendation, based on the individual participants at the table, including the number of participants, the mean recommendation, the median recommendation, the minimum and maximum recommendation, and the first and third quartiles for each achievement level.

MATH Grade 03 Round 1 Summary Statistics - Table 1

	N	Mean	Median	Min	Max	Q1	Q3
PME Raw Score	5	13.60	13	11.00	18.00	12.00	14.00
ME Raw Score	5	33.60	32	30.00	41.00	32.00	33.00
EE Raw Score	5	46.00	46	44.00	48.00	46.00	46.00

Overall Test—Level Recommendations

This provided the participant with the aggregate test-level recommendation, based on the individual participants in the committee, including the number of participants, the mean recommendation, the median recommendation, the minimum and maximum recommendation, and the first and third quartiles for each achievement level.

MATH Grade 03 Round 1 Summary Statistics - Overall

	N	Mean	Median	Min	Max	Q1	Q3
PME Raw Score	20	14.40	14	7.00	23.00	12.00	17.50
ME Raw Score	20	31.95	33	24.00	41.00	30.50	33.50
EE Raw Score	20	44.20	44	39.00	48.00	42.50	46.00

Item-level Judgment Agreement

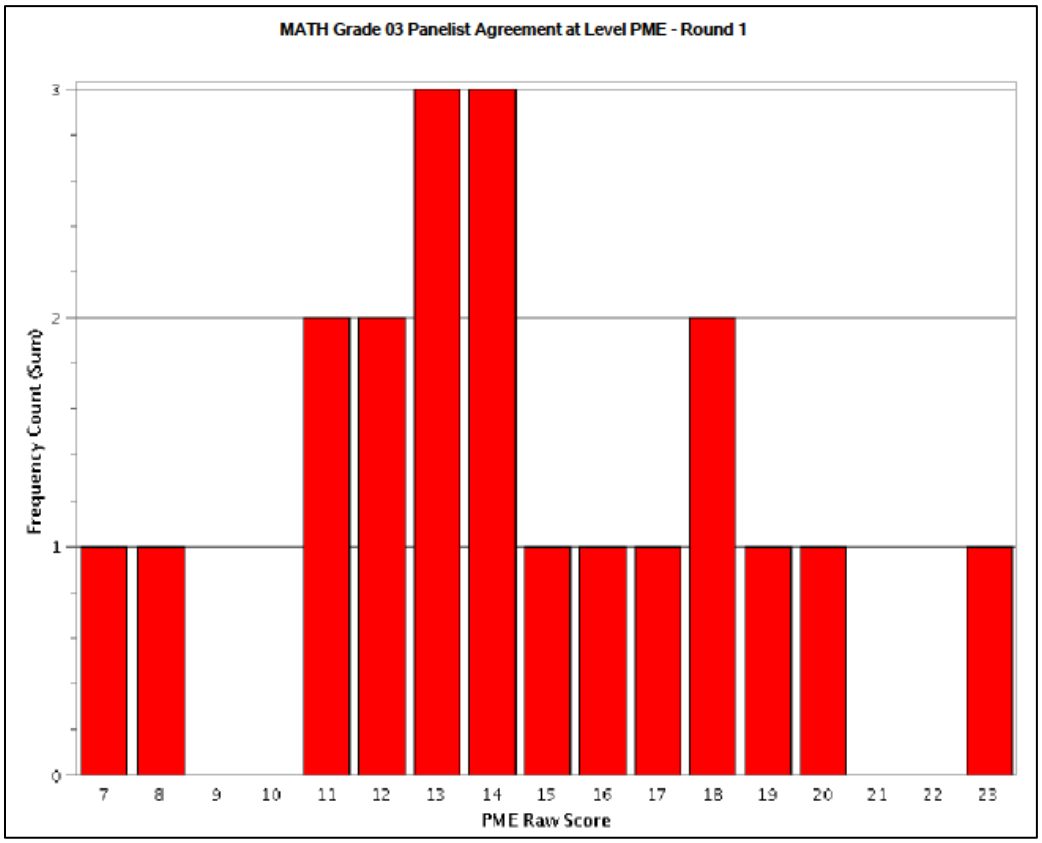
This provided the participants with item-level judgment distributions for the committee for each item. Additionally, for each achievement level, the items with the greatest level of judgment disagreement were identified.

MATH Grade 03 Round 1 Level PME Flagged Items

UIN	Max Points	0	1	2	3
VH083831	3	45%	50%	5%	0%
MA306360	2	50%	50%	0%	0%
M00038	1	45%	55%	0%	0%
M01874	1	60%	40%	0%	0%
VH093469	1	60%	40%	0%	0%

Test-level Participant Recommendation Agreement

This feedback was presented to participants by the facilitator. It presented bar graphs displaying the distribution of participant recommendations for the cut score, by raw score, for each achievement level: Partially Meeting Expectation, Meeting Expectations, and Exceeding Expectations. Graphs displaying consecutive achievement levels (Partially Meeting Expectations and Meeting Expectations) on the scale graph were also presented.



Item Score Mean and Score Distribution

This provided, for each item, the mean score and the distribution of scores received by students during the Spring 2017 administration. The results presented were based on the sample of data used to create the impact data.

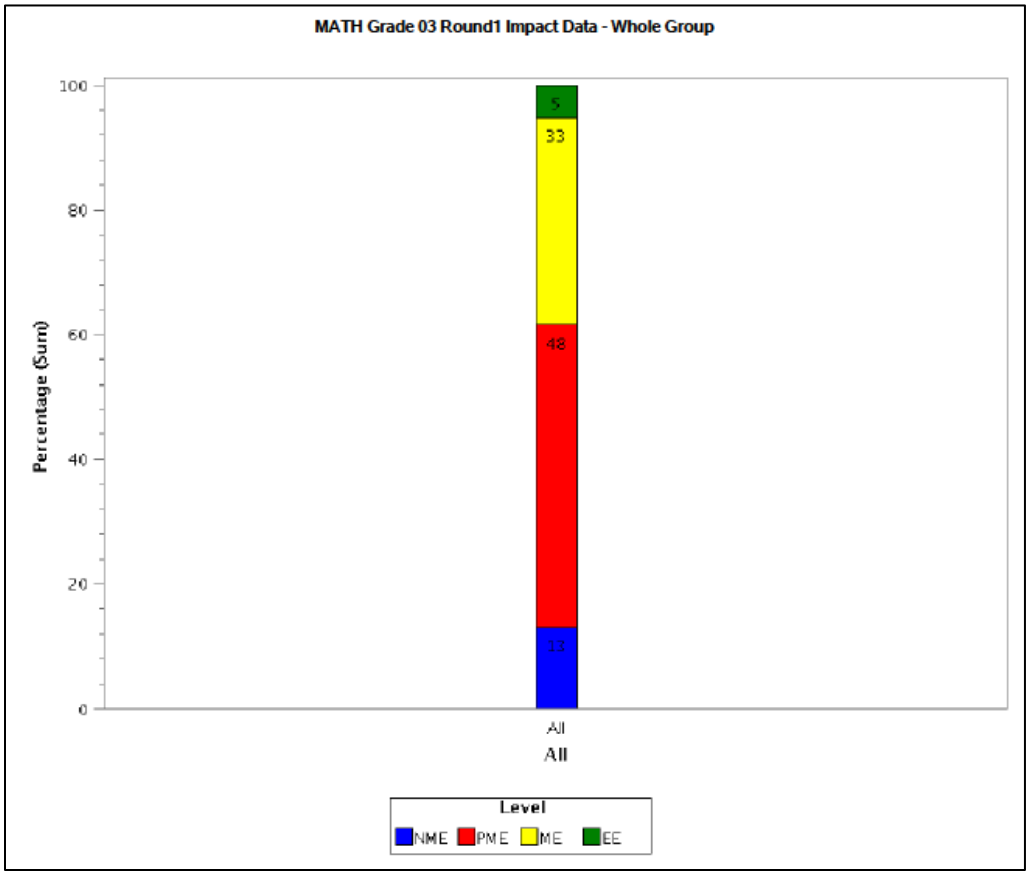
Item Score Mean and Distribution

Grade 3 Mathematics

Sequence	Item	Item Type	Reporting Category	Maximum Points	Score Mean	Score Distribution				
						0 pts	1 pt	2 pts	3 pts	4 pts
1	MA283002	SR	MD	1	0.891	10.9%	89.1%			
2	M03387P	SR	F	1	0.455	54.5%	45.5%			
3	MA306301	SR	G	1	0.481	51.9%	48.1%			
4	MA203641	SA	MD	1	0.836	16.4%	83.6%			
5	M00003	SR	OA	1	0.806	19.4%	80.6%			
6	MA306310	SR	G	1	0.509	49.1%	50.9%			
7	MA306335	CR	BT	2	0.760	37.1%	49.8%	13.1%		

Impact Data

This provided the percentage of student expected to be classified into each achievement level, Not Meeting Expectations, Partially Meeting Expectations, Meeting Expectations, and Exceeding Expectations, based on the committee test-level cut score recommendations for that round. These results were based on the sample of student data from the Spring 2017 administration.



Appendix G – Committee Recommended Cut Scores by Round

Table G.1: STE Grade 5

Achievement Level	Maximum Score	Rounds			Vertical Articulation	Final
		1	2	3		
Partially Meeting Expectations	54	17	12	16	17	18
Meeting Expectations		36	28	30	35	33
Exceeding Expectations		52	45	47	44	45

Table G.2: STE Grade 8

Achievement Level	Maximum Score	Rounds			Vertical Articulation	Final
		1	2	3		
Partially Meeting Expectations	54	11	13	17	16	16
Meeting Expectations		39	31	33	32	31
Exceeding Expectations		51	47	46	43	44

Table G.3: ELA Grade 10

Achievement Level	Maximum Score	Rounds			Vertical Articulation	Final
		1	2	3		
Partially Meeting Expectations	49	16	16	19	21	21
Meeting Expectations		32	33	35	37	38
Exceeding Expectations		46	46	46	47	47

Table G.4: Math Grade 10

Achievement Level	Maximum Score	Rounds			Vertical Articulation	Final
		1	2	3		
Partially Meeting Expectations	60	13	12	13	13	13
Meeting Expectations		35	33	32	32	32
Exceeding Expectations		53	52	53	53	53

Appendix H – Recommended Cut Score Summary Statistics

STE Grade 5

Round	Statistic	Achievement Level		
		Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
1	Mean	15.59	36.41	50.47
	Minimum	6	27	44
	Q1	11	34	50
	Median	**17**	**36**	**52**
	Q3	19	41	52
	Maximum	23	45	54
2	Mean	11.29	28.24	44.29
	Minimum	4	13	34
	Q1	7	24	42
	Median	**12**	**28**	**45**
	Q3	15	36	48
	Maximum	19	40	51
3	Mean	15.00	31.44	45.89
	Minimum	9	23	35
	Q1	13	29	44
	Median	**16**	**30**	**47**
	Q3	17	35	48
	Maximum	21	40	51

STE Grade 8

Round	Statistic	Achievement Level		
		Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
1	Mean	13.33	37.22	50.72
	Minimum	6	22	46
	Q1	10	31	50
	Median	**11**	**39**	**51**
	Q3	19	43	52
	Maximum	23	46	54
2	Mean	13.33	30.39	45.39
	Minimum	4	18	37
	Q1	11	27	43
	Median	**13**	**31**	**47**
	Q3	18	34	47
	Maximum	23	41	50
3	Mean	16.78	33.06	45.94
	Minimum	10	25	42
	Q1	16	32	45
	Median	**17**	**33**	**46**
	Q3	19	34	47
	Maximum	21	39	49

ELA Grade 10

Round	Statistic	Achievement Level		
		Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
1	Mean	14.90	32.50	45.10
	Minimum	6	18	35
	Q1	12.5	29	43
	Median	**16**	**32**	**46**
	Q3	18	37	48.5
	Maximum	23	44	49
2	Mean	16.00	31.90	44.50
	Minimum	9	25	39
	Q1	14.5	29	42.5
	Median	**16**	**33**	**46**
	Q3	17.5	34	46
	Maximum	24	36	48
3	Mean	18.65	34.75	46.00
	Minimum	13	28	42
	Q1	16	33	45
	Median	**19**	**35**	**46**
	Q3	21	37	47
	Maximum	24	39	49

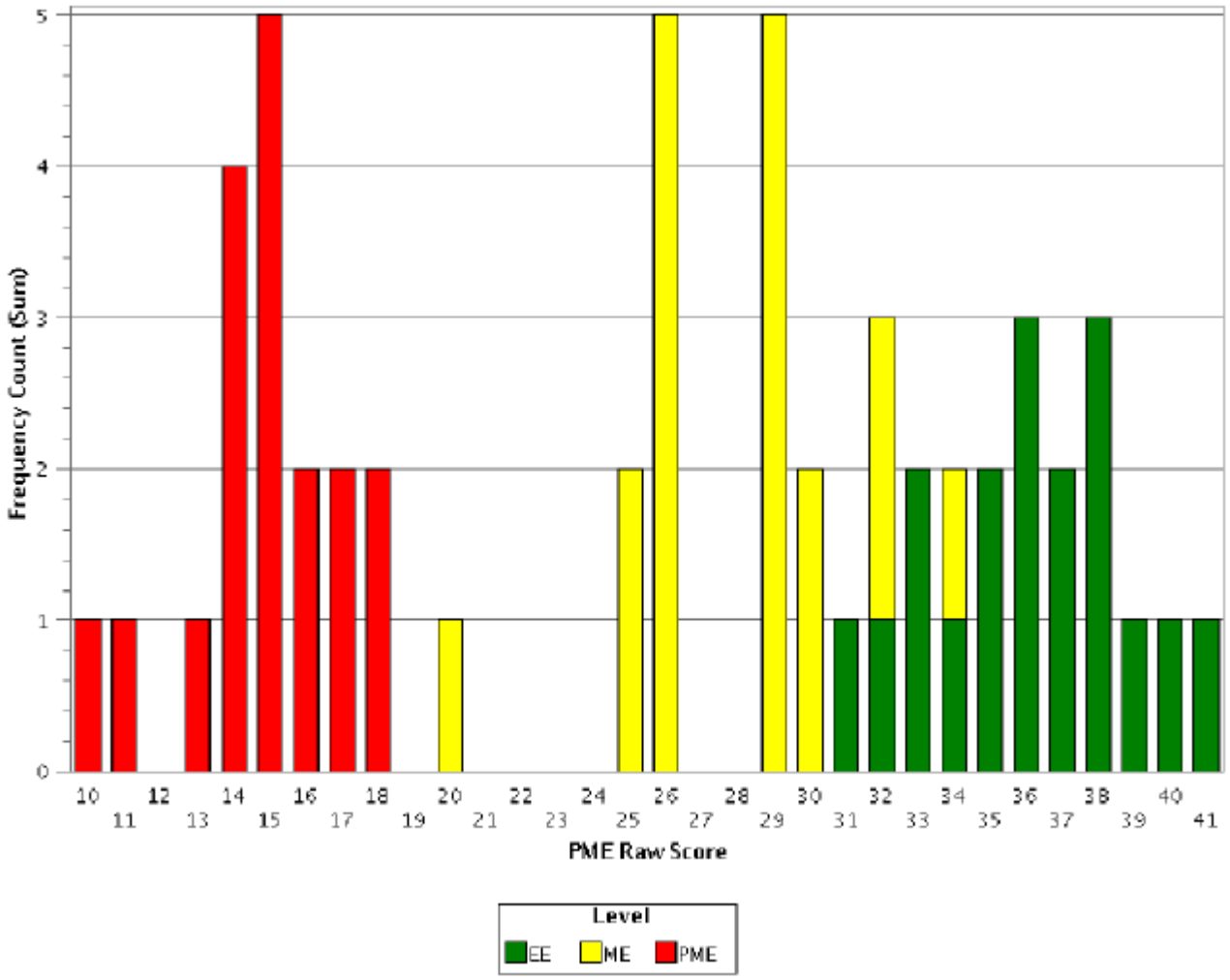
Math Grade 10

Round	Statistic	Achievement Level		
		Partially Meeting Expectations	Meeting Expectations	Exceeding Expectations
1	Mean	13.84	35.42	52.53
	Minimum	6	23	42
	Q1	9	29	51
	Median	**13**	**35**	**53**
	Q3	18	42	56
	Maximum	24	50	60
2	Mean	11.63	34.26	52.00
	Minimum	6	26	45
	Q1	9	31	51
	Median	**12**	**33**	**52**
	Q3	14	39	53
	Maximum	16	45	56
3	Mean	12.05	33.42	51.53
	Minimum	6	25	44
	Q1	10	31	48
	Median	**13**	**32**	**53**
	Q3	14	37	54
	Maximum	16	41	55

Appendix I – Test-Level Participant Judgment Agreement

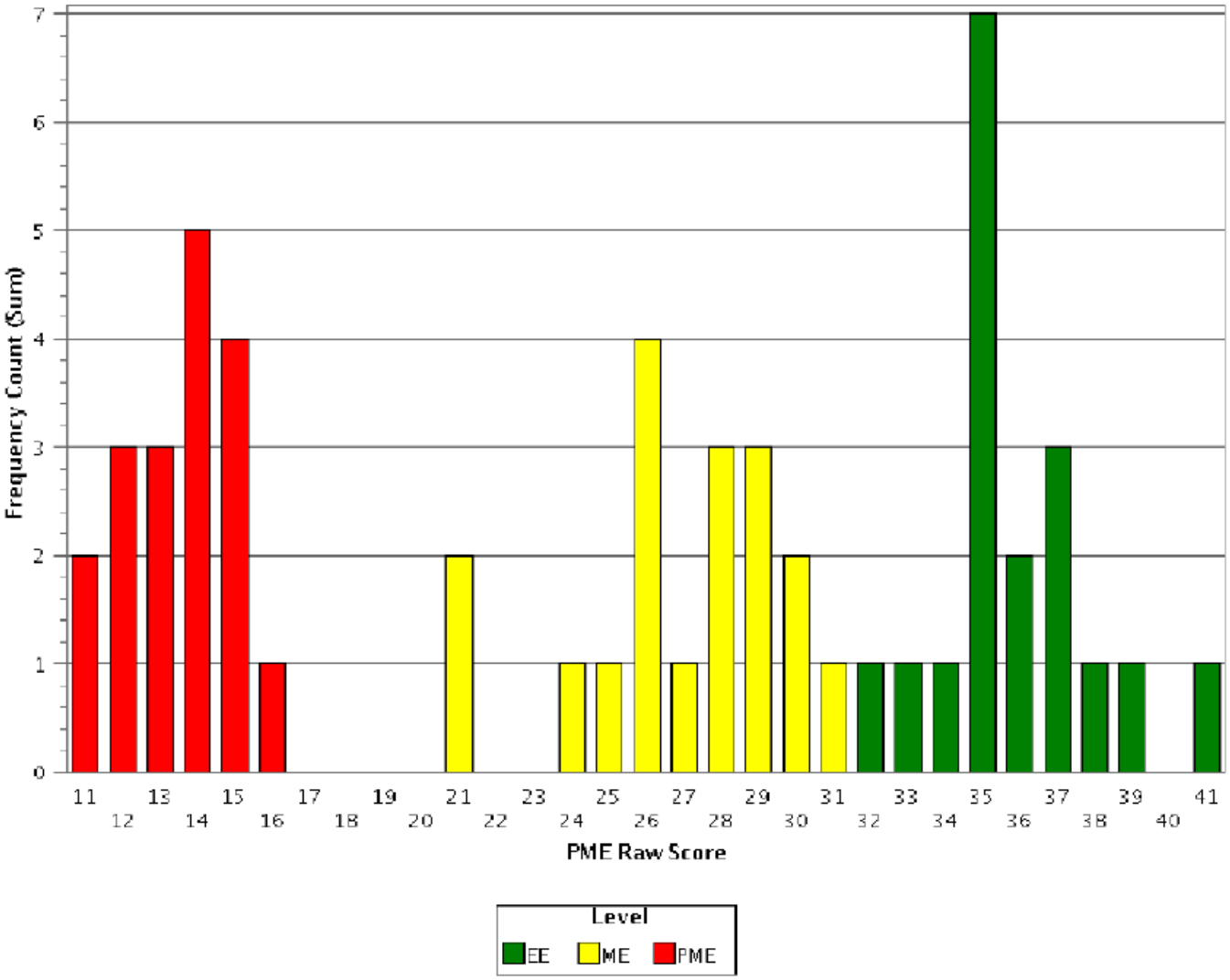
STE Grade 5

Round 1:



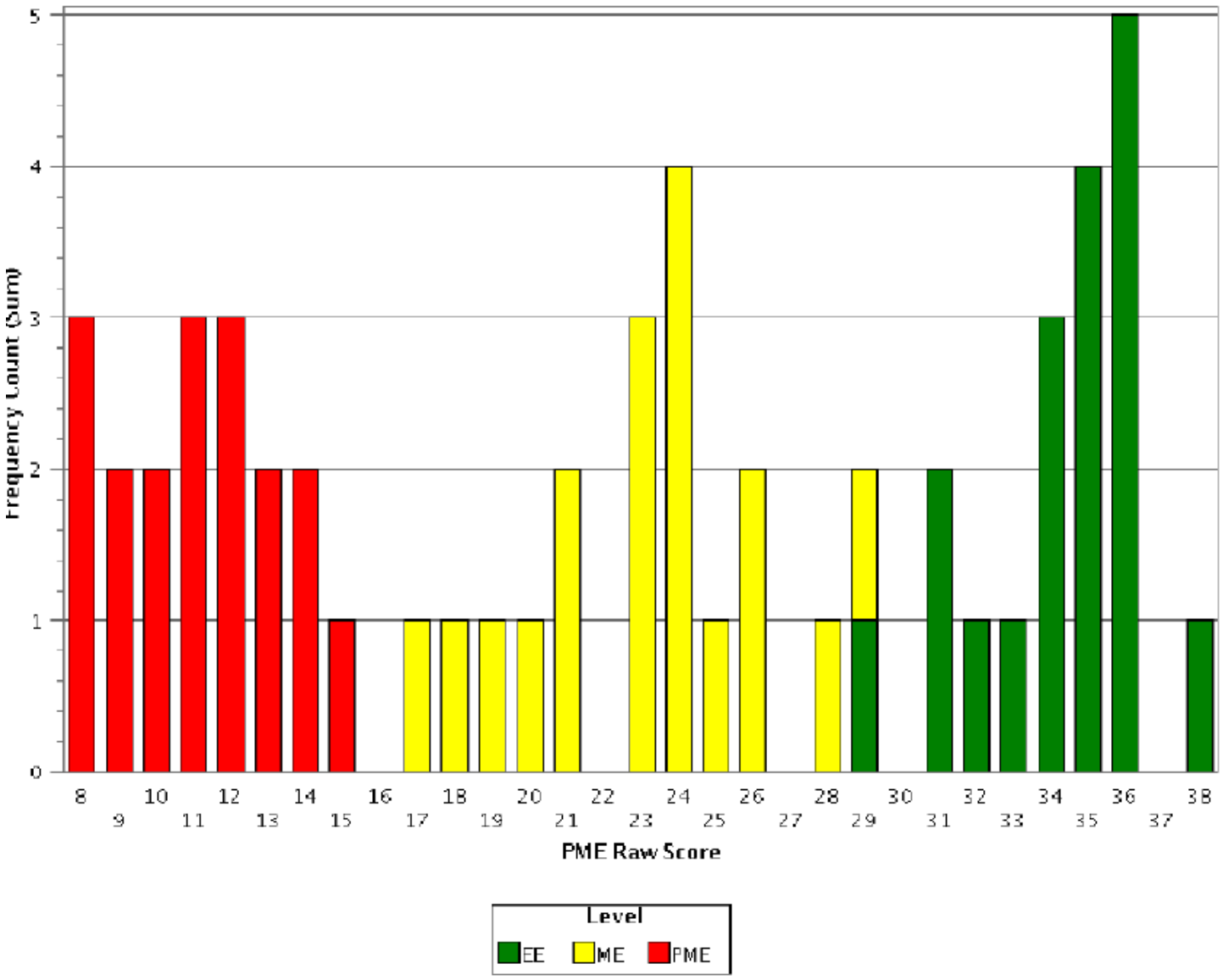
All Three Achievement Levels Concurrently

Round 2:



All Three Achievement Levels Concurrently

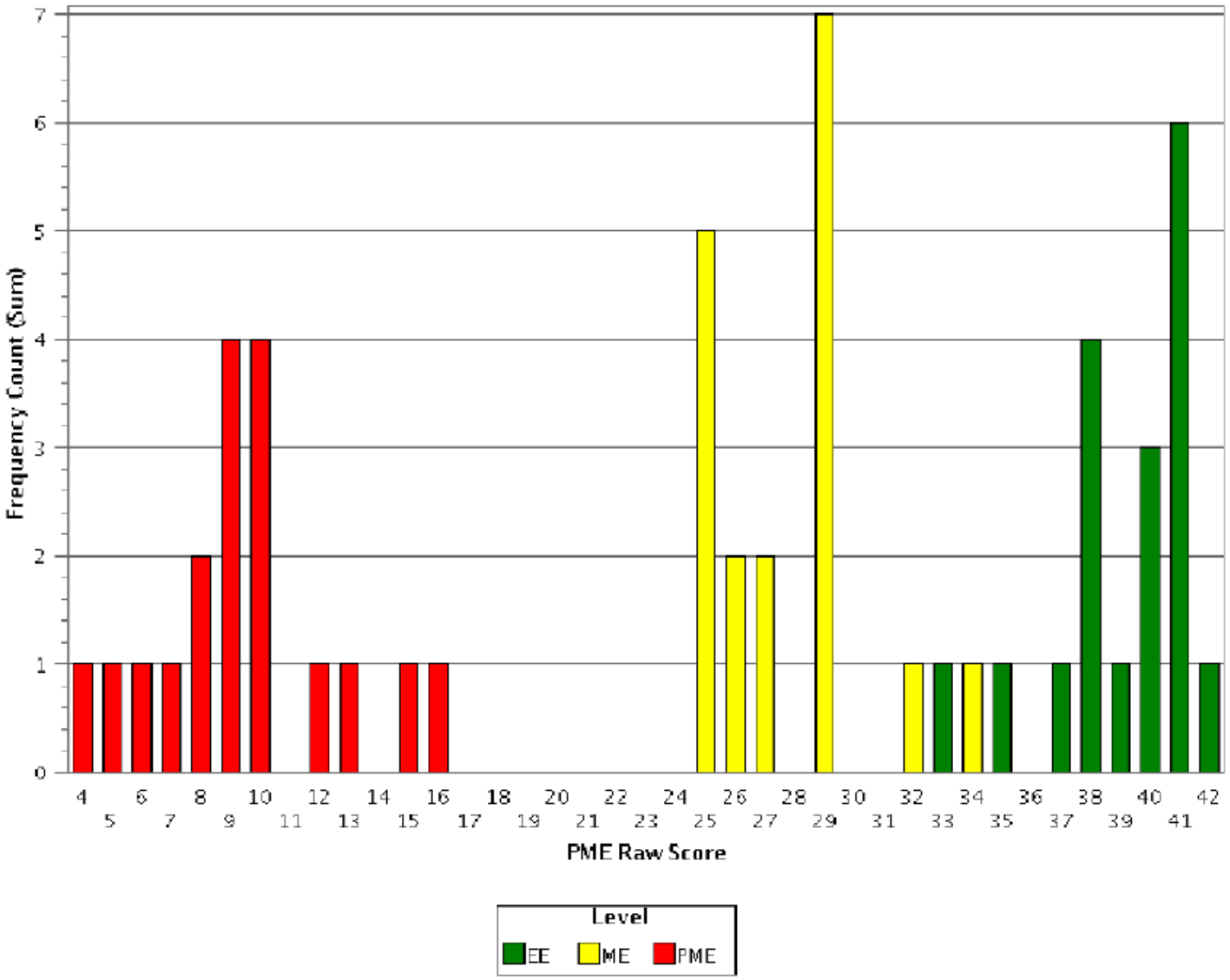
Round 3:



All Three Achievement Levels Concurrently

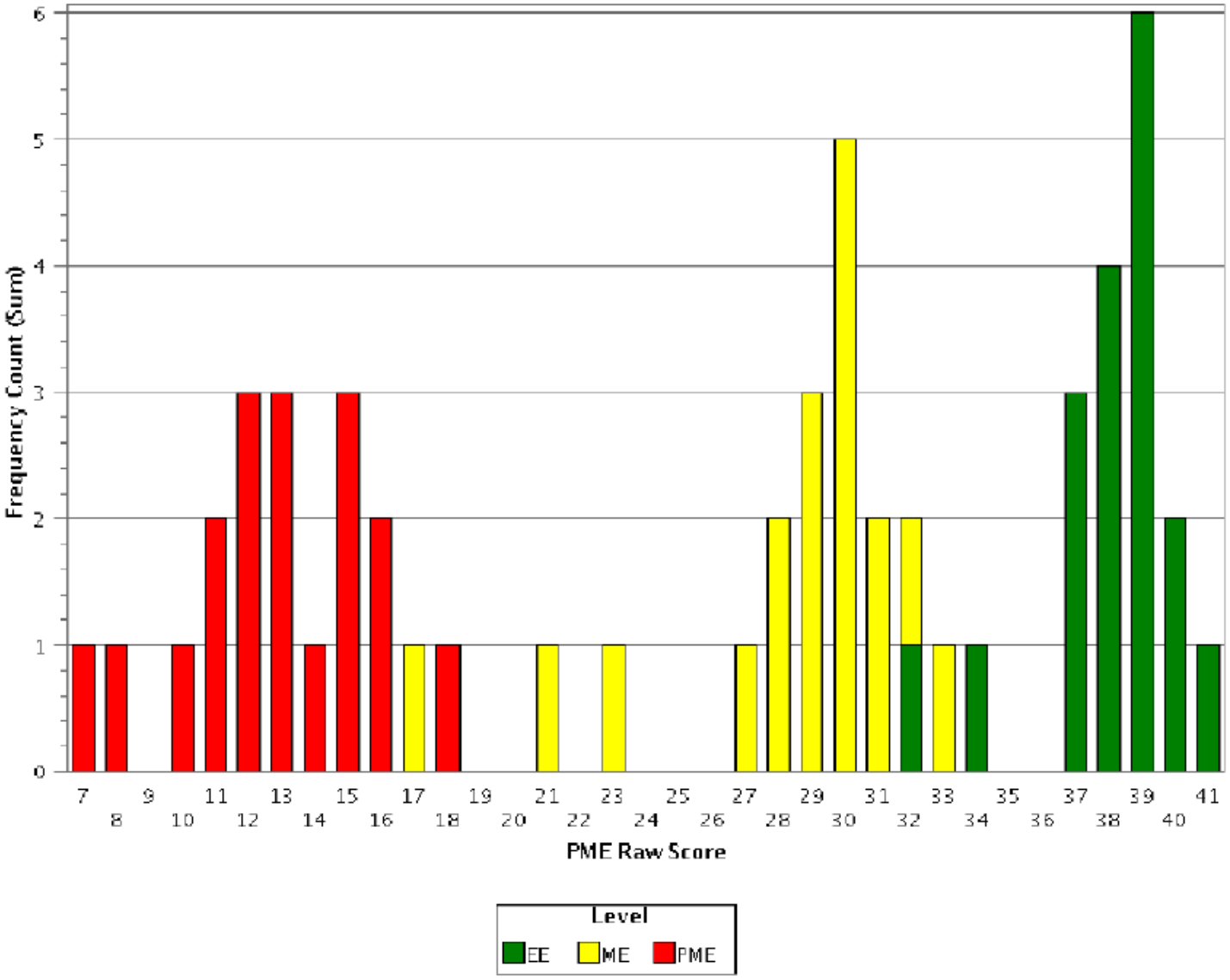
STE Grade 8

Round 1:



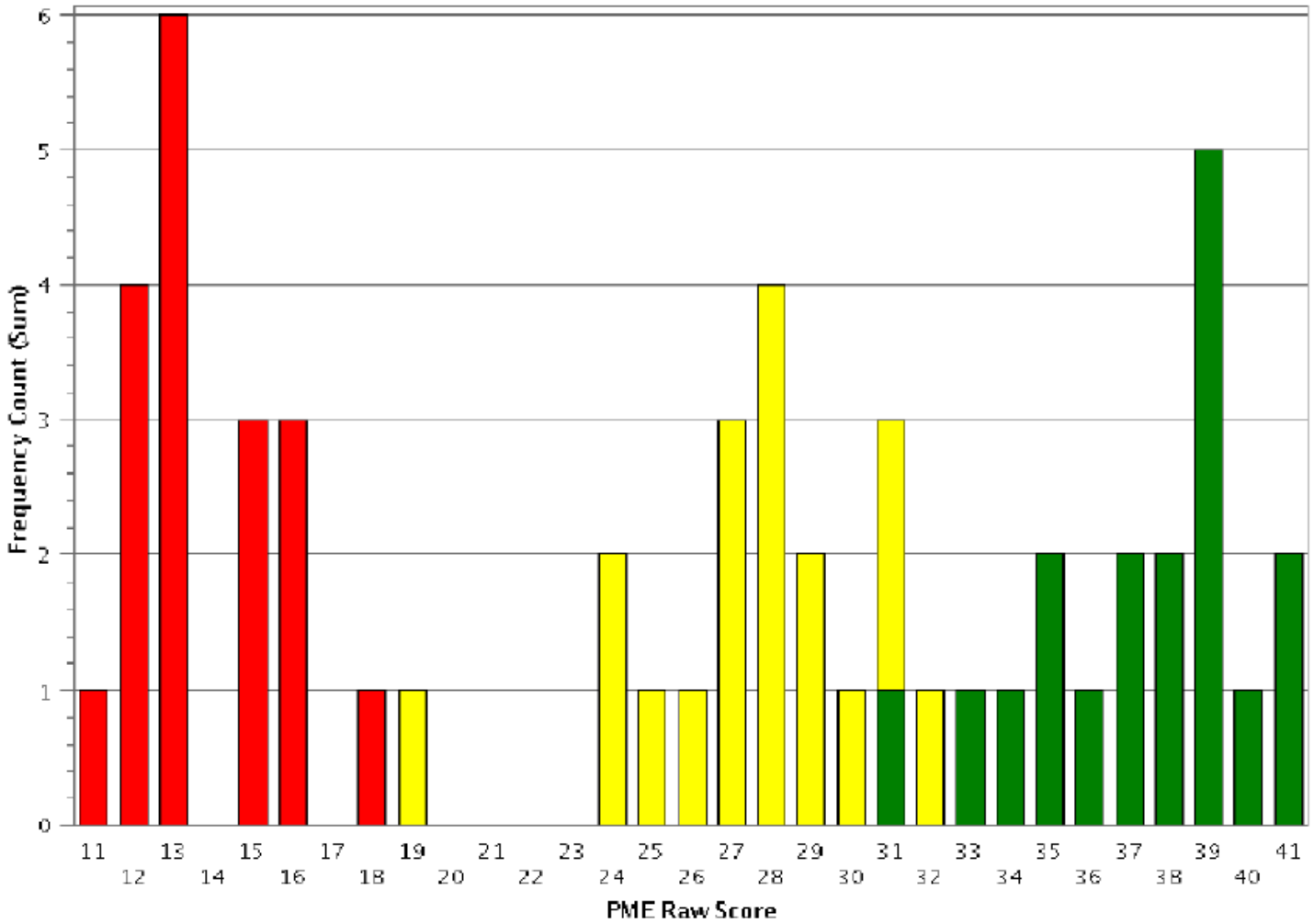
All Three Achievement Levels Concurrently

Round 2:



All Three Achievement Levels Concurrently

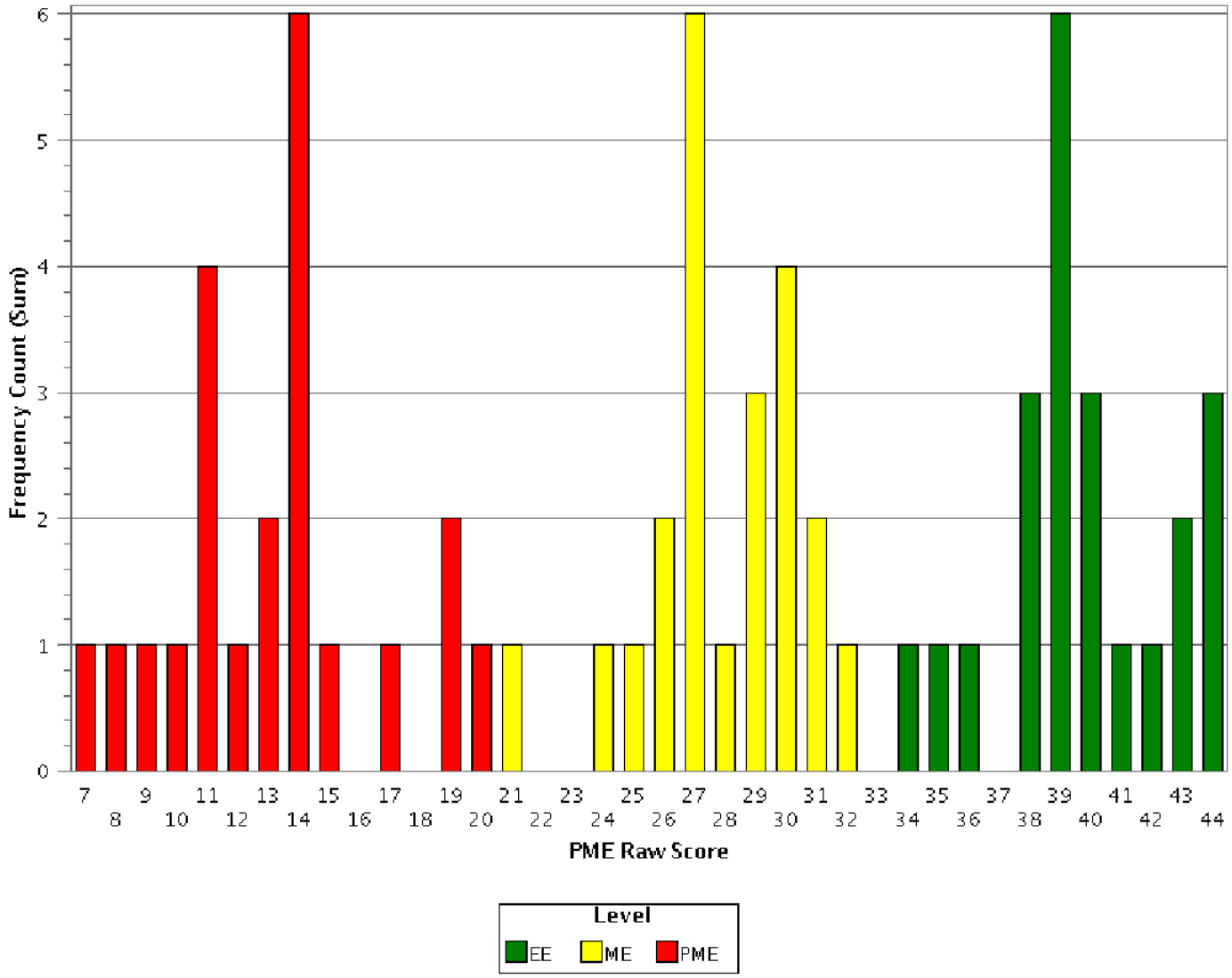
Round 3:



All Three Achievement Levels Concurrently

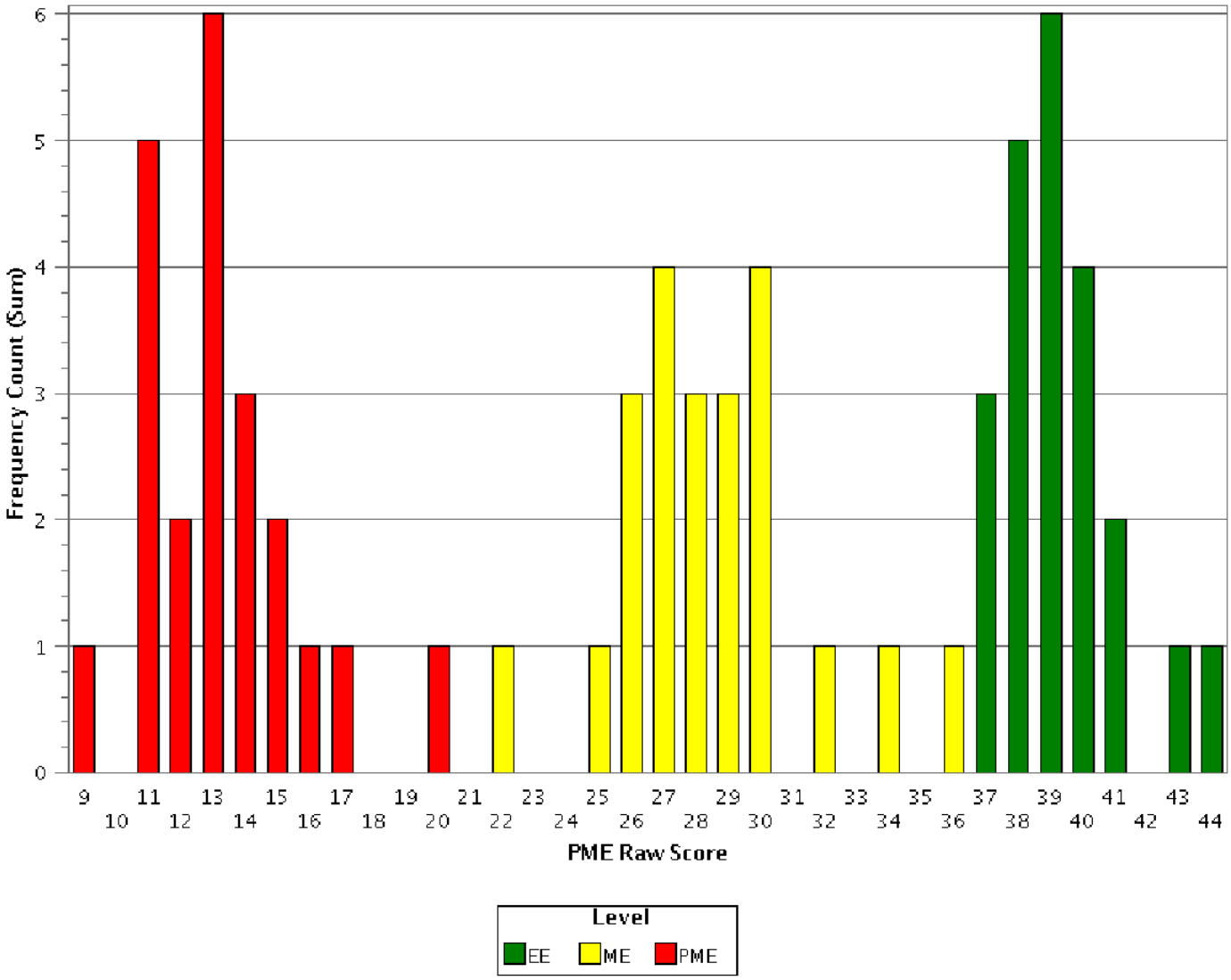
ELA Grade 10

Round 1:



All Three Achievement Levels Concurrently

Round 2:



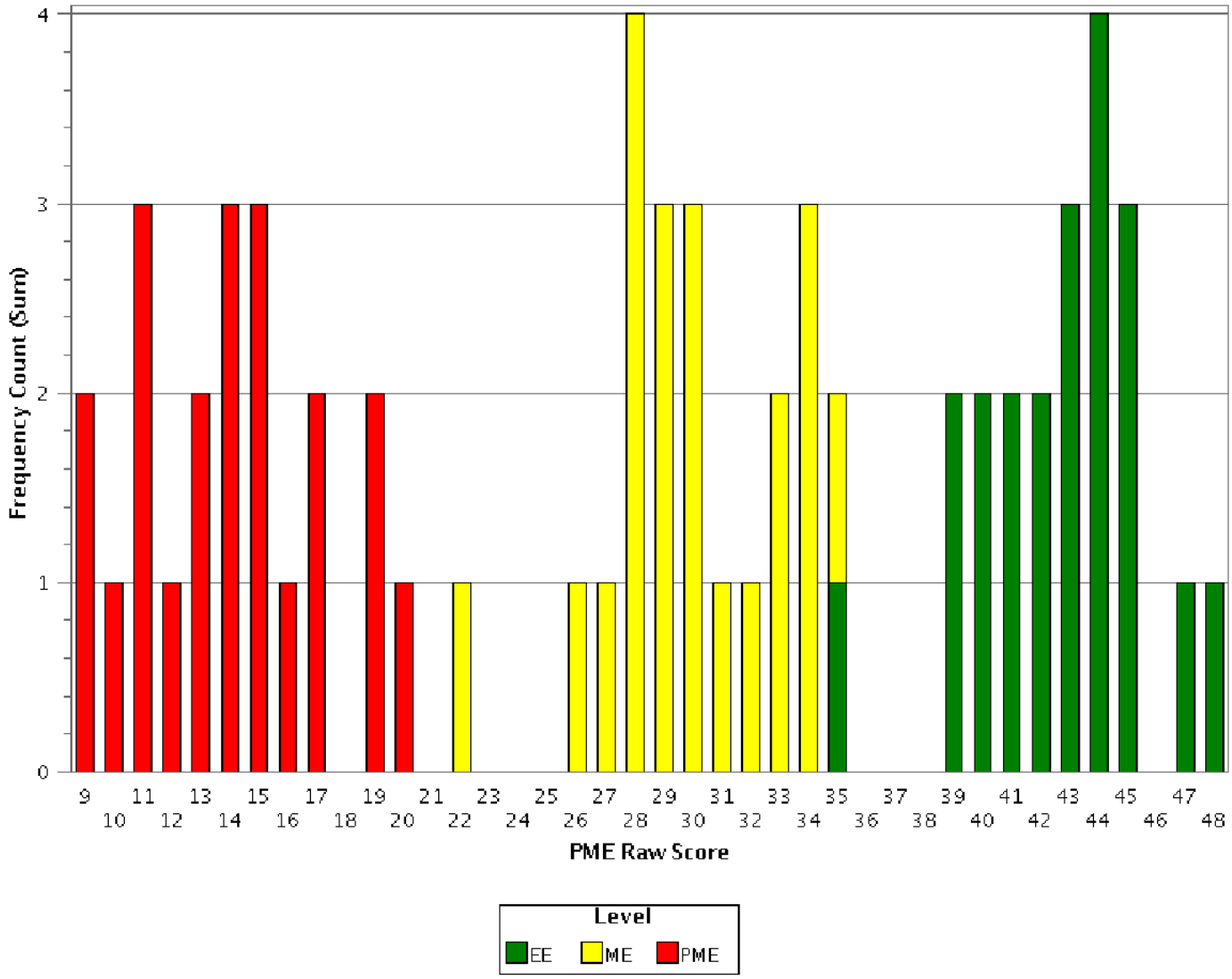
All Three Achievement Levels Concurrently

Round 3:

All Three Achievement Levels Concurrently

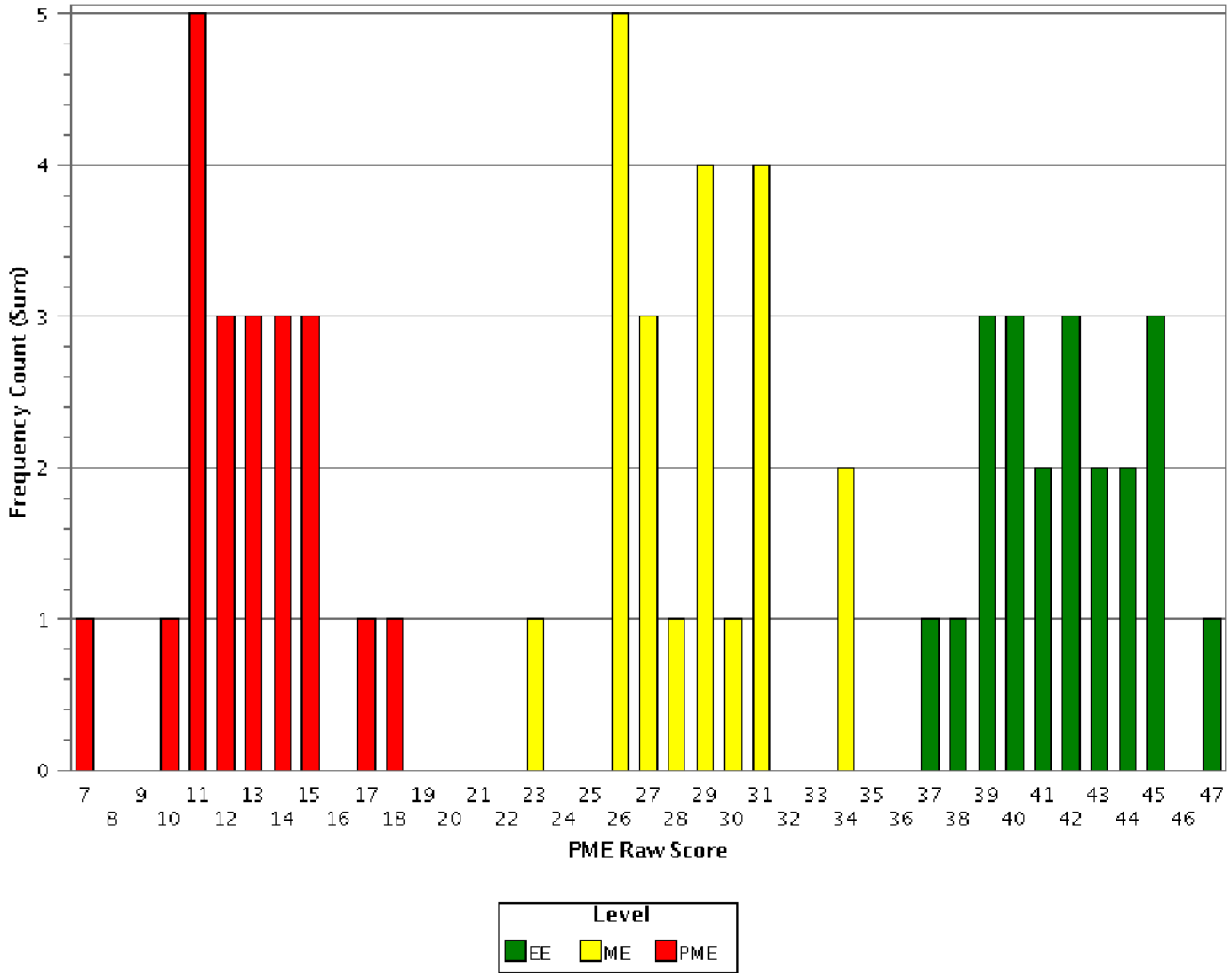
Math Grade 10

Round 1:



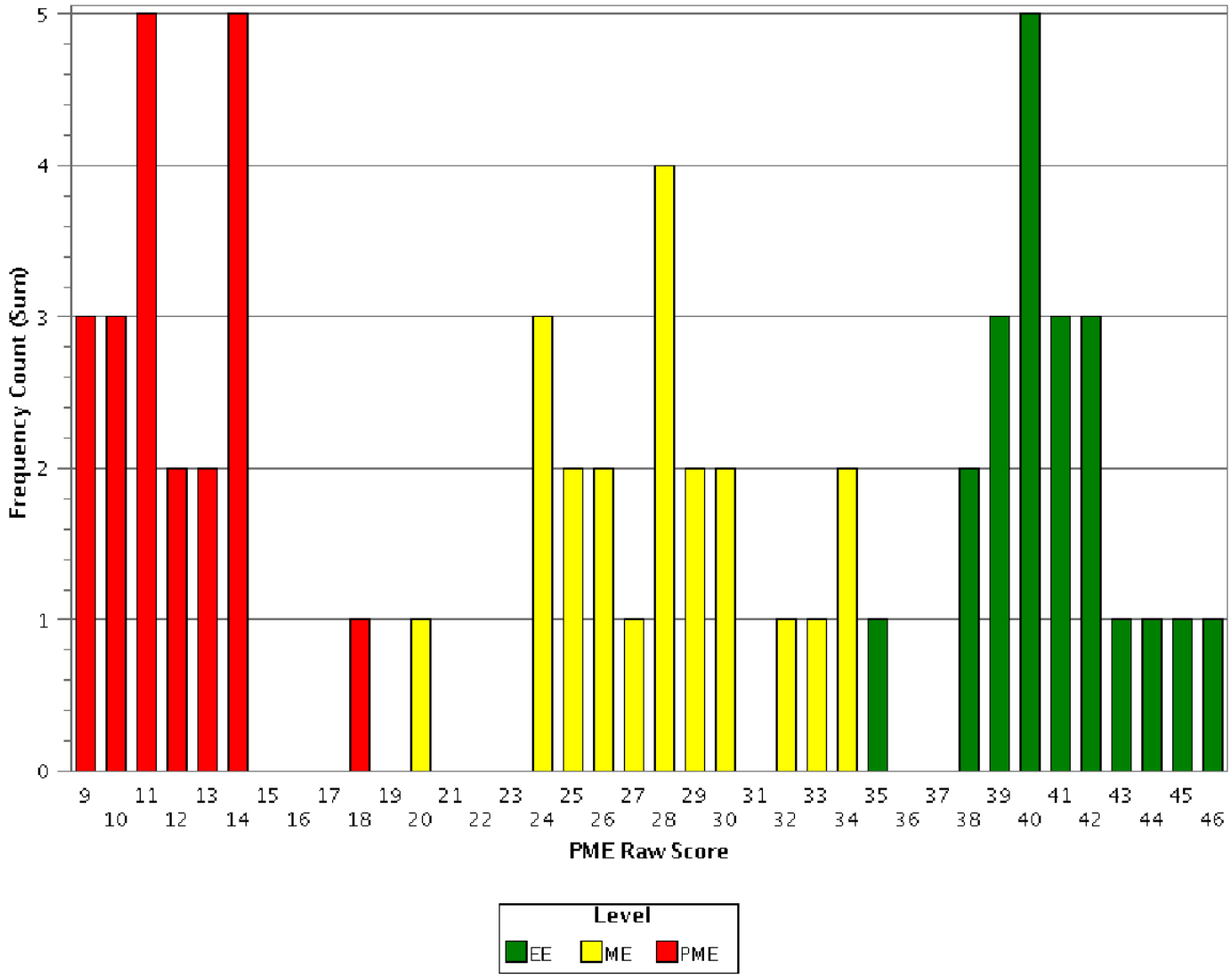
All Three Achievement Levels Concurrently

Round 2:



All Three Achievement Levels Concurrently

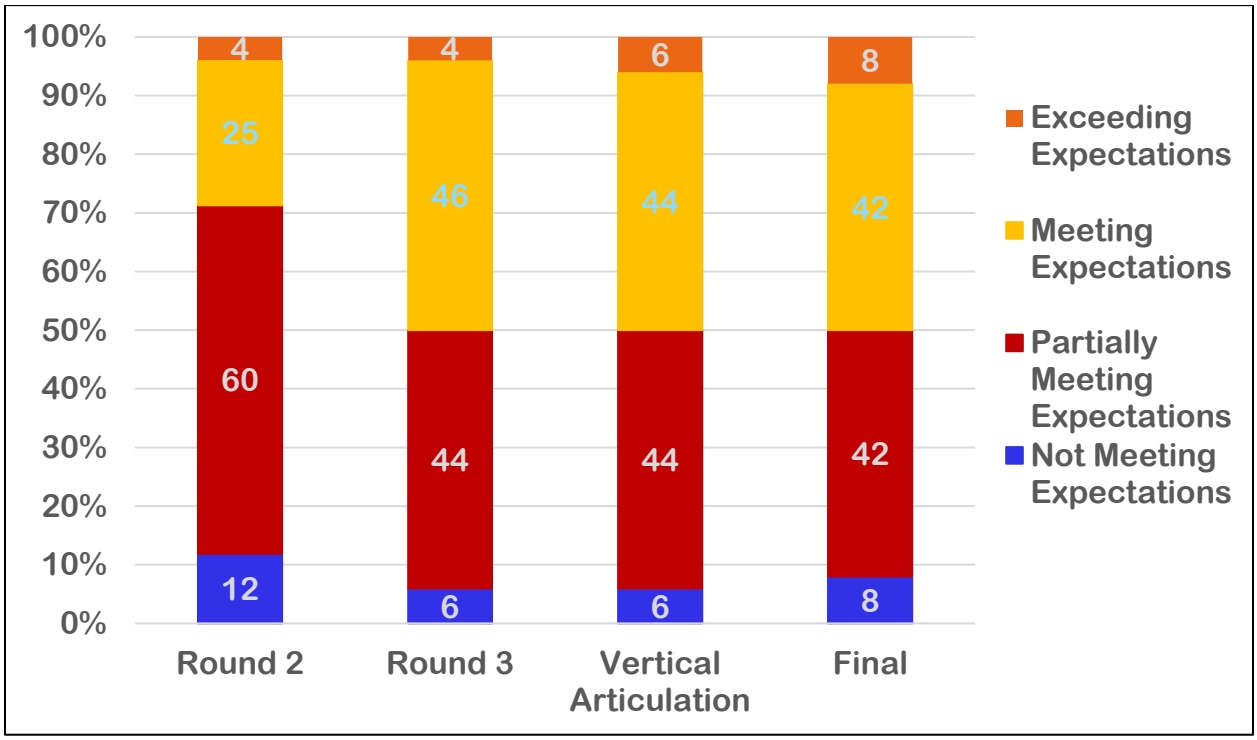
Round 3:



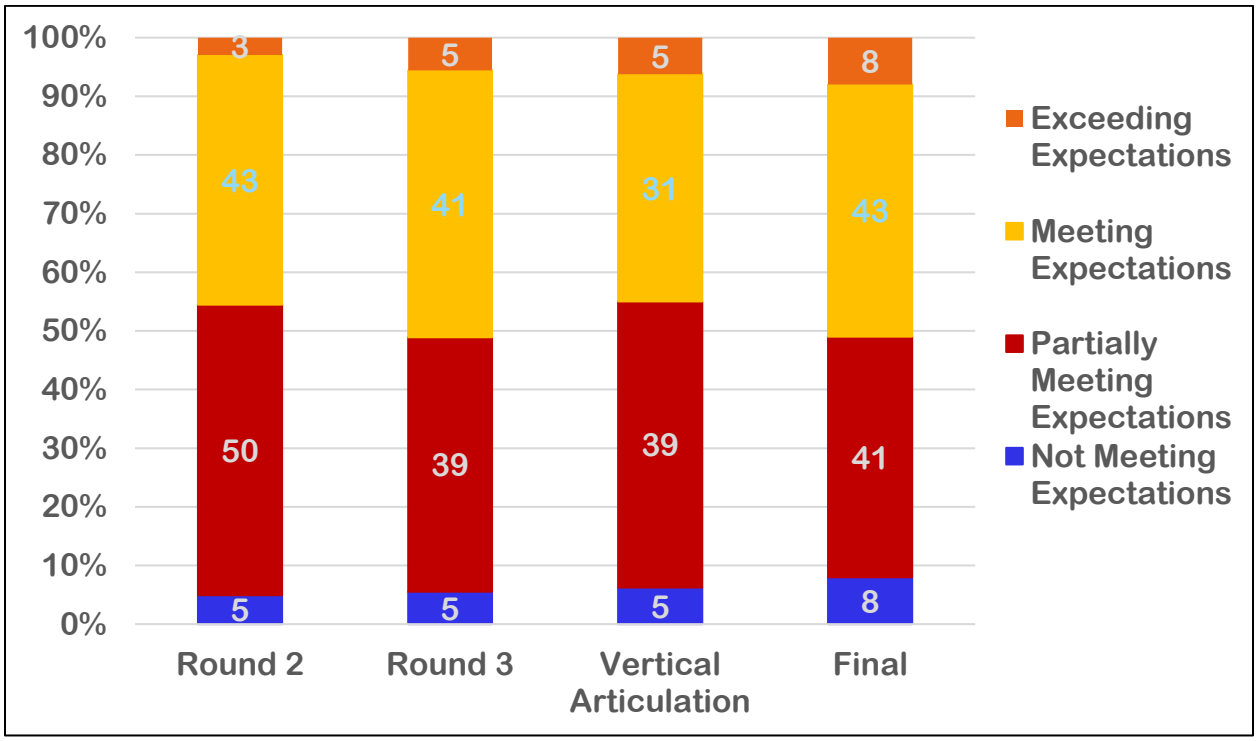
All Three Achievement Levels Concurrently

Appendix J – Impact Data

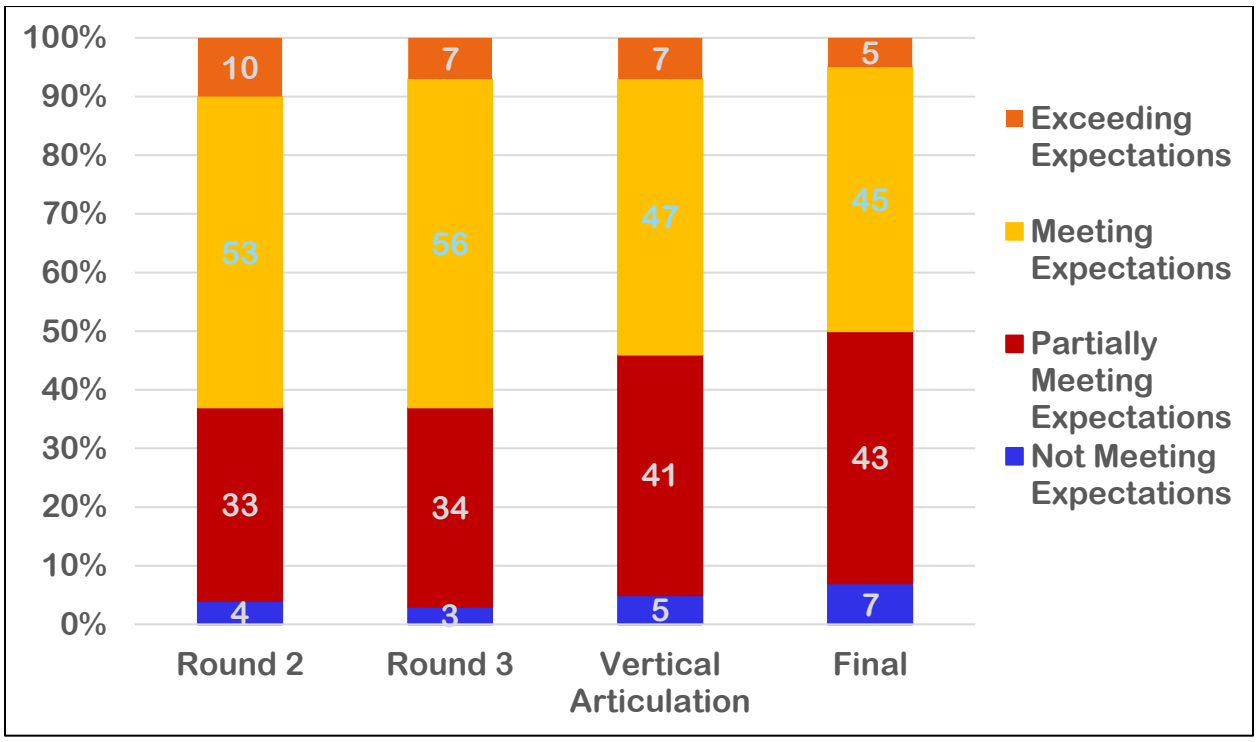
STE Grade 5



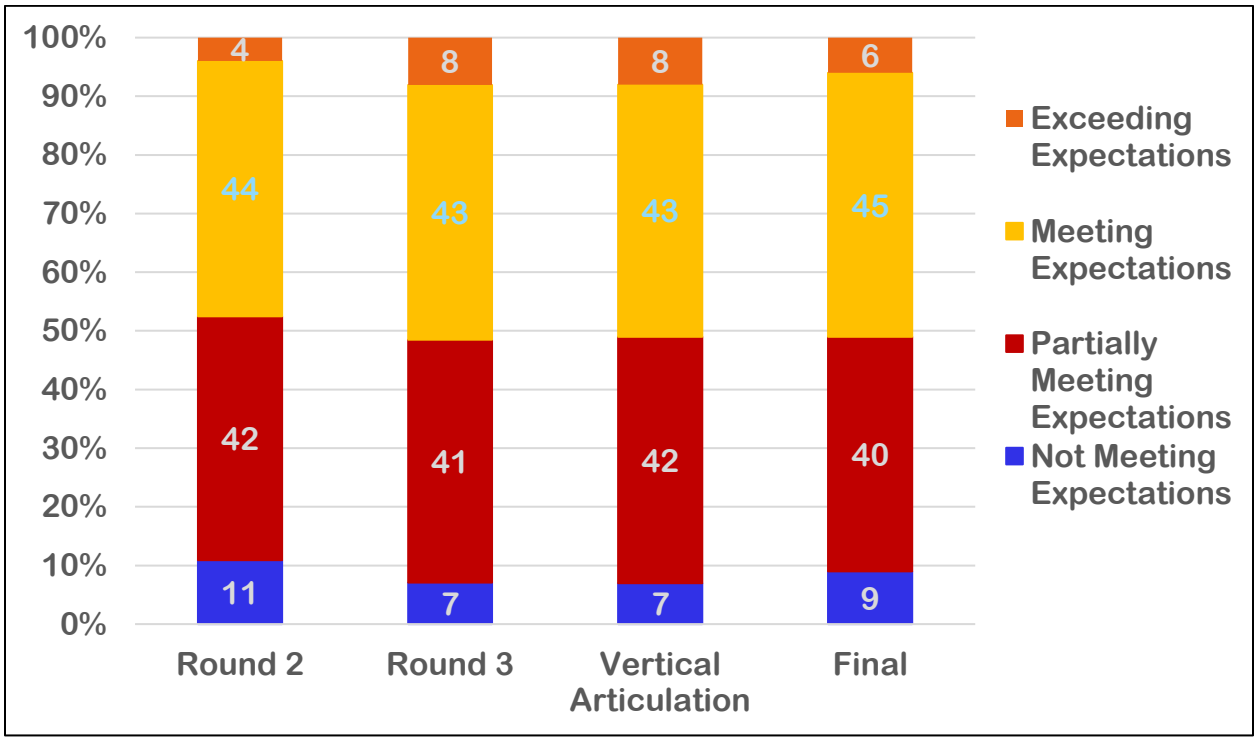
STE Grade 8



ELA Grade 10



Math Grade 10

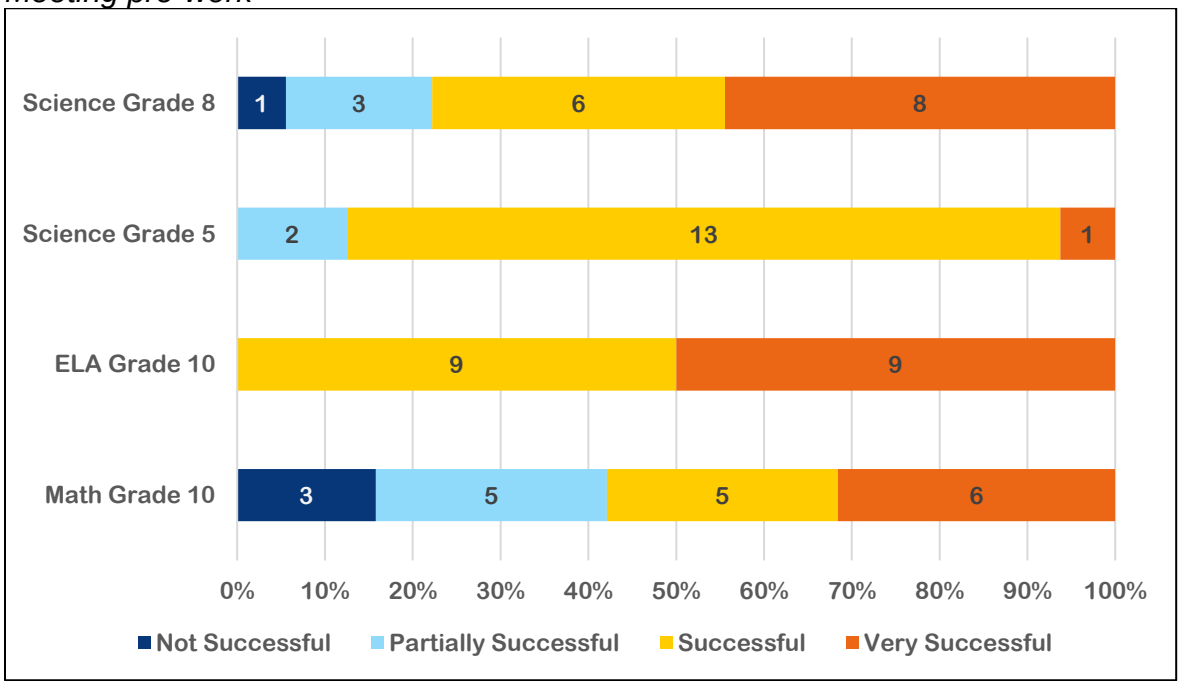


Appendix K – Participant Evaluation Results

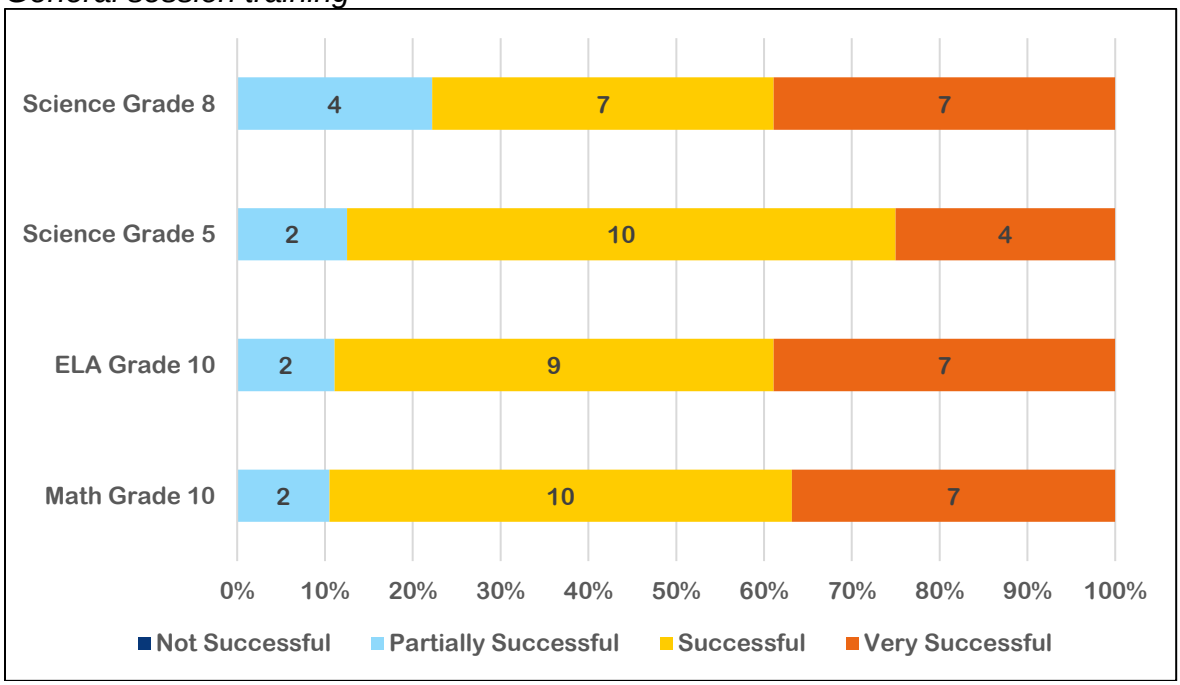
Breakout Session Process Evaluation

Question 1: Select the option that best reflects your opinion about the level of success of the various components of the meeting in which you participated. The activities were designed to help you both understand the process and be supportive of the recommendations made by the committee.

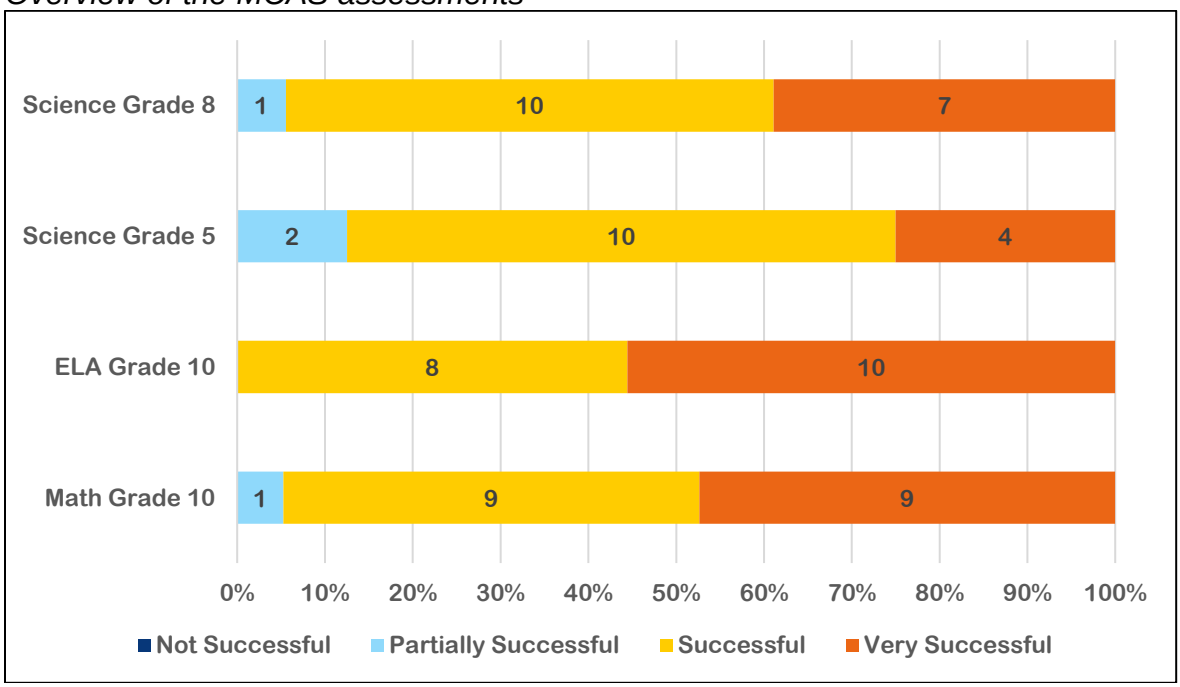
Meeting pre-work



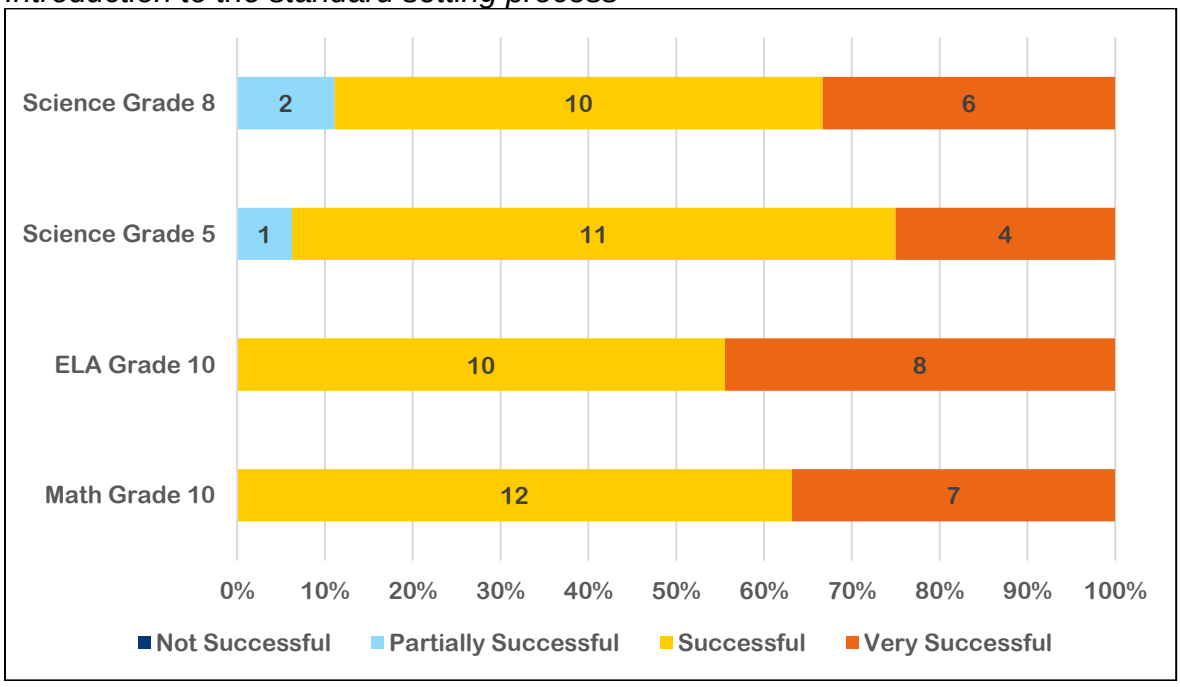
General session training



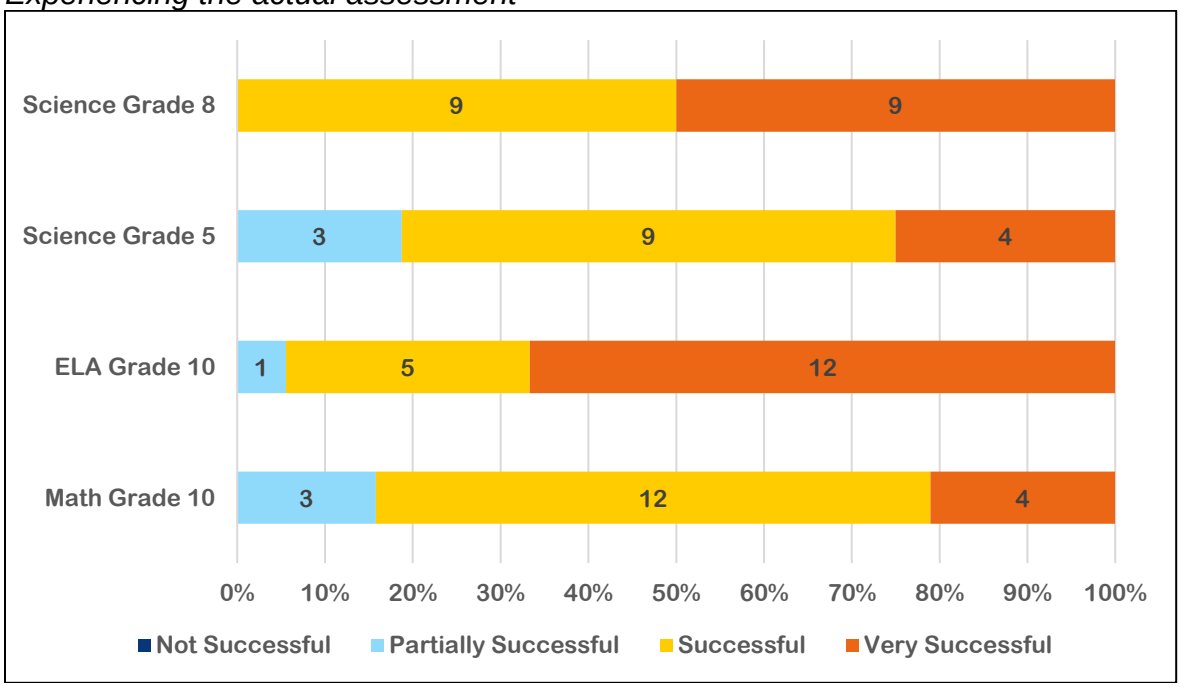
Overview of the MCAS assessments



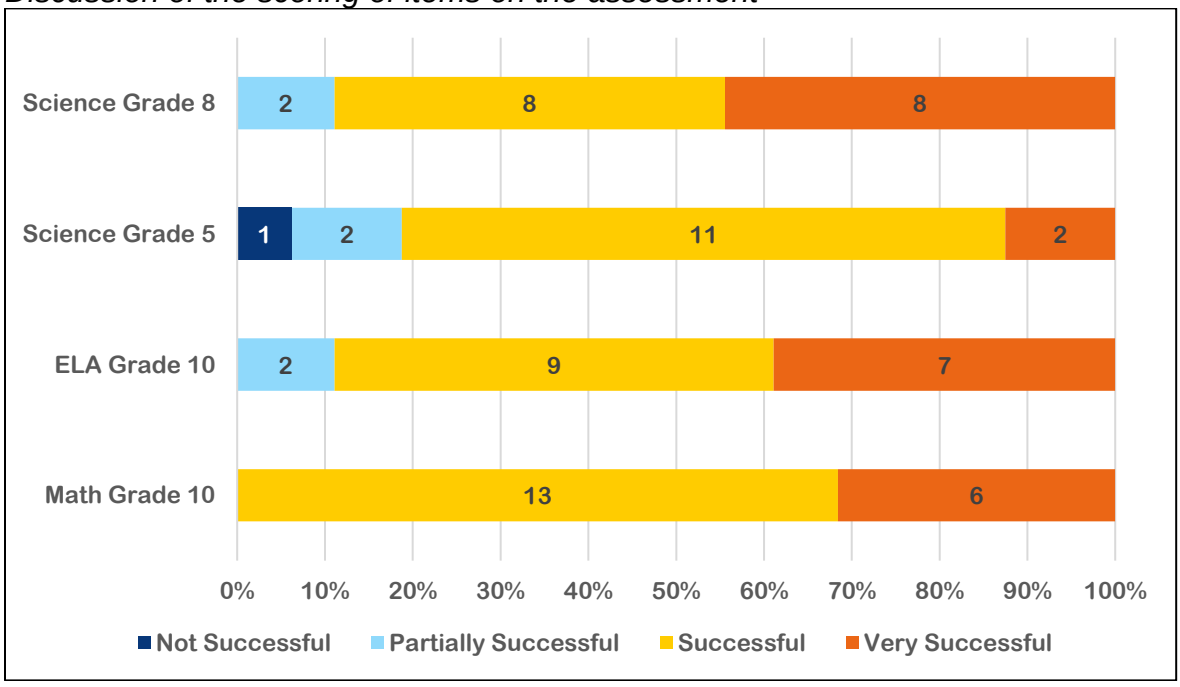
Introduction to the standard setting process



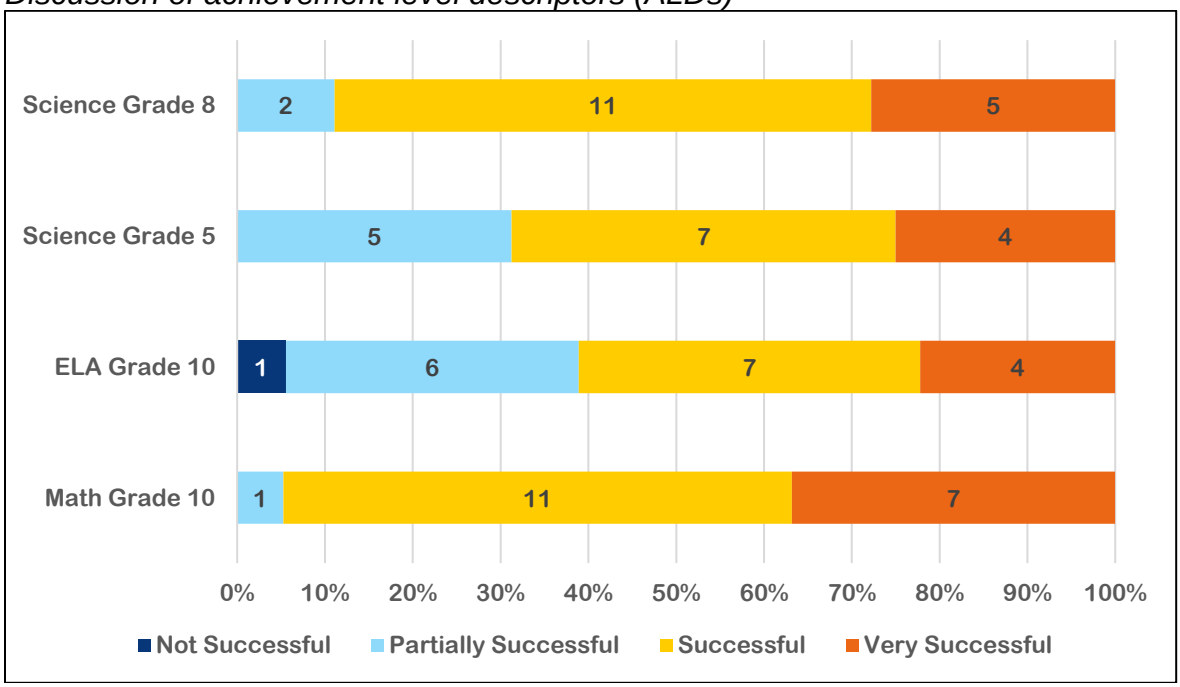
Experiencing the actual assessment



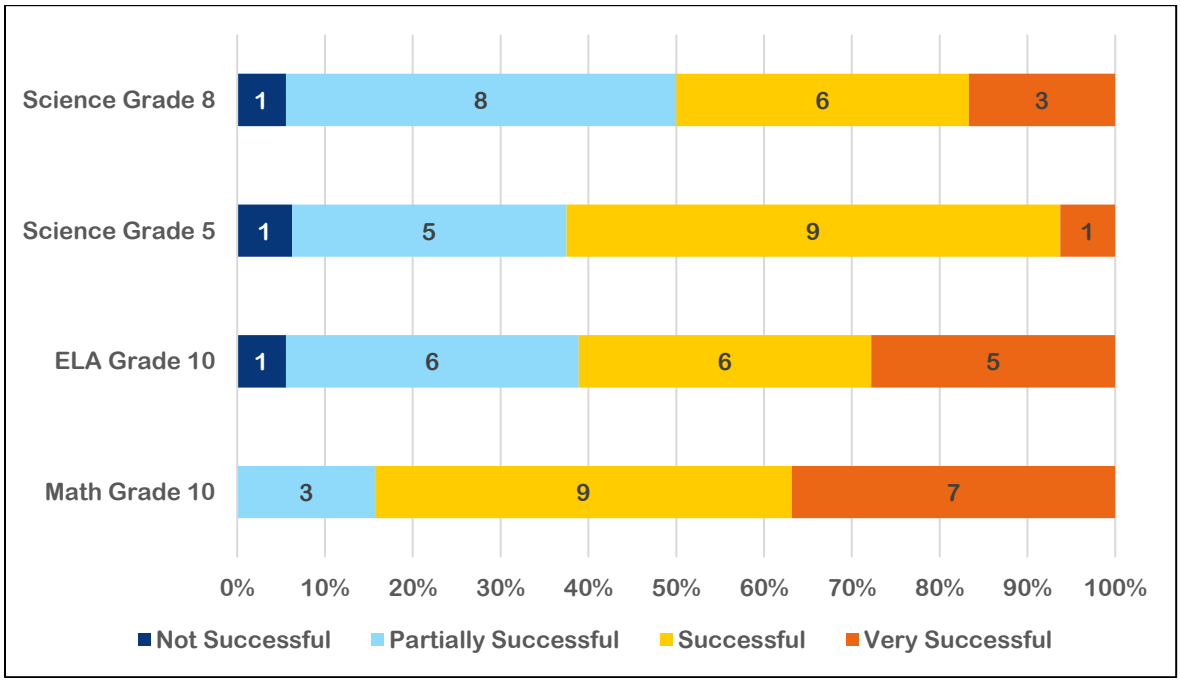
Discussion of the scoring of items on the assessment



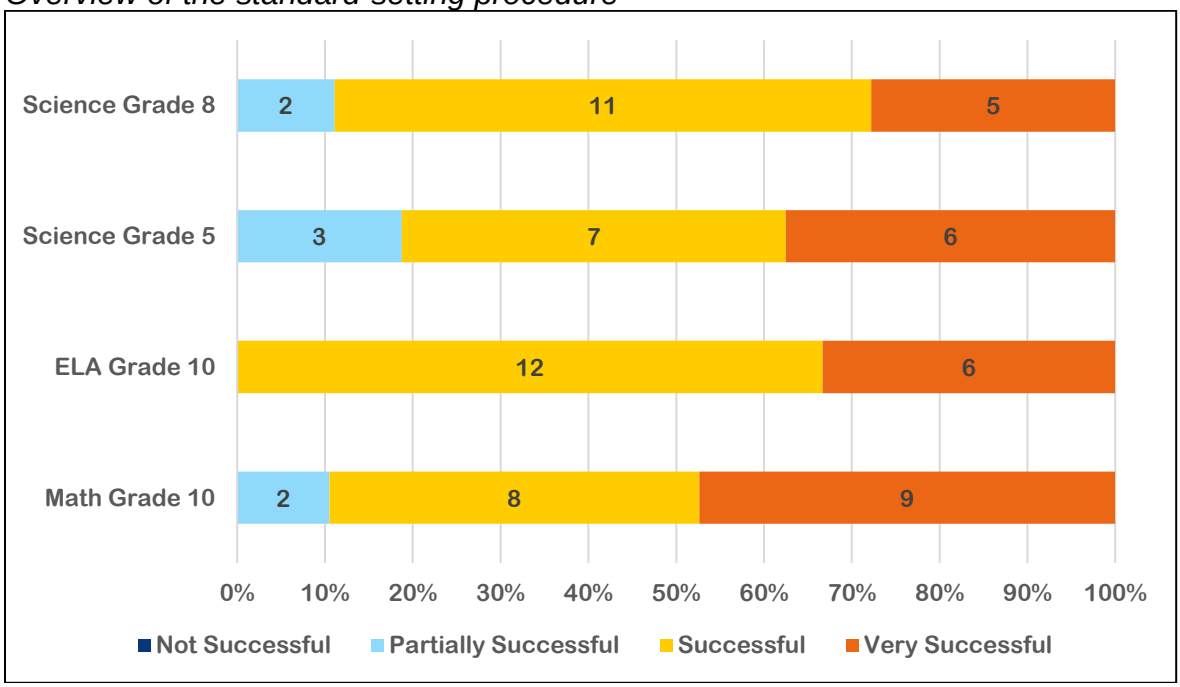
Discussion of achievement level descriptors (ALDs)



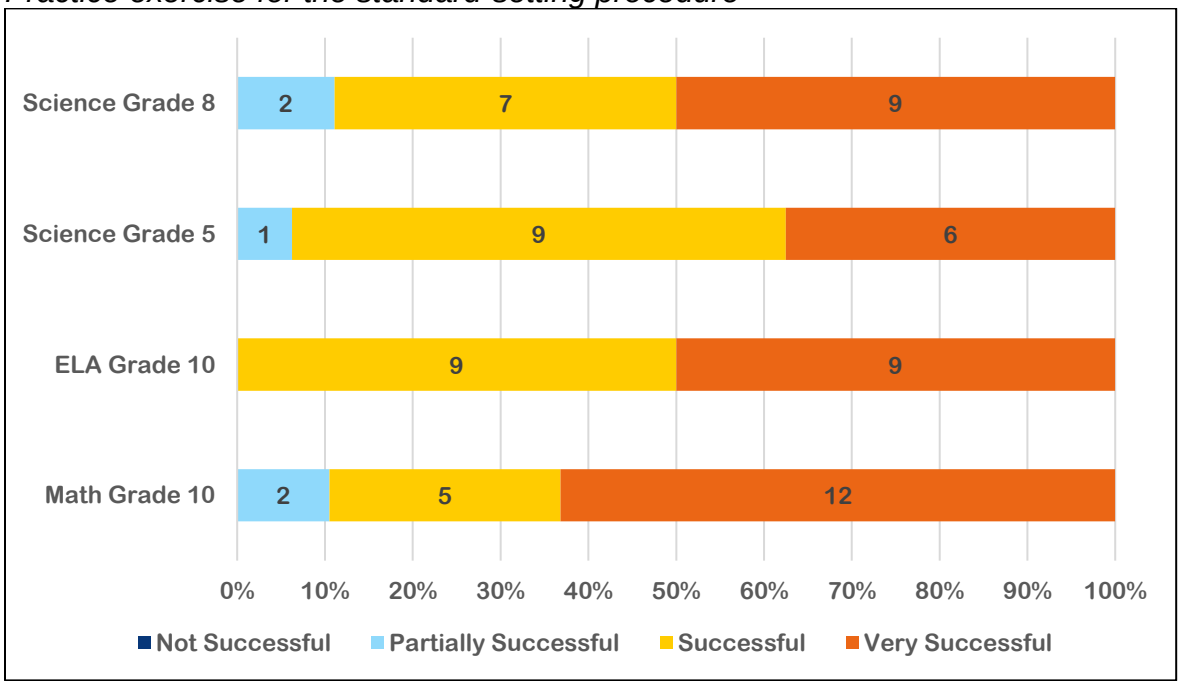
Development and discussion of the borderline descriptions



Overview of the standard-setting procedure

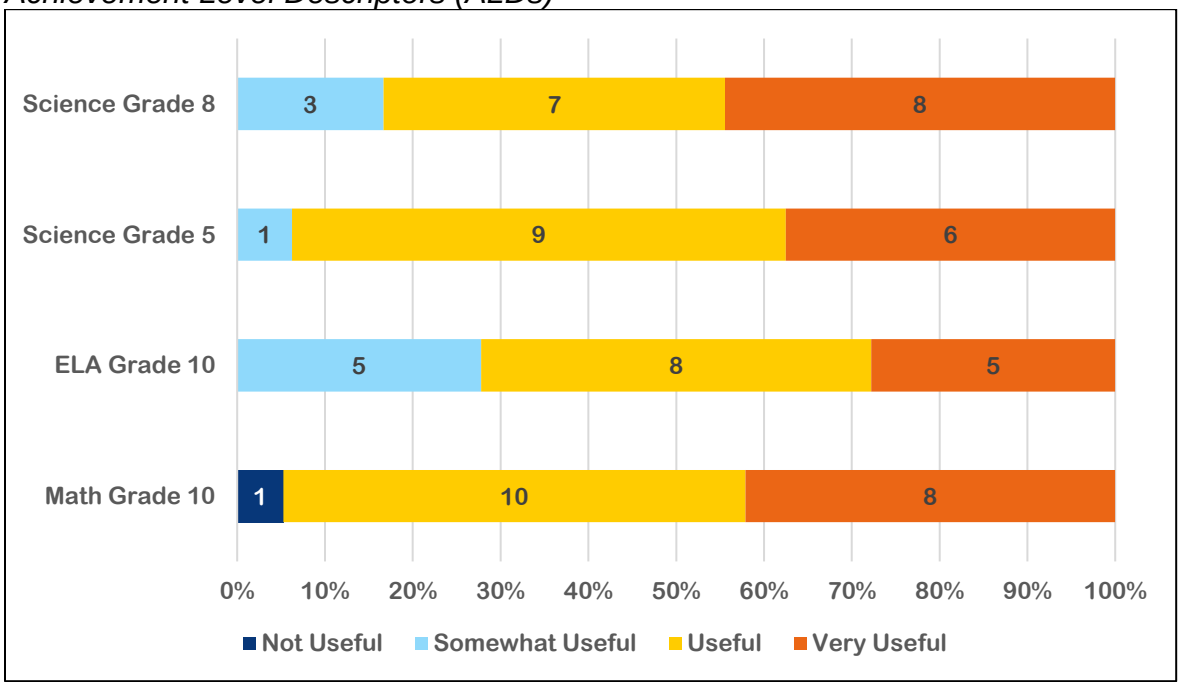


Practice exercise for the standard-setting procedure

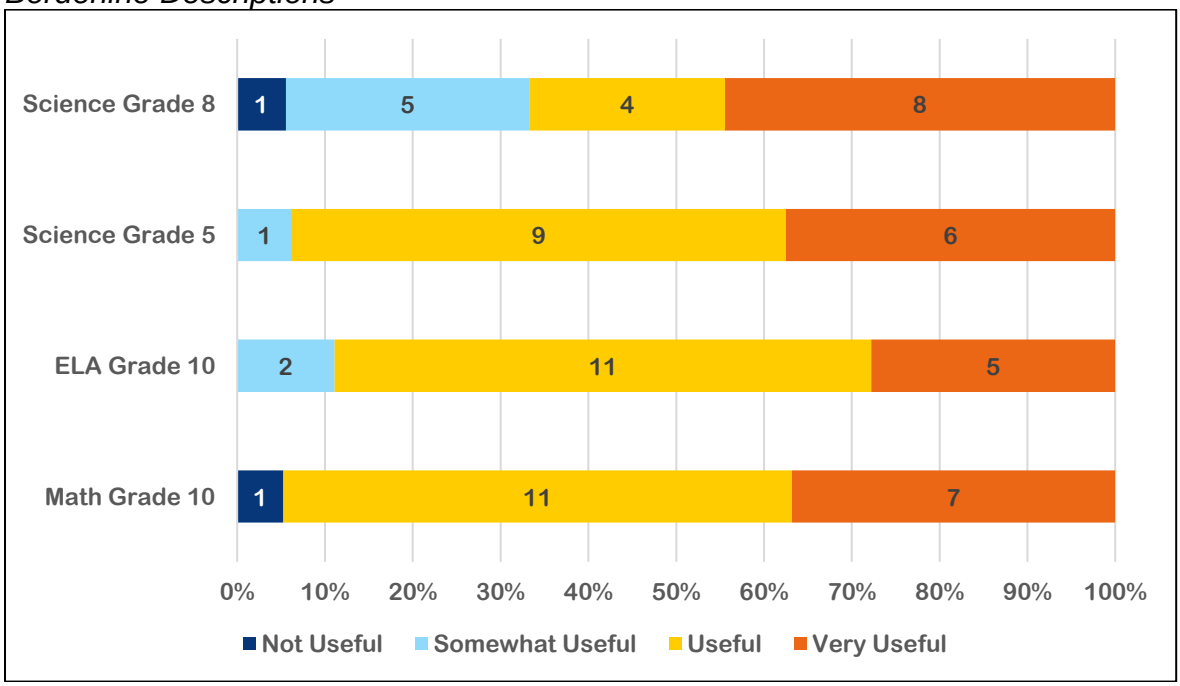


Question 2: How useful do you feel the following activities or information were in assisting you to make your recommendations?

Achievement Level Descriptors (ALDs)

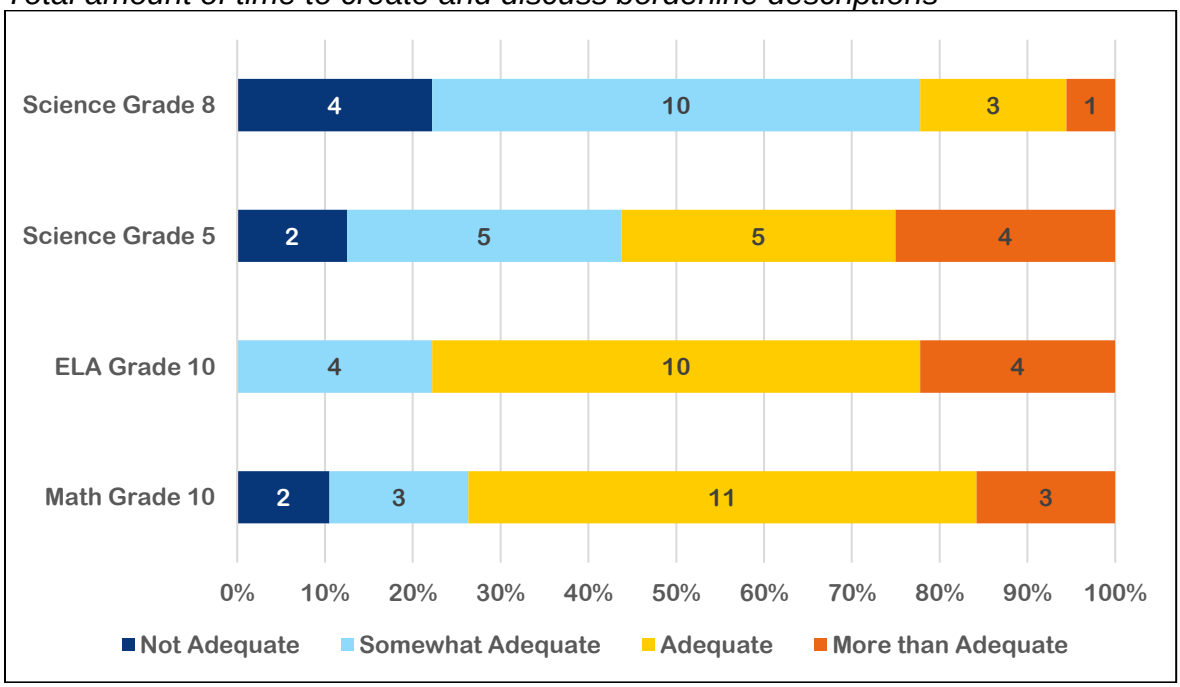


Borderline Descriptions

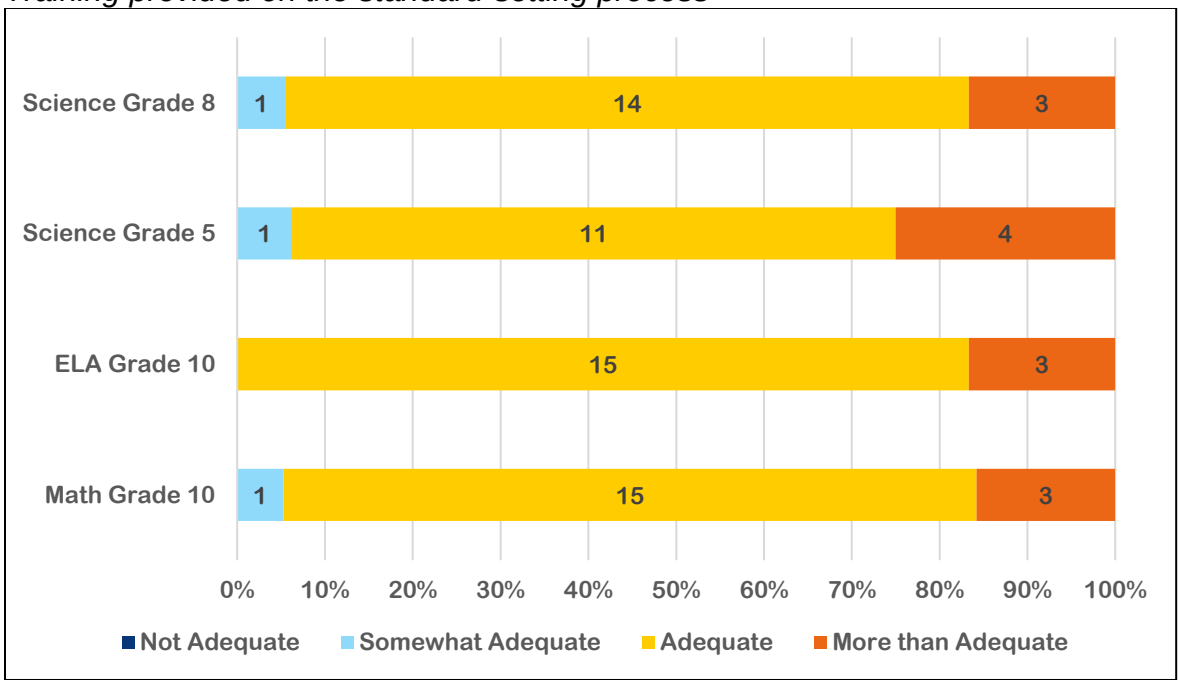


Question 3: How adequate were the following elements of the session?

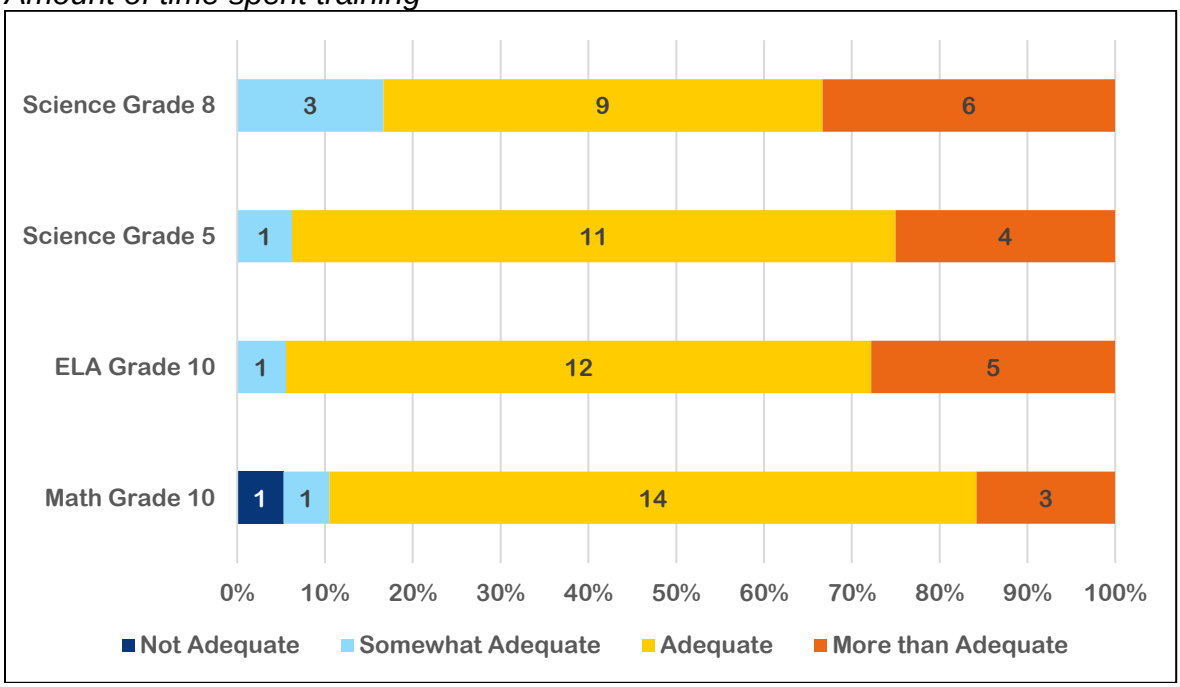
Total amount of time to create and discuss borderline descriptions



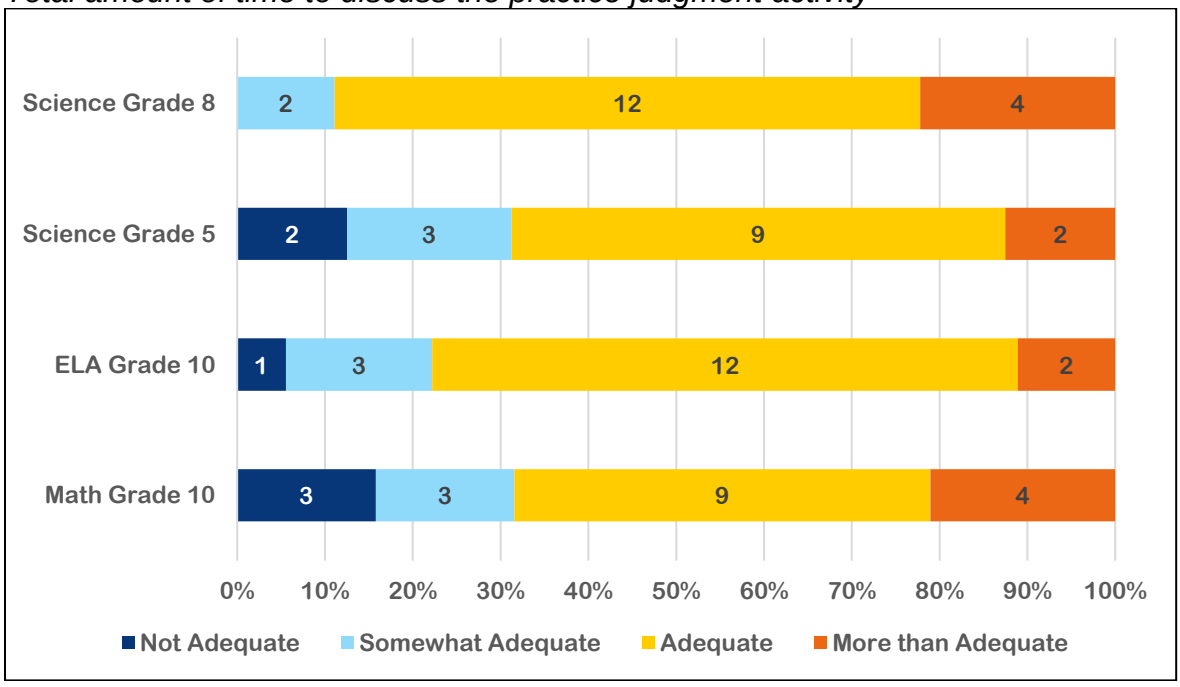
Training provided on the standard-setting process



Amount of time spent training

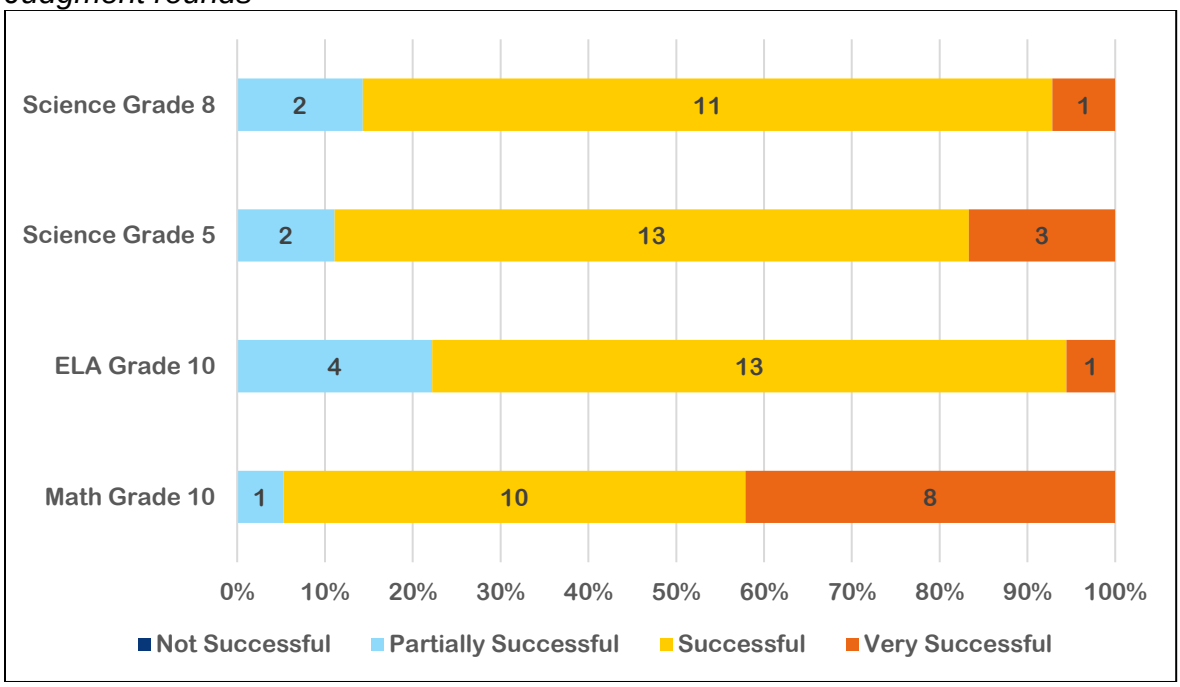


Total amount of time to discuss the practice judgment activity

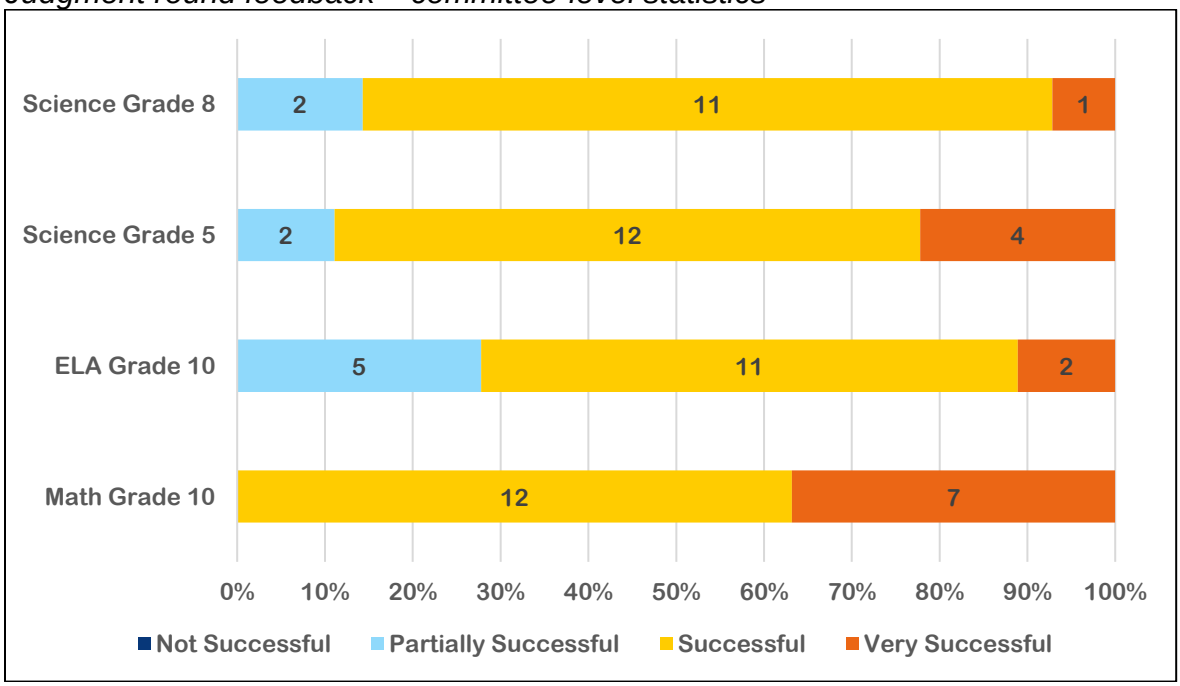


Question 4: Select the option that best reflects your opinion about the level of success of the various components of the meeting in which you participated. The activities were designed to help you both understand the process and be supportive of the recommendations made by the committee.

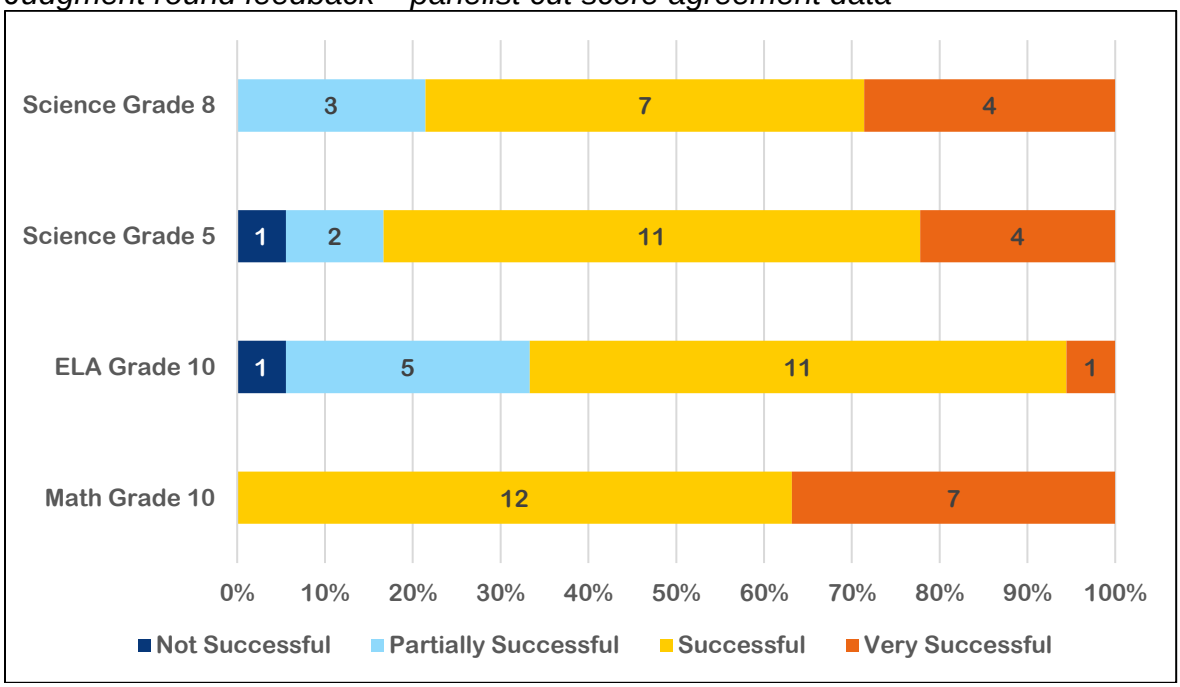
Judgment rounds



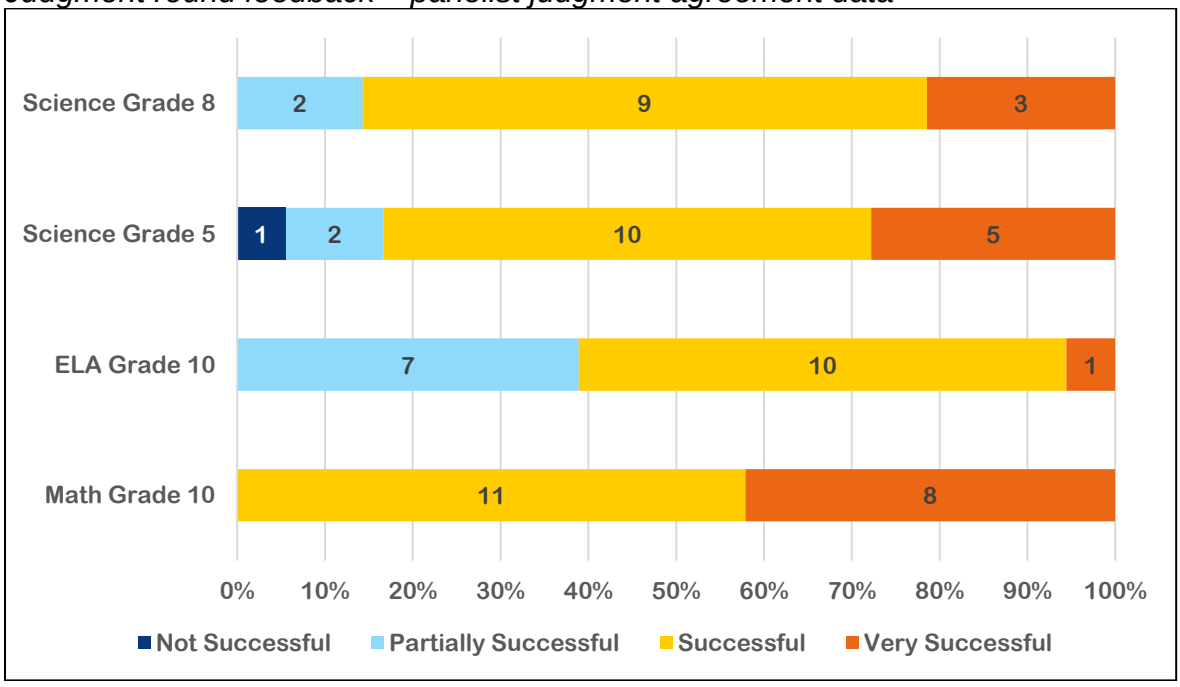
Judgment round feedback – committee-level statistics



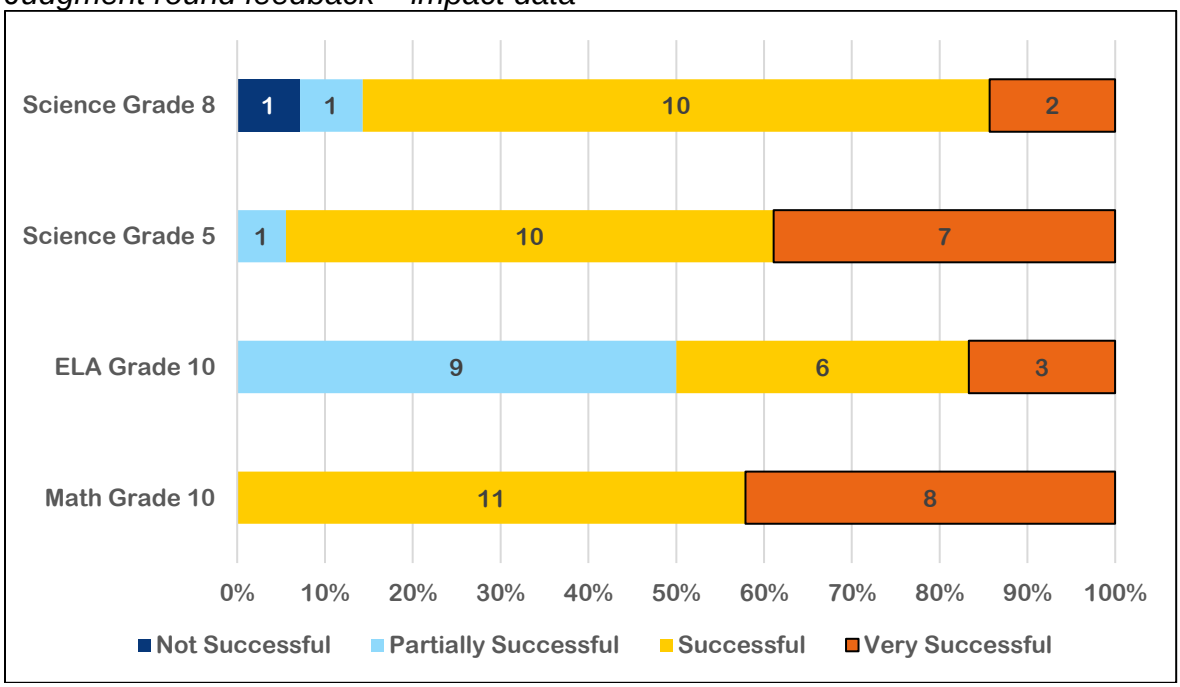
Judgment round feedback – panelist cut score agreement data



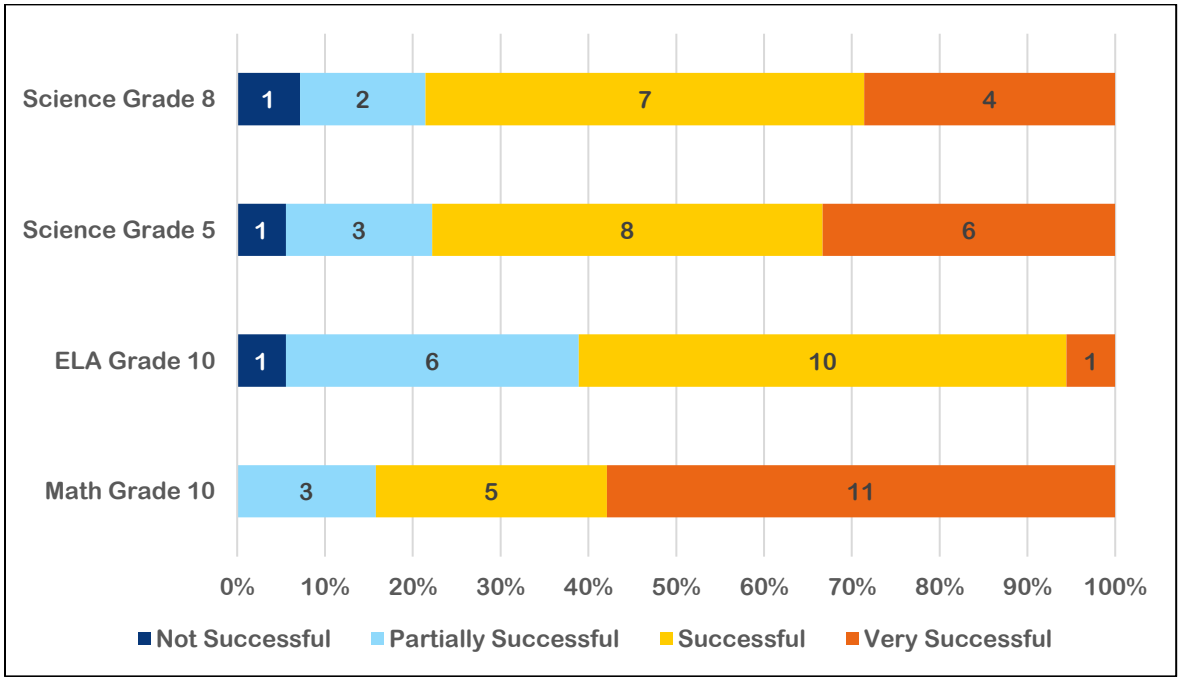
Judgment round feedback – panelist judgment agreement data



Judgment round feedback – impact data

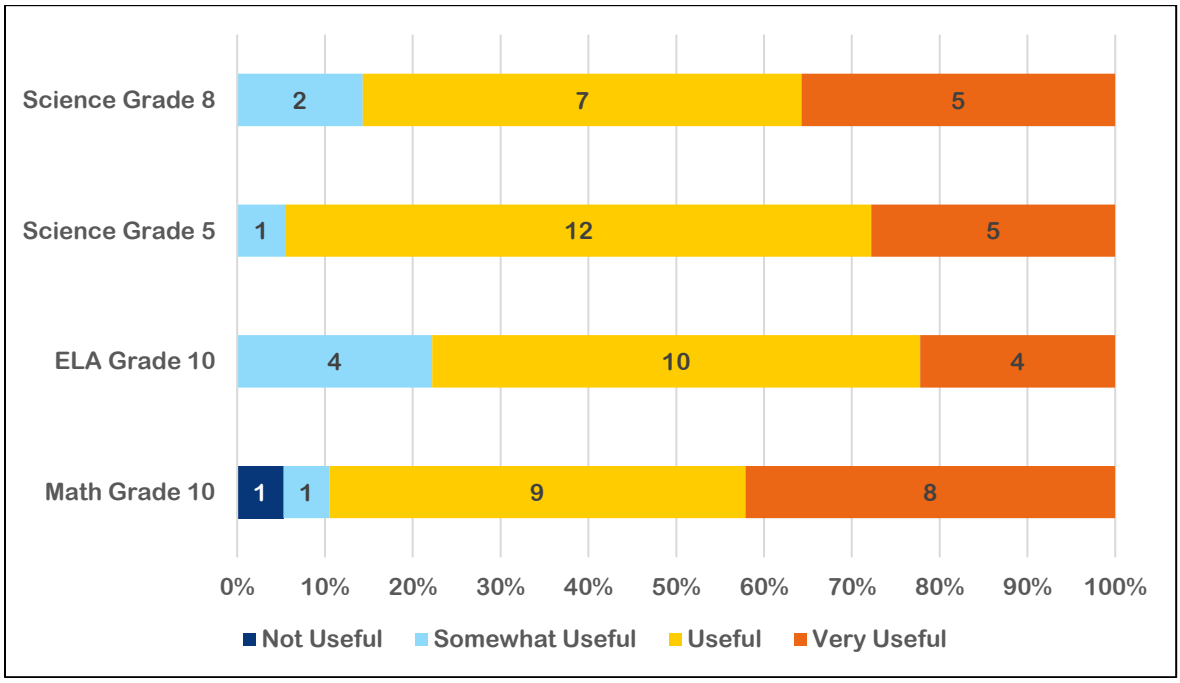


Discussions after each round

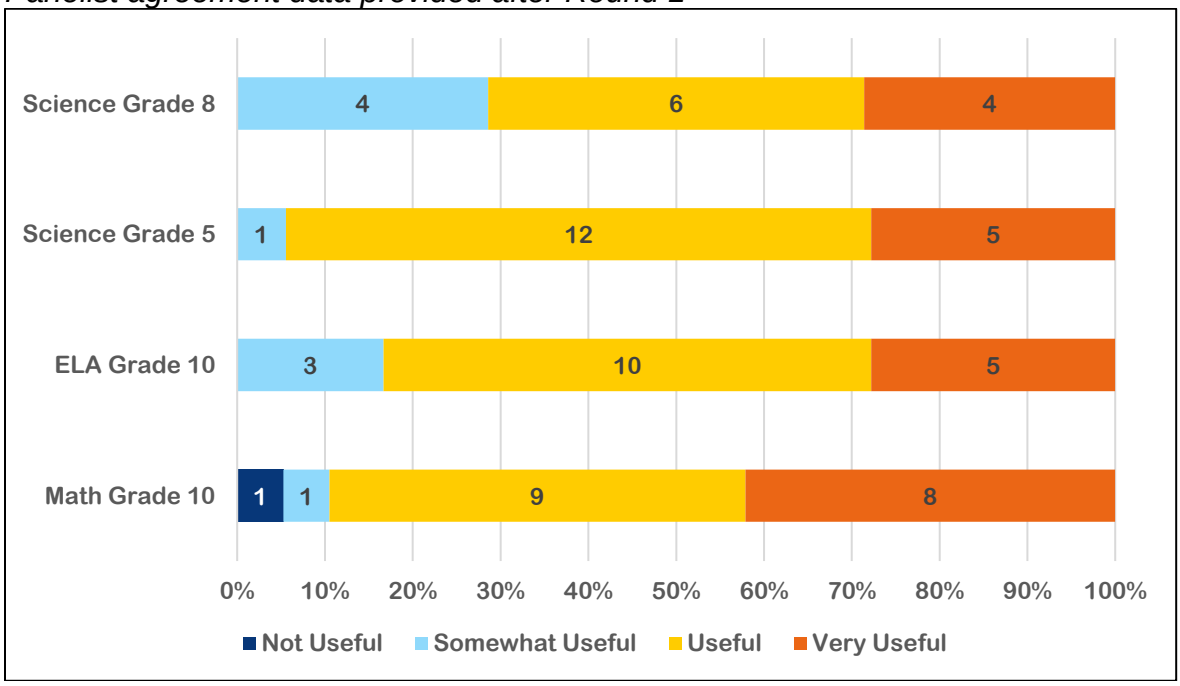


Question 5: How useful do you feel the following activities or information were in assisting you to make your recommendations?

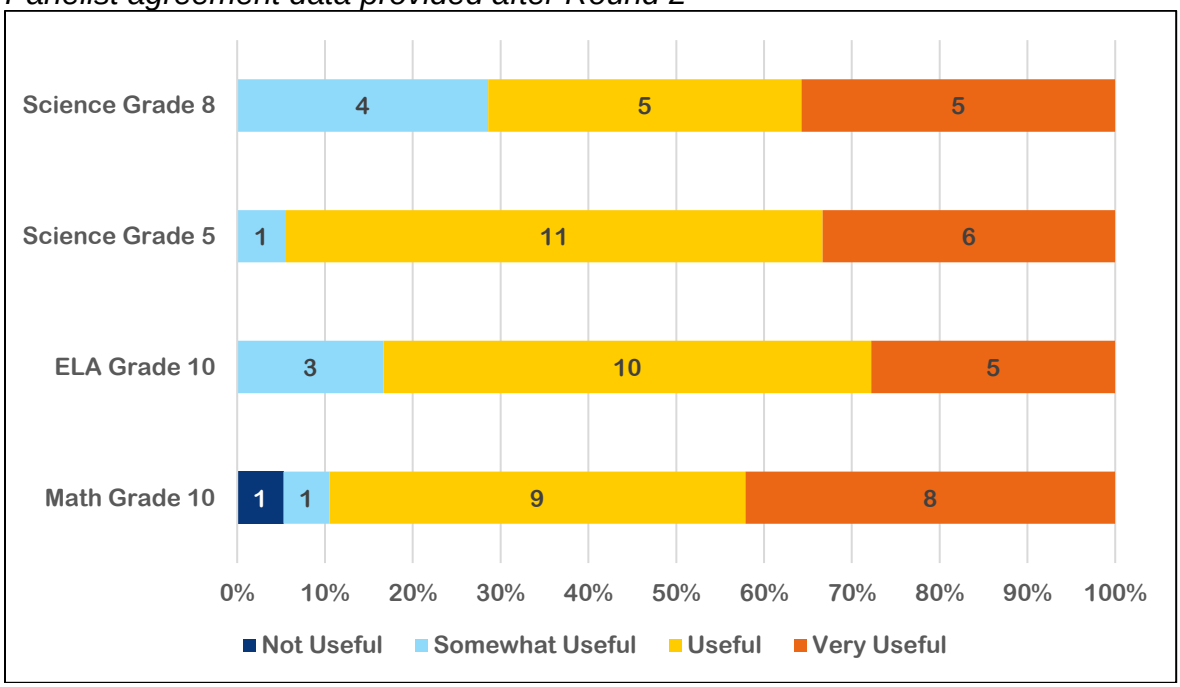
Committee-level statistics after Rounds 1 and 2



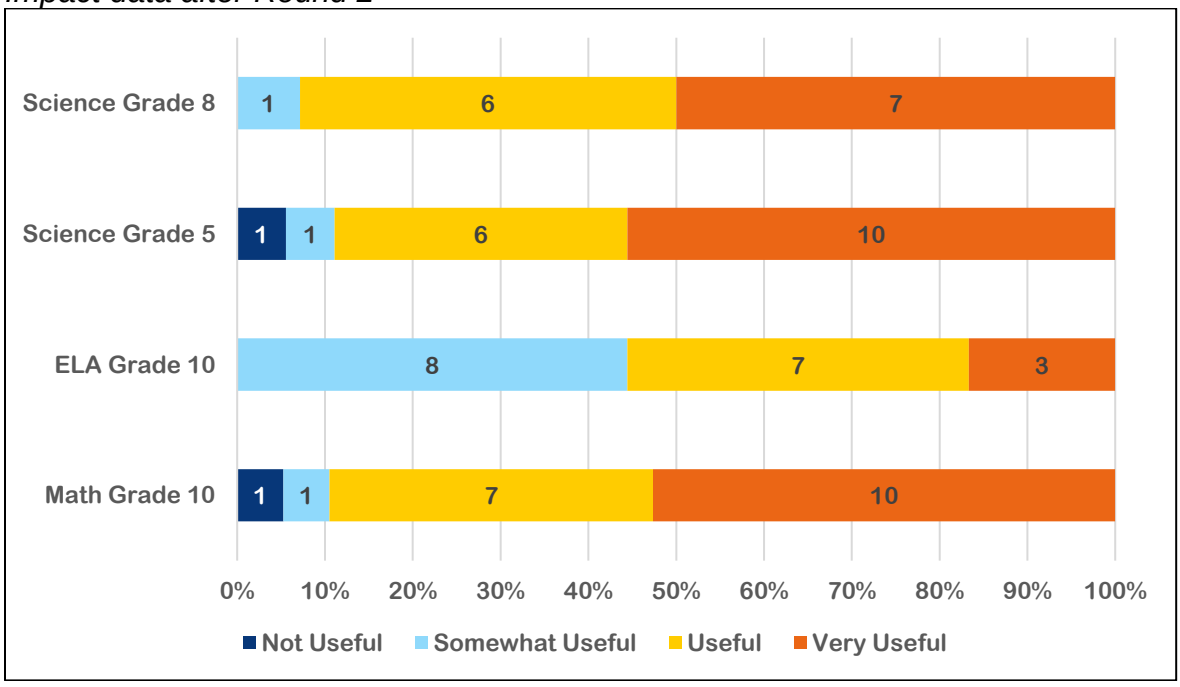
Panelist agreement data provided after Round 1



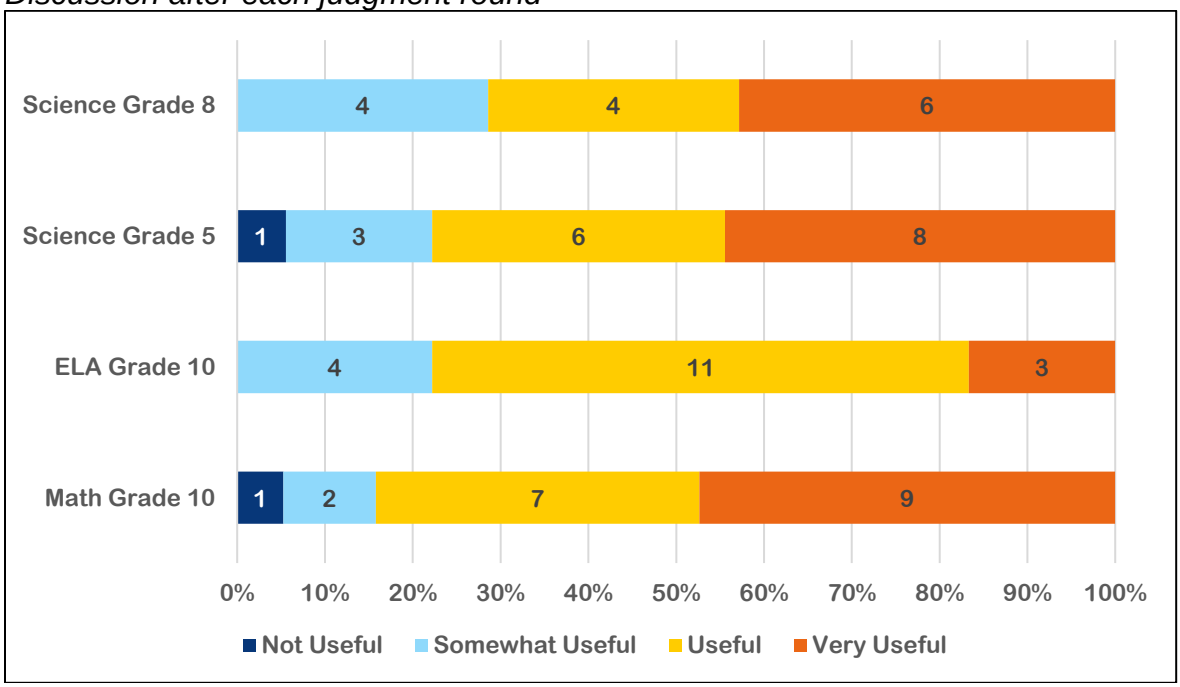
Panelist agreement data provided after Round 2



Impact data after Round 2

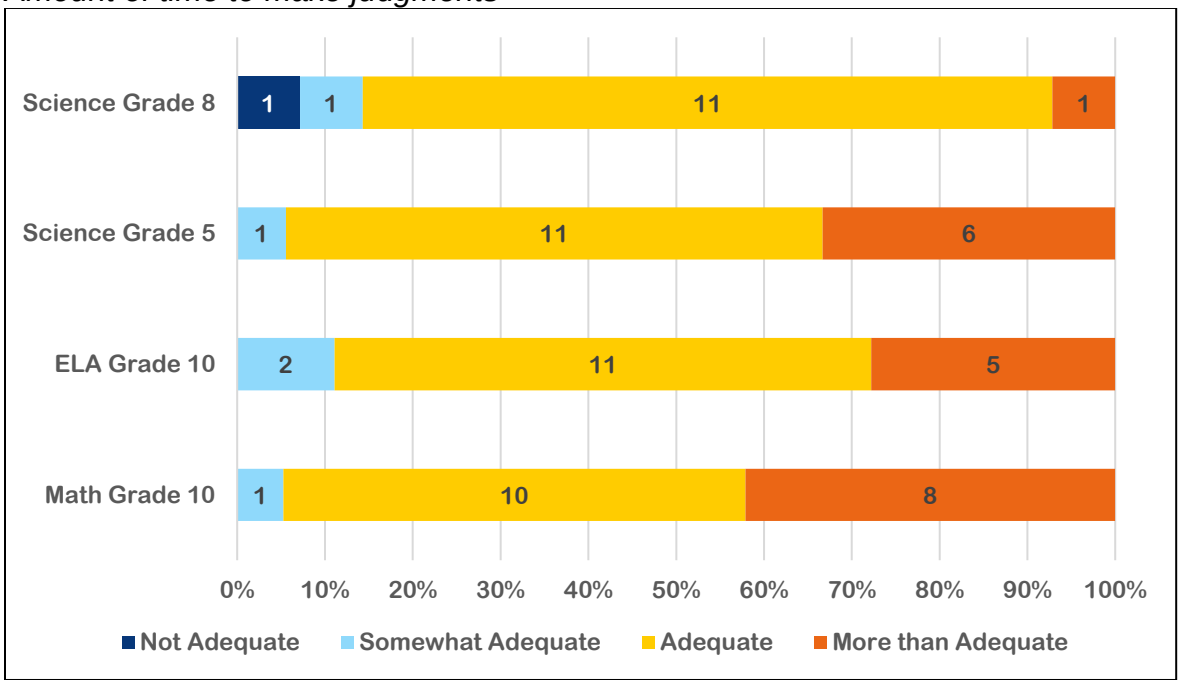


Discussion after each judgment round

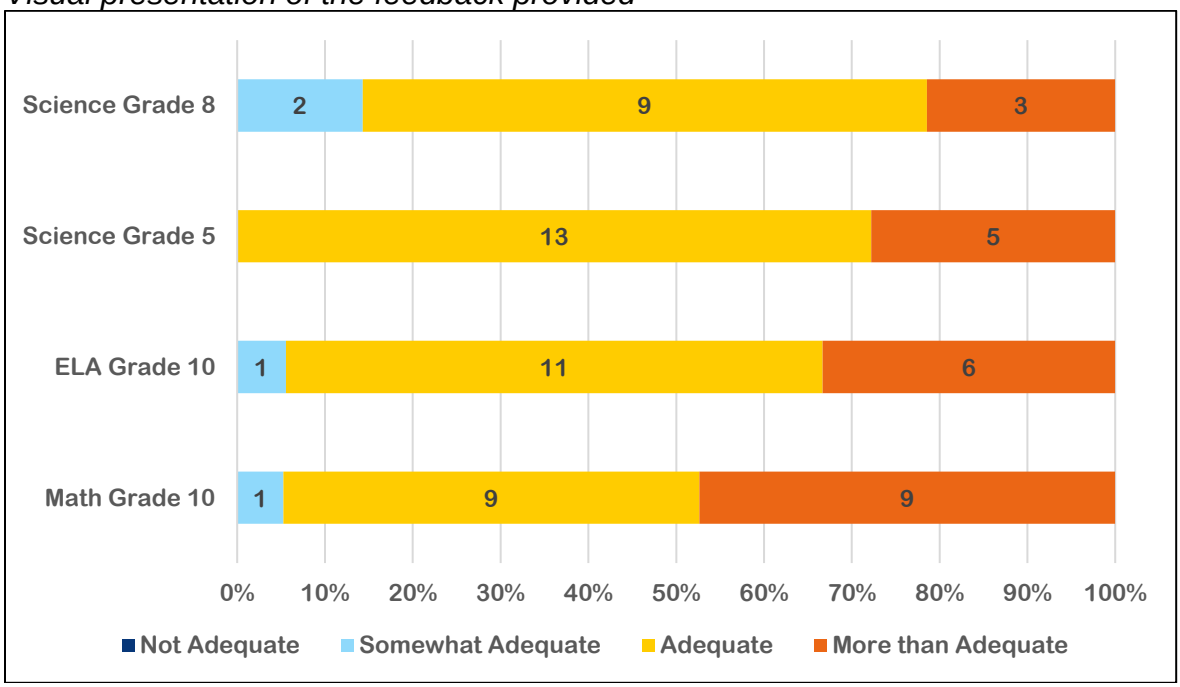


Question 6: How adequate were the following elements of the session?

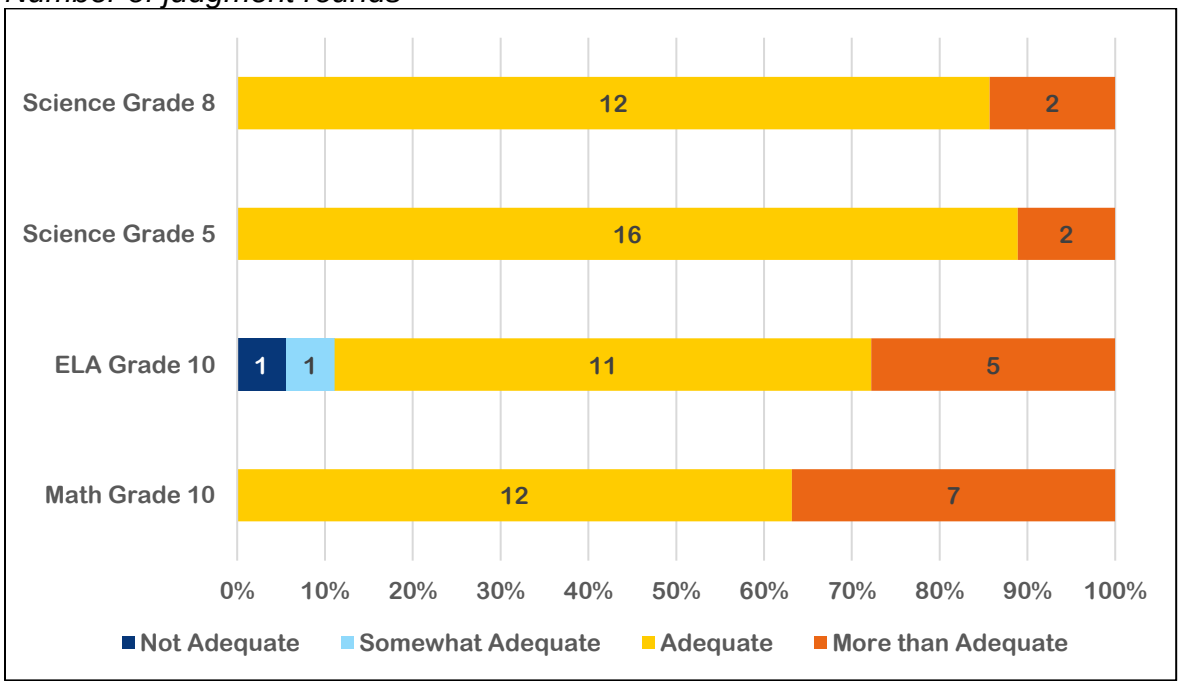
Amount of time to make judgments



Visual presentation of the feedback provided



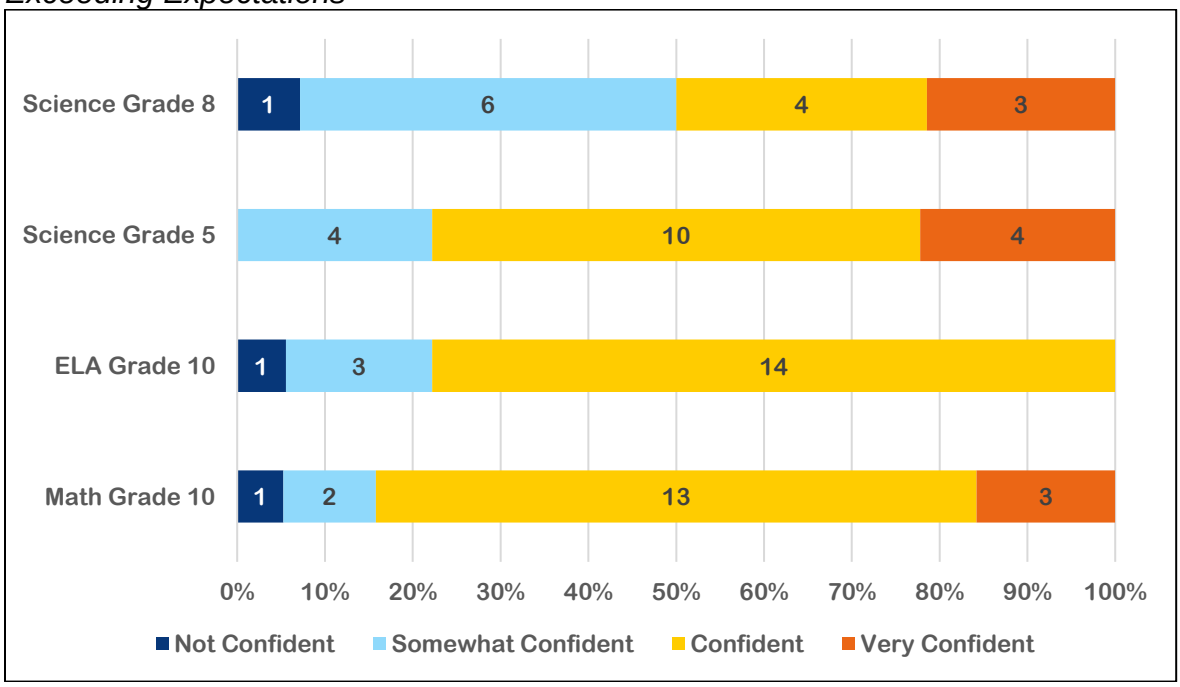
Number of judgment rounds



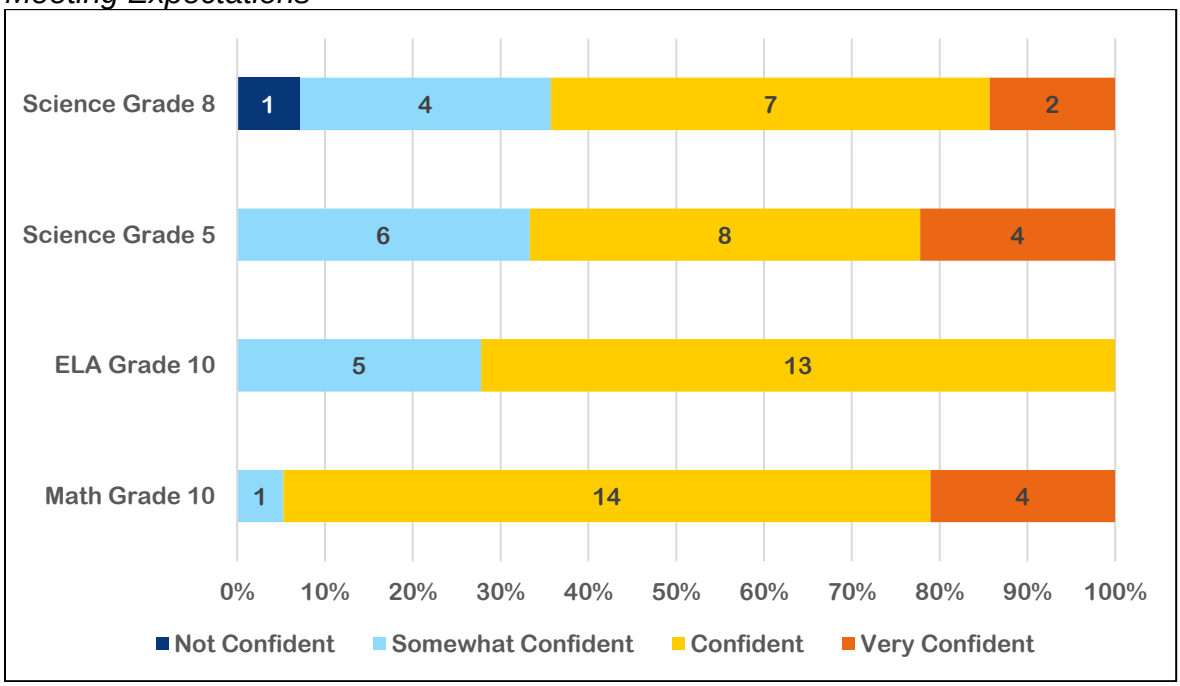
Question 7: In applying the standard-setting method, you were asked to recommend cut scores (separating four achievement levels) for student performance on MCAS assessments.

How confident do you feel that the Achievement Level Descriptors (ALDs) for the specific subject and grade are reasonable for each student achievement level?

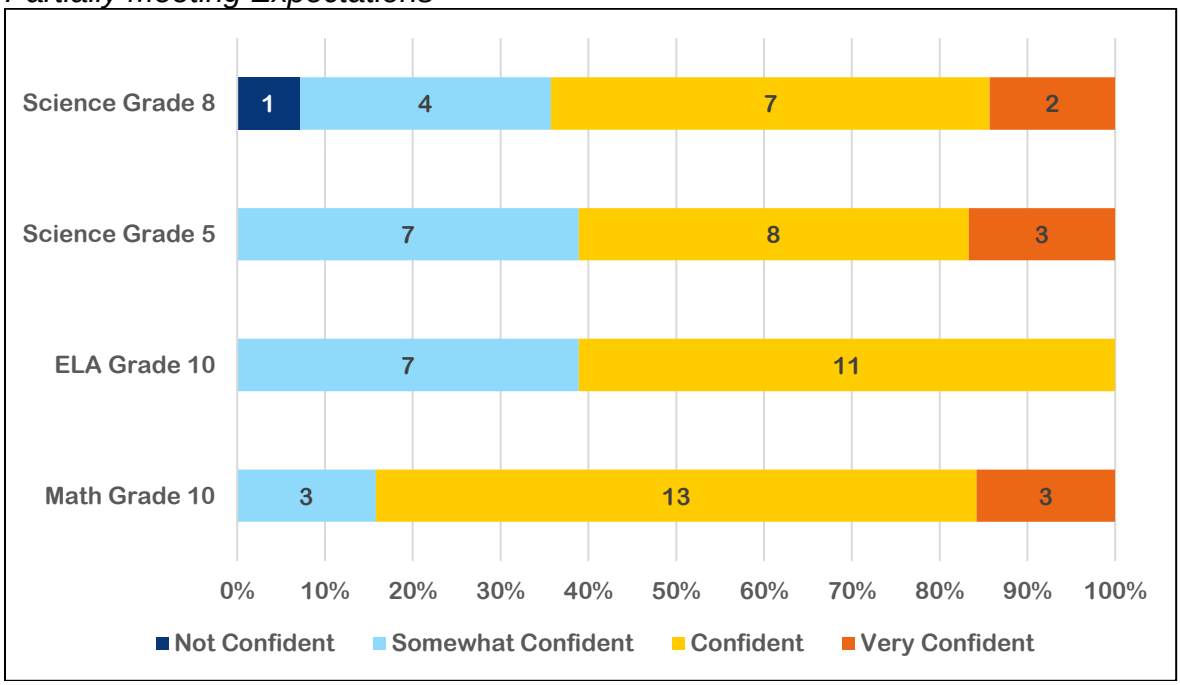
Exceeding Expectations



Meeting Expectations

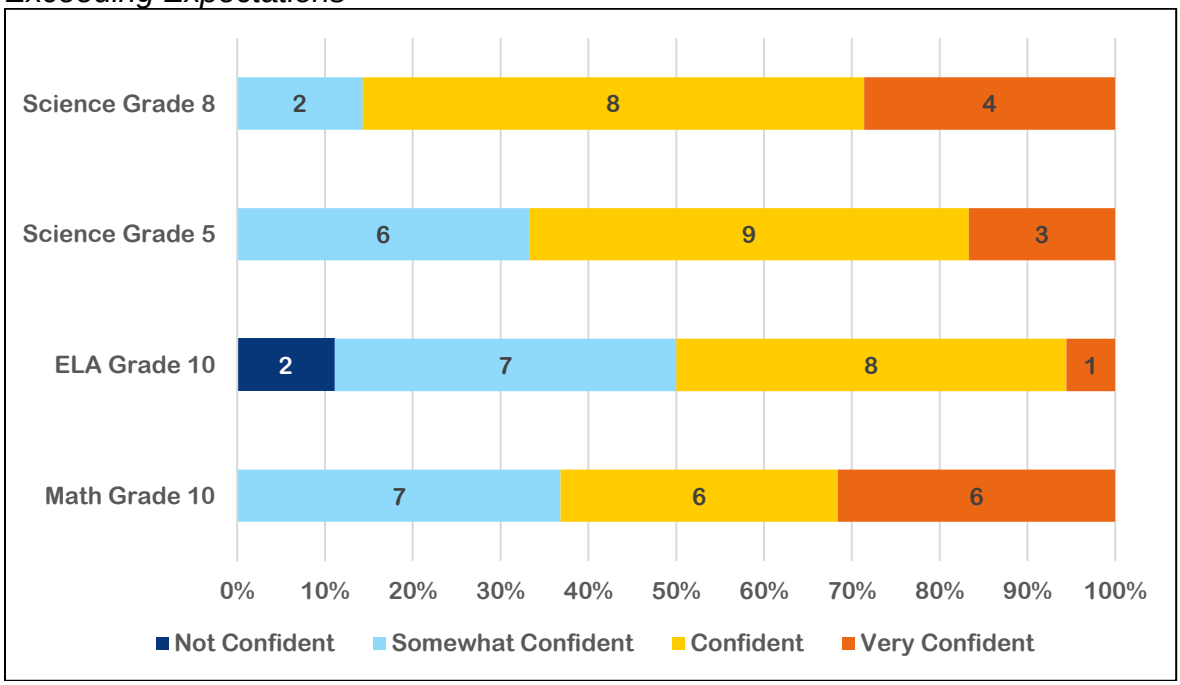


Partially Meeting Expectations

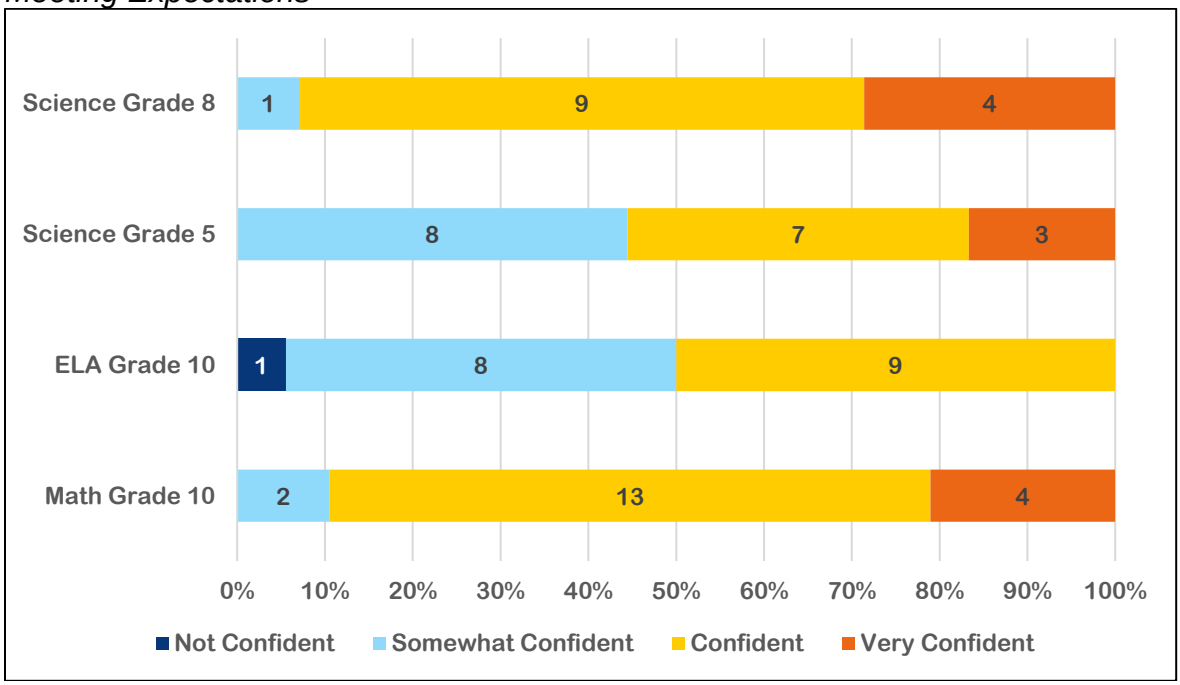


Question 8: How confident do you feel that the final cut score recommendations for the specific subject and grade represent appropriate levels of student performance?

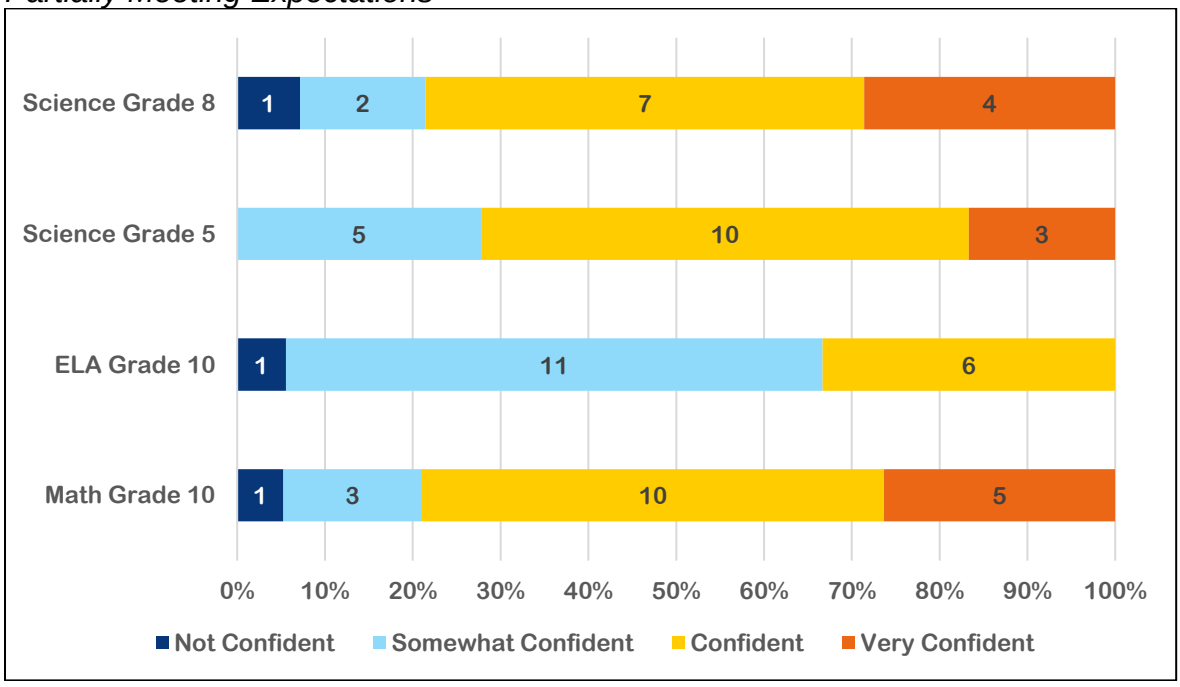
Exceeding Expectations



Meeting Expectations

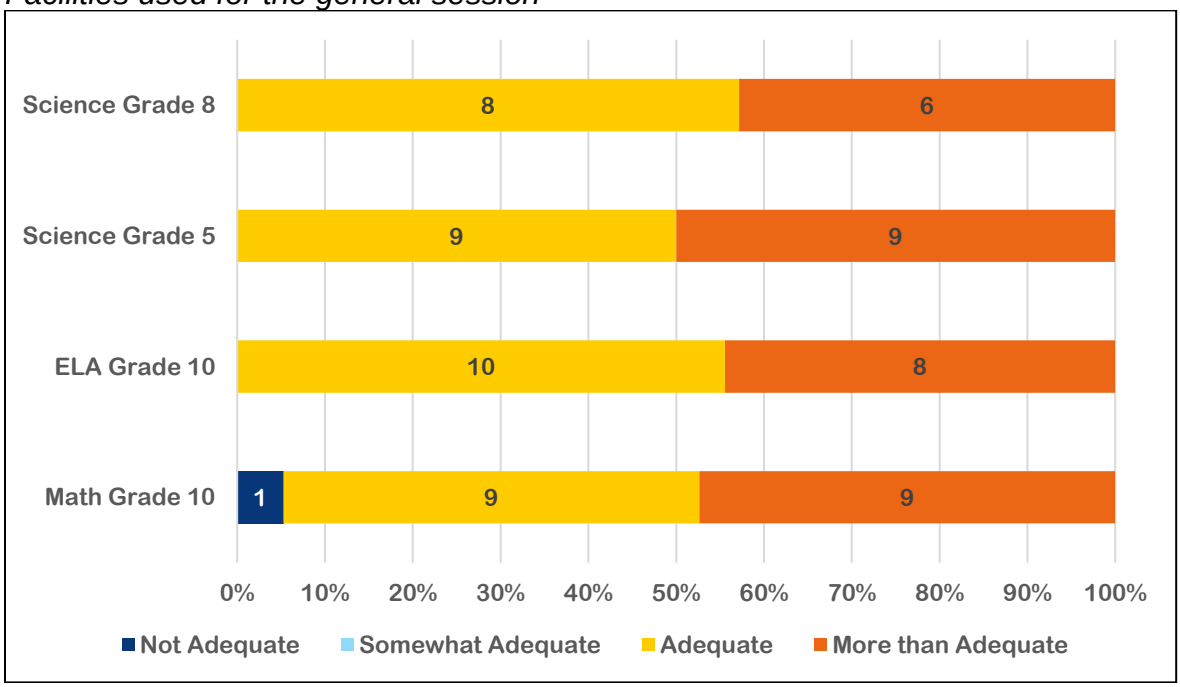


Partially Meeting Expectations

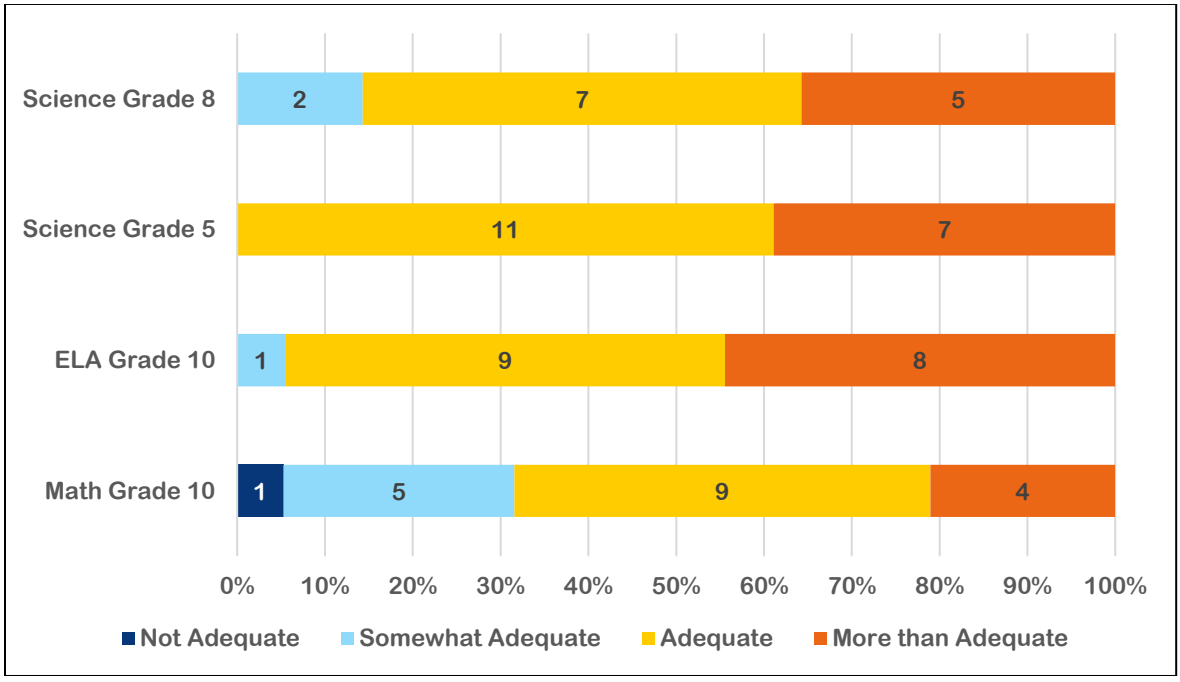


Question 9: How adequate were the following elements of the session?

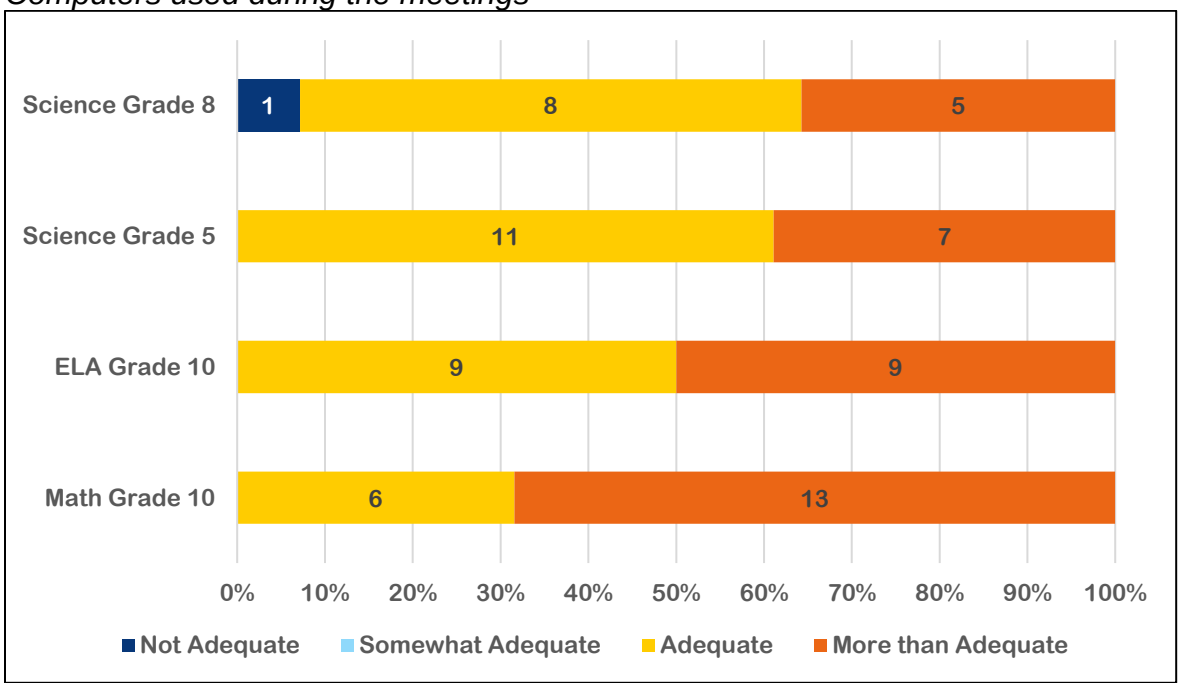
Facilities used for the general session



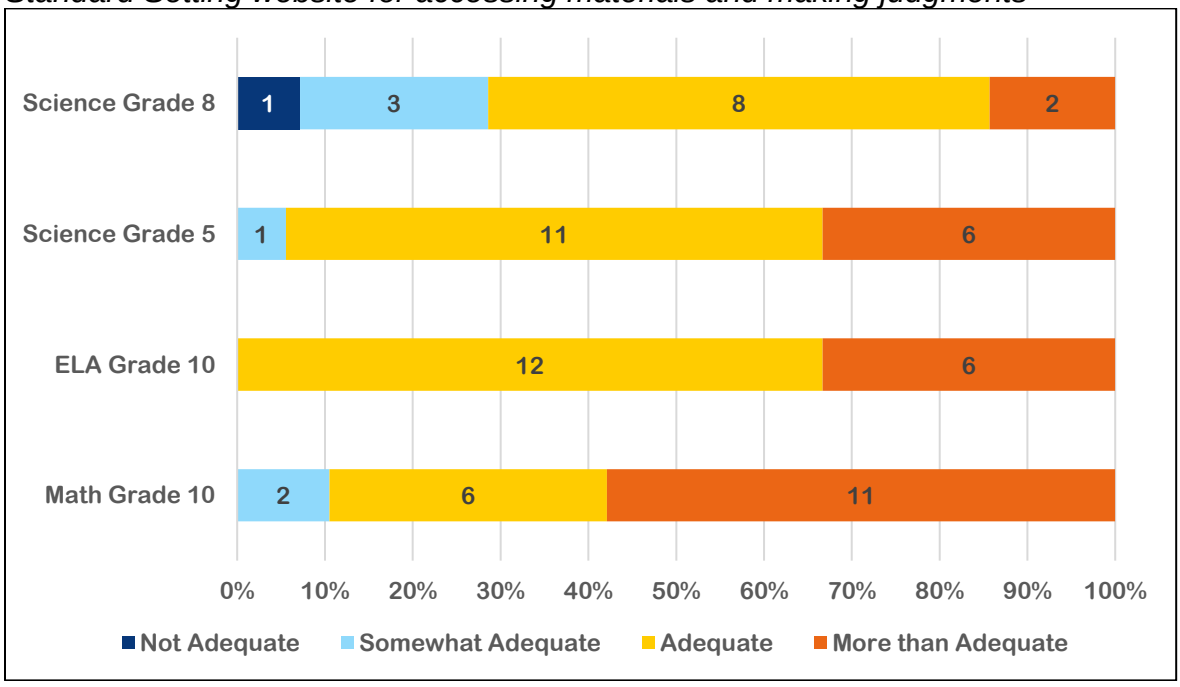
Facilities used for the breakout session



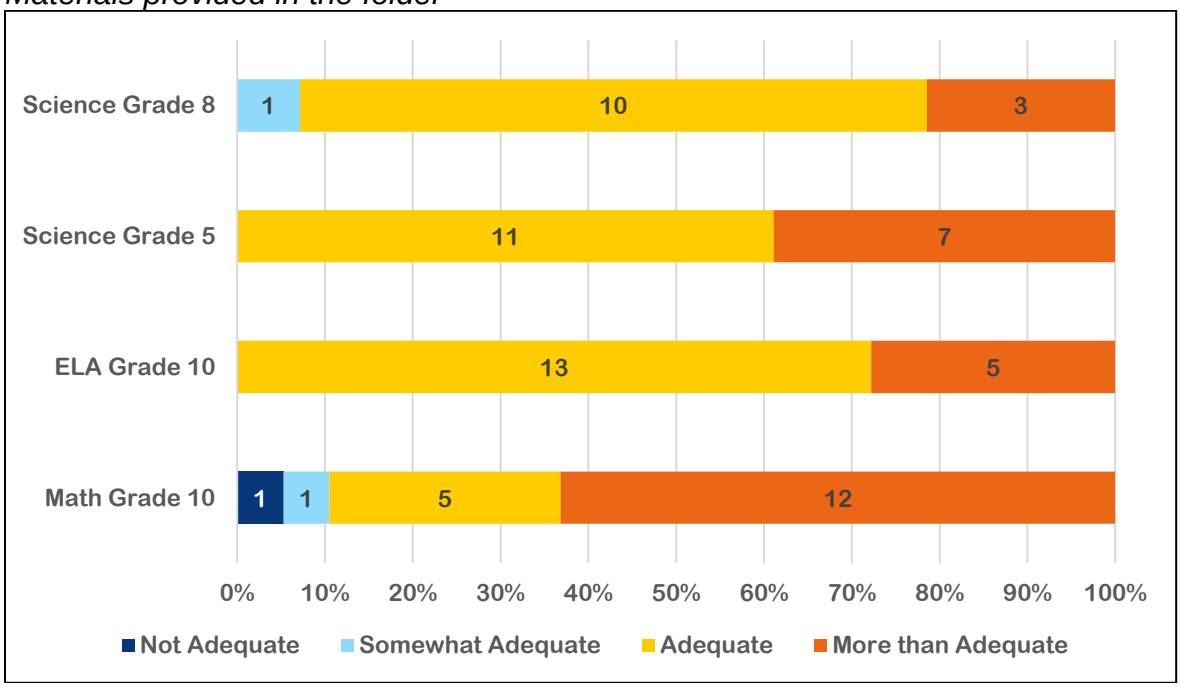
Computers used during the meetings



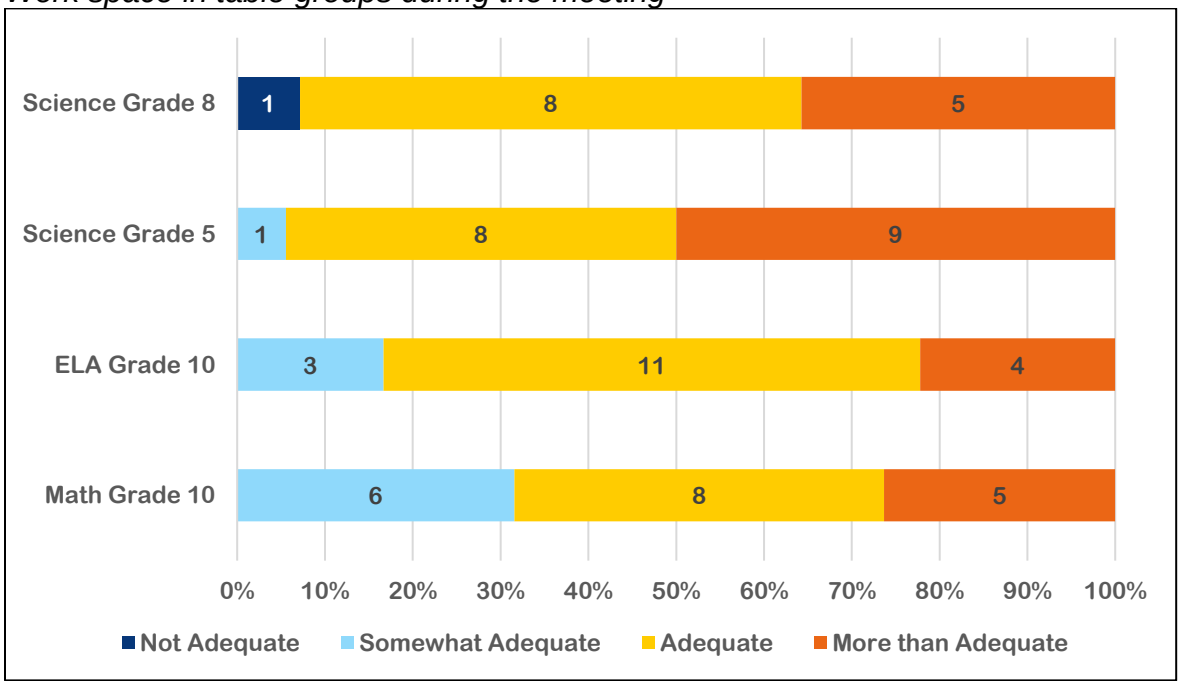
Standard Setting website for accessing materials and making judgments



Materials provided in the folder

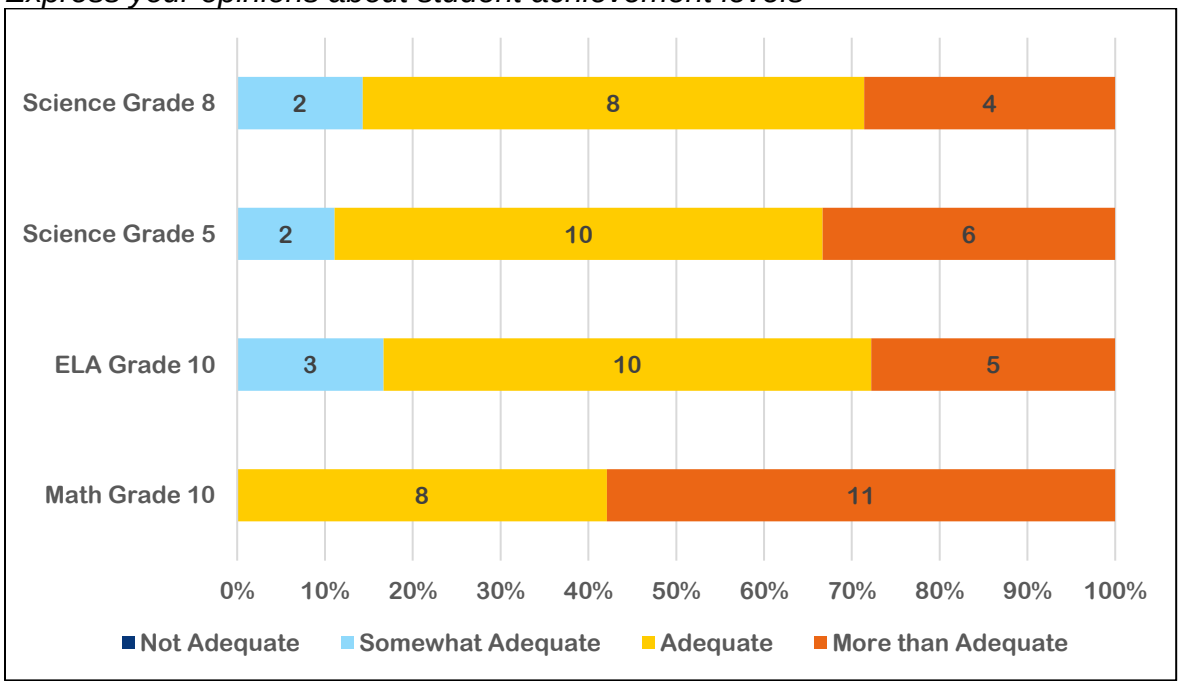


Work space in table groups during the meeting

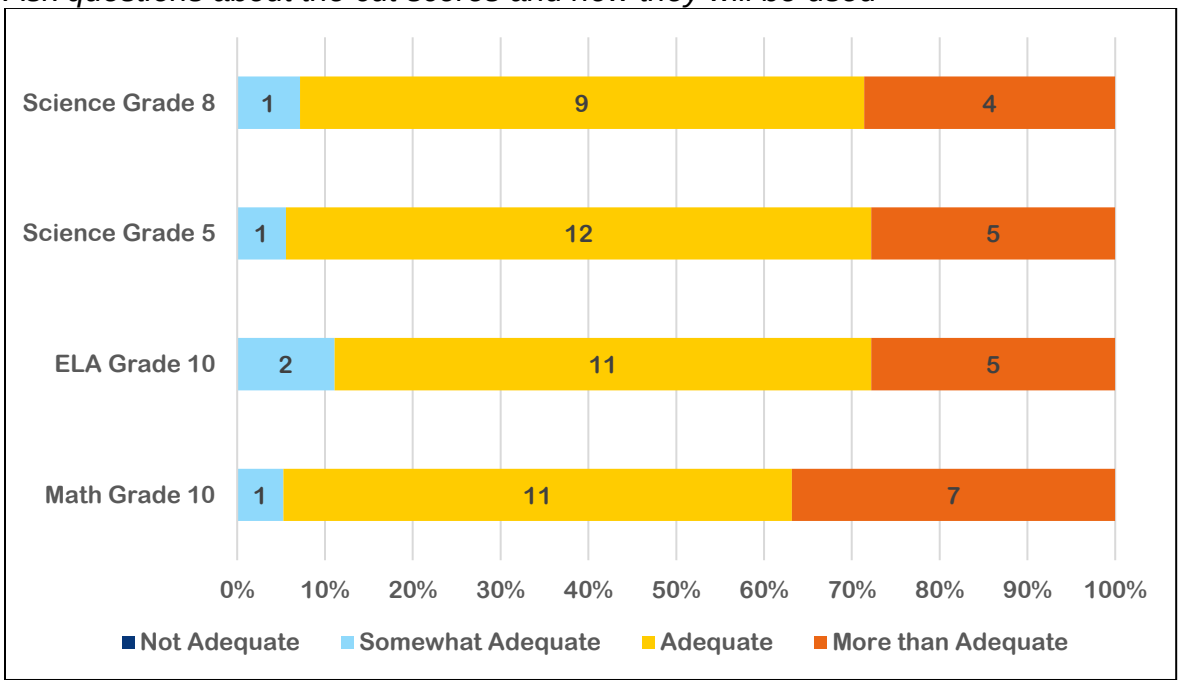


Question 10: Did you have adequate opportunities during the session to:

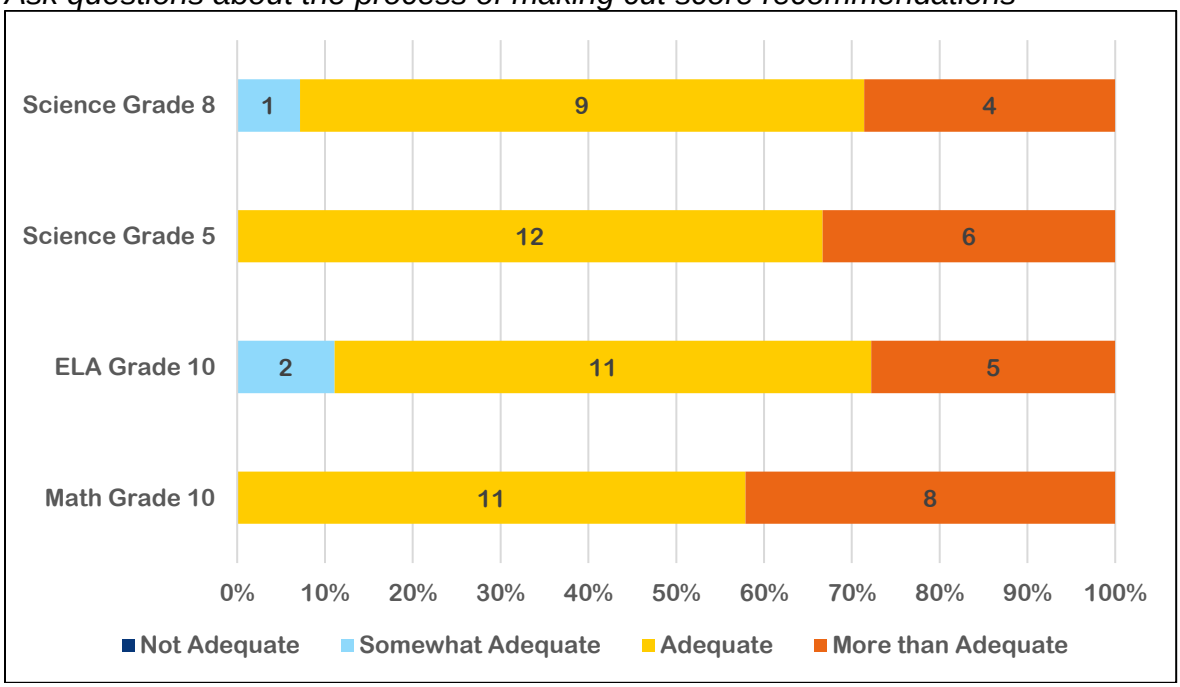
Express your opinions about student achievement levels



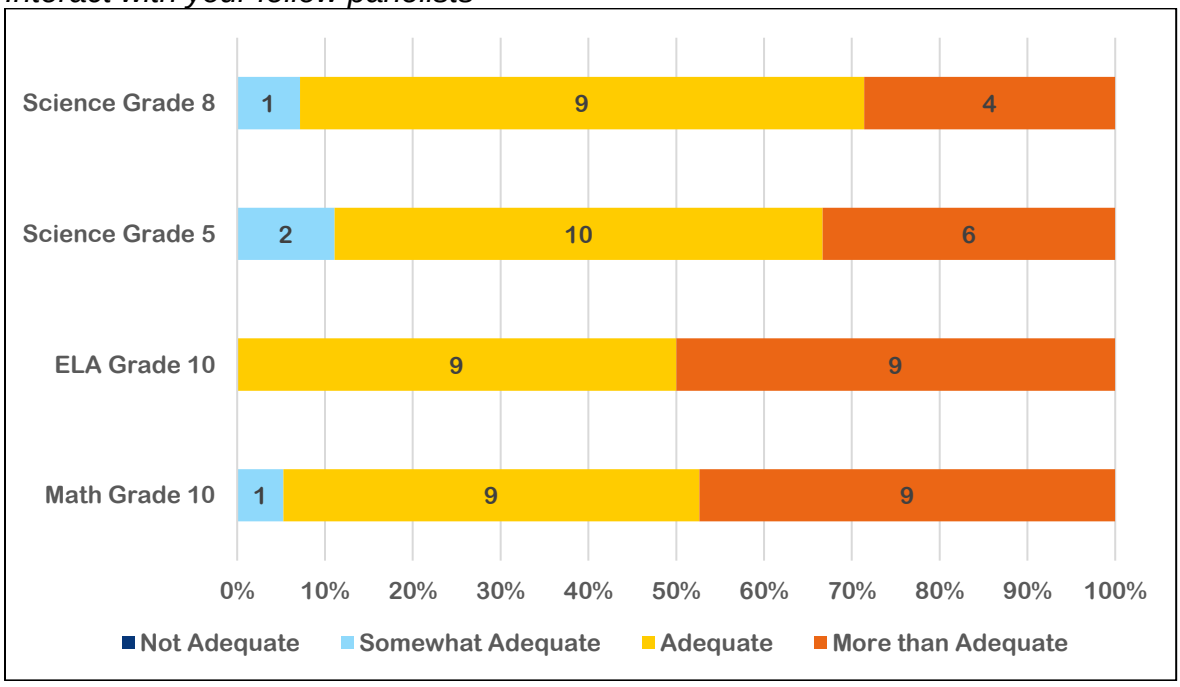
Ask questions about the cut scores and how they will be used



Ask questions about the process of making cut score recommendations

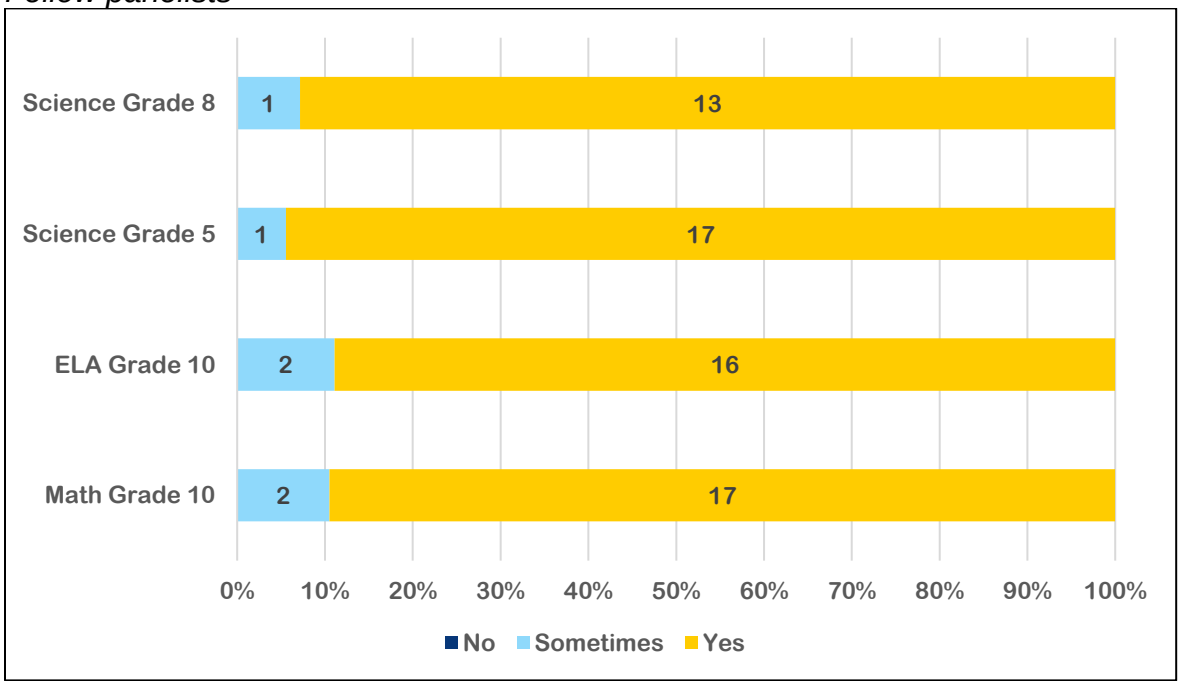


Interact with your fellow panelists

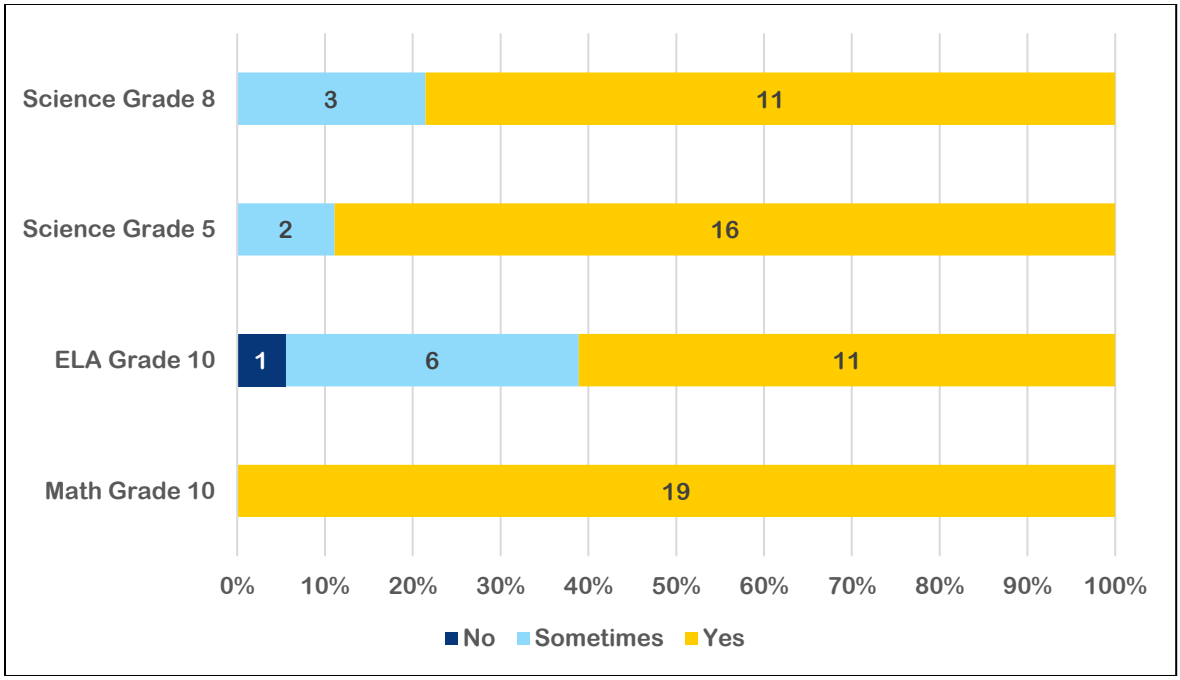


Question 11: Do you believe your opinions and judgments were treated with respect by:

Fellow panelists



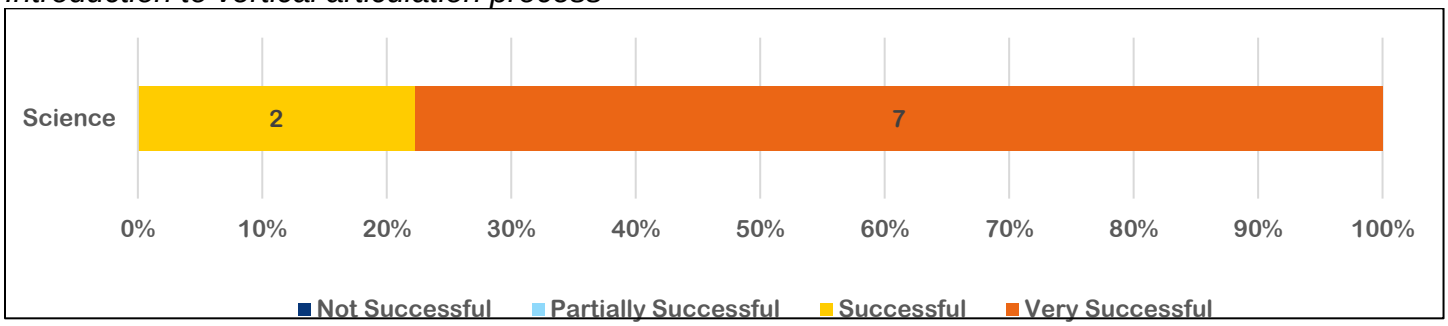
Facilitators



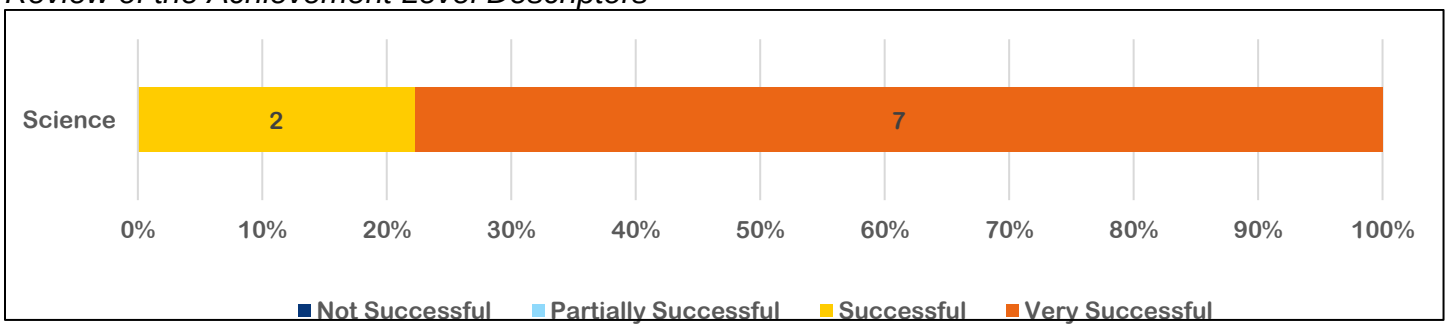
Vertical Articulation Process Evaluation

Question 1: Select the option that best reflects your opinion about the level of success of the various components of the meeting in which you participated. The activities were designed to help you both understand the process and be supportive of the recommendations made by the committee.

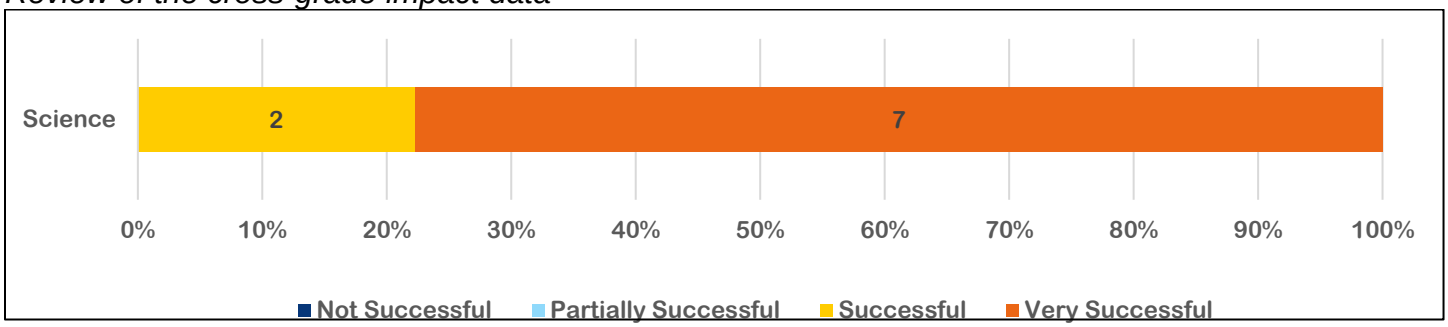
Introduction to vertical articulation process



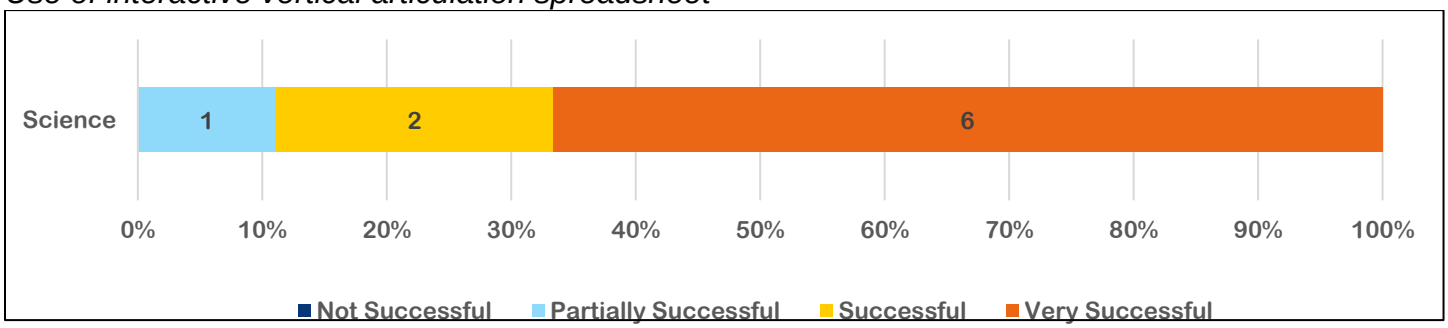
Review of the Achievement Level Descriptors



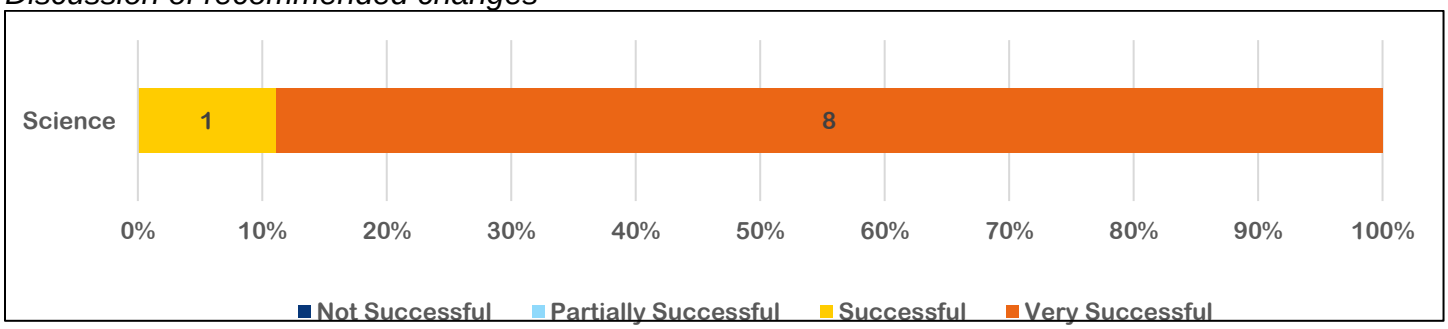
Review of the cross-grade impact data



Use of interactive vertical articulation spreadsheet

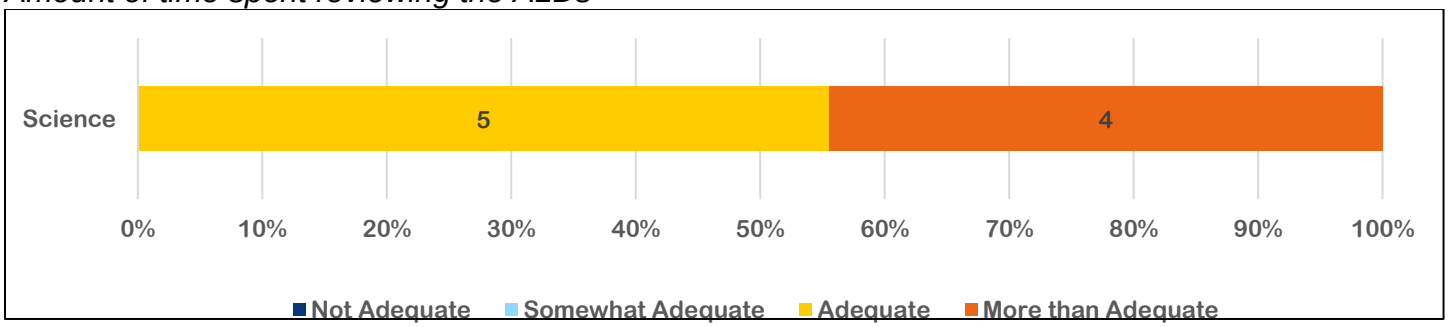


Discussion of recommended changes

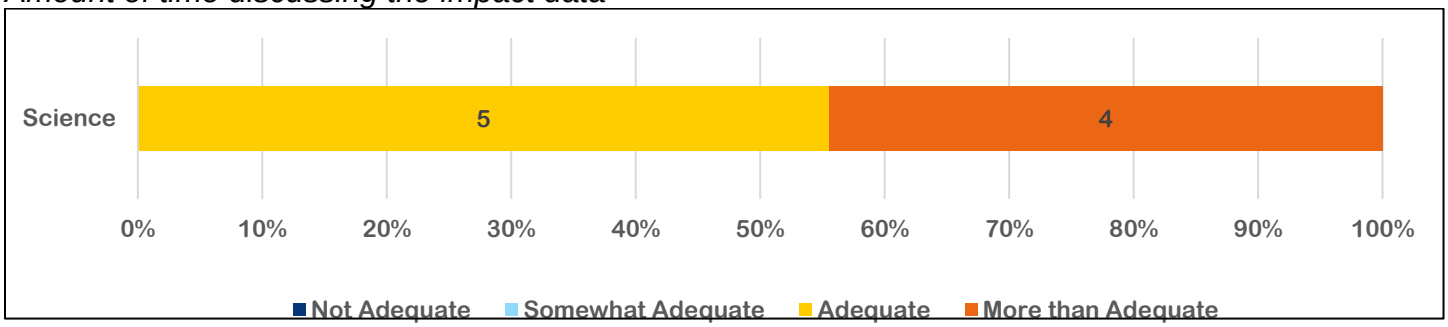


Question 2: How adequate were the following elements of the session?

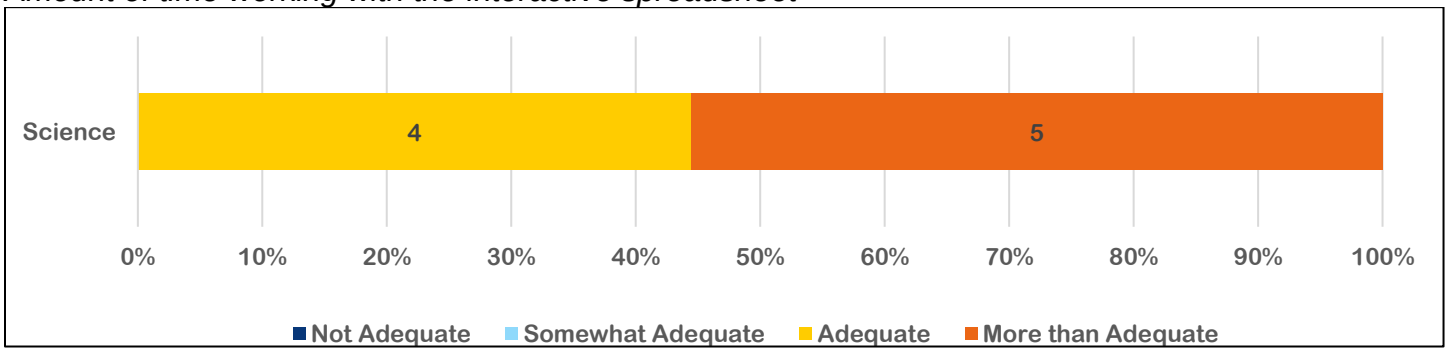
Amount of time spent reviewing the ALDs



Amount of time discussing the impact data

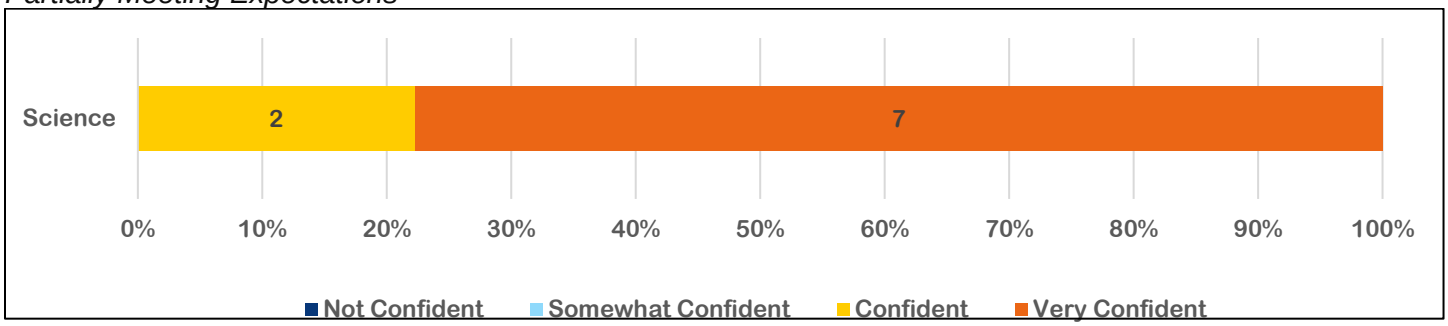


Amount of time working with the interactive spreadsheet

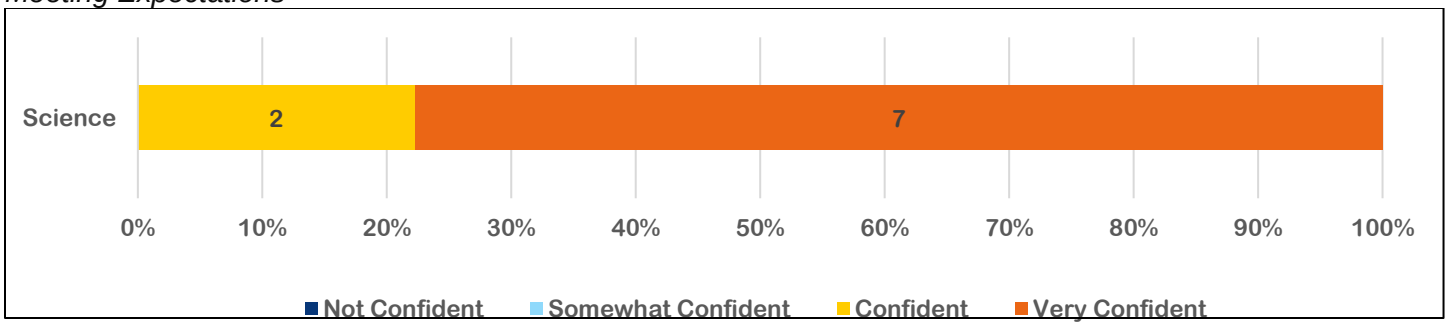


Question 3: How confident do you feel that the final cut score recommendations for the grades 5 and 8 STE represent appropriate levels of student performance?

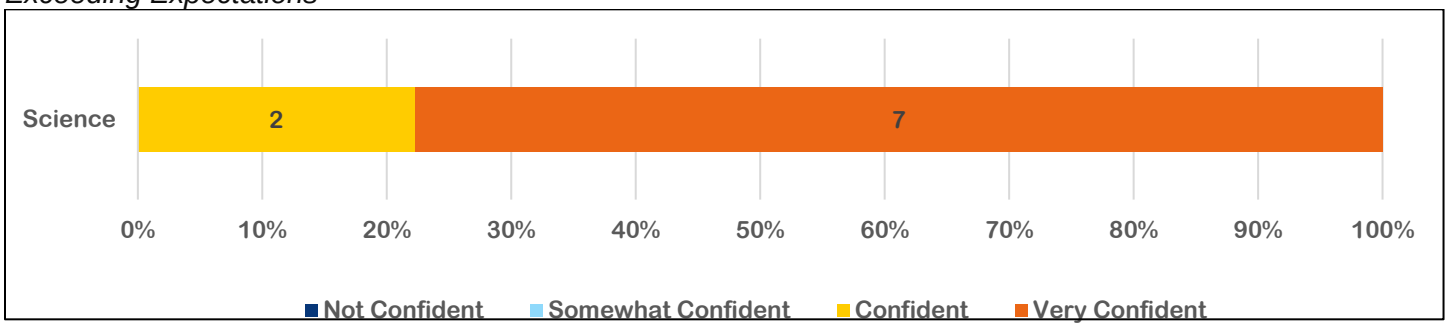
Partially Meeting Expectations



Meeting Expectations



Exceeding Expectations



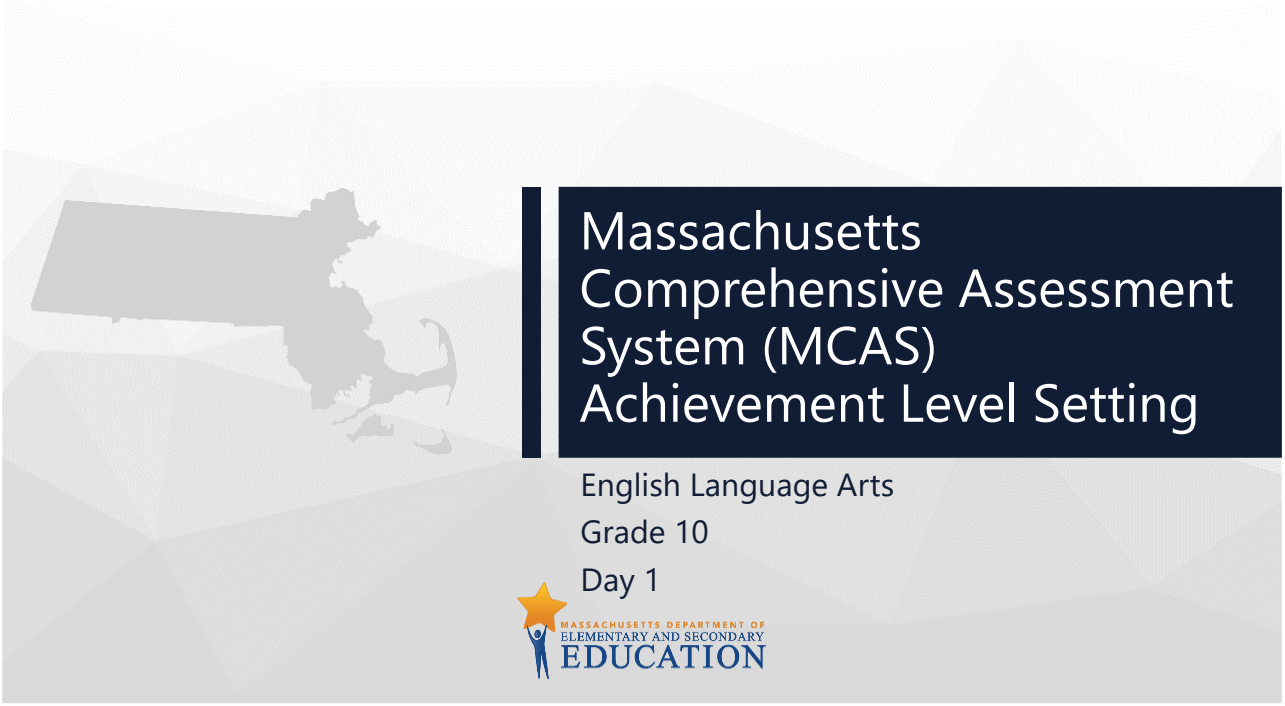
Appendix L – PowerPoint Presentations

A sampling of presentations from the General Session and Breakout sessions by day are presented below.

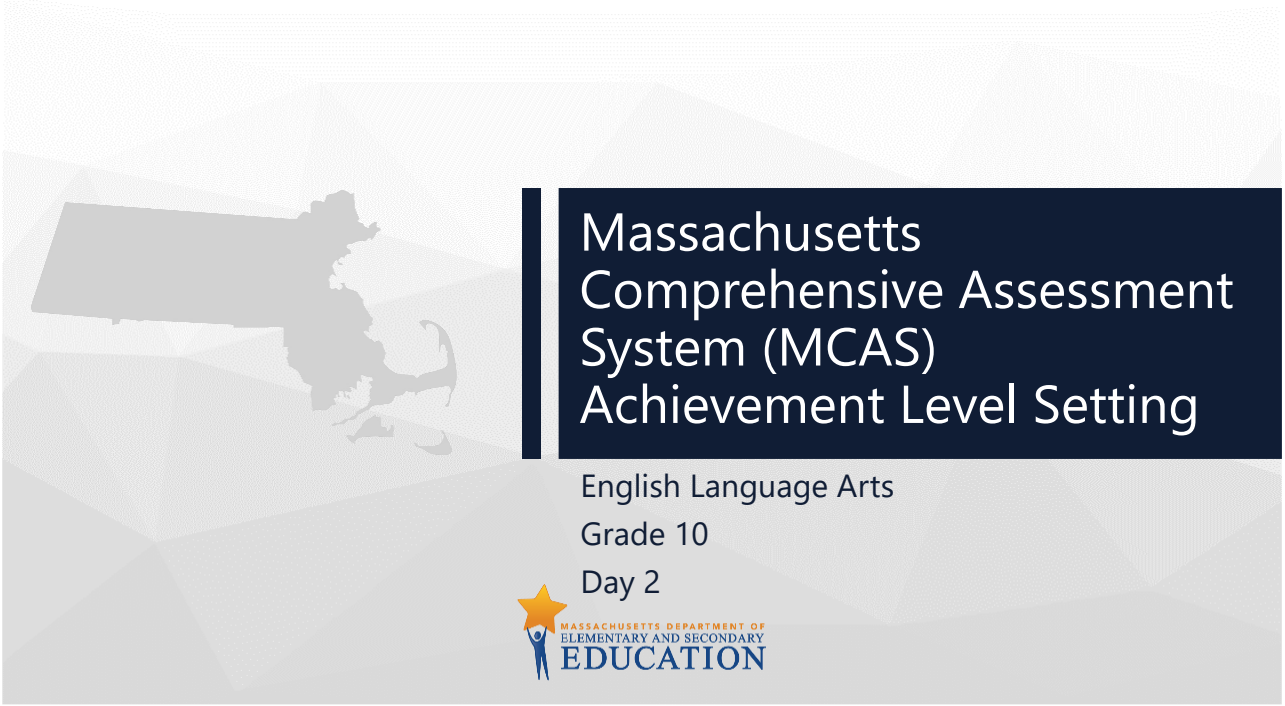
General Session

Table Leader Training

MCAS Breakout Day 1



MCAS Breakout Day 2



Vertical Articulation

Competency Determination Validation