Publisher's Response to EdReports.org Evaluation of Discovery Education Math Techbook™ Traditional High School

Submitted May 1, 2017

We are grateful for the thorough analysis of Math Techbook by EdReports. The review validates a four-year effort to produce high-quality instructional materials that meet or exceed the bar set by more than 20 years of research in mathematics education. Built to meet the recommendations in the *High School Publishers' Criteria for the Common Core State Standards for Mathematics*, Math Techbook reflects both the spirit and intent of the Common Core State Standards for Mathematics (CCSSM). Consequently, the design of Math Techbook presents material in a manner that allows all students to learn mathematics with an appropriate level of depth and rigor. The high school courses are specifically designed to prepare students for the mathematics that they will encounter in higher education or professional settings.

Discovery Education invites you to review Math Techbook. Please visit **www.tinyurl.com/MTBpreview** to learn more about Math Techbook and to register for a free 60-day trial.

Discovery Education Math Techbook Traditional High School received a perfect score on the second gateway, Rigor & Mathematical Practices and on the first subcategory (Use and Design to Facilitate Student Learning) within the third gateway, Usability. The following responses address the indicators in the third gateway for which Math Techbook did not receive full credit.

Indicator 1b.ii

The materials, when used as designed, allow students to fully learn each standard.

The EdReports evaluation claims that there are four standards not fully covered in Math Techbook Traditional: N-Q.1, N-Q.3, N-RN.3, and G-GPE.5.

- For N-Q.1, students have many opportunities to engage in activities in which considering the units will help to understand a problem or solution. Algebra I, Concept 4.1, Investigation 1 contains an activity about density, and the technology-enhanced items (TEIs) and lab experiment within that investigation require significant attention to units. In Algebra I, Concept 1.2, students need to consider units when working with equations and expressions about target heart rates and a pumpkin launch. The intent of Math Techbook was to integrate N-Q.1 throughout all three high school courses, rather than attempt to teach it through direct instruction in a particular unit or investigation.

- We followed this same philosophy for N-Q.3. Though not taught explicitly, students are given ample opportunity to choose a level of accuracy. The EdReports review specifically mentions a problem about carbon dating in Algebra II, Concept 2.2, stating that the video mentions the approximate nature of the results, "but the answer key gives a result to the nearest year." Although the sample answer provided for teachers was "17,526 years"—which has been updated to 17,500—this TEI will actually accept any answer from 17,000 to 17,999 as correct, supporting the idea that the half-life of carbon-14 is only an approximation. The range of acceptable answers allows for a half-life from 5,690 to 5,770. If a student misses the problem three times, a revealed solution shows 17,500 with an "approximately equal" sign.

  As other examples, an Apply problem in Algebra I, Concept 8.2 asks students to predict a population in 20 years, but then requires them to reflect on the reliability of their prediction, and the extension in Algebra II, Concept 2.1 requires students to investigate acidity and pH levels. These and many other activities require careful attention to units when analyzing the situation.

- Before receiving the EdReports evaluation, we realized that we do not ask students to explain why the sum of a rational and irrational number is irrational. We will make a change to Algebra I, Concept 7.3, to include this content in Summer 2017.

- With regard to G-GPE.5, the EdReports evaluation states that students are not asked "to prove the slope criteria for parallel and perpendicular lines." This is untrue. Although students are informally introduced to the slope criteria in Geometry, Concept 3.1, they are asked to formally prove the slope criteria in Geometry, Concept 3.2.

Indicator 3m
Materials provide strategies for gathering information about students' prior knowledge within and across grade levels.

The EdReports evaluation states that there are no specific strategies for assessing students' prior knowledge. The Math Techbook approach to pre-assessment is to pique student interest while collecting data regarding their ability to handle the coming material. Each concept is designed to increase student interest through engaging activities while also assessing student readiness through interactives and TEIs. Student results of these informal assessments are available in the Dashboard. The design intentionally does not begin with a traditional pre-assessment; rather, it follows the best practices that view formative assessment as an ongoing process (Black and Wiliam, 1998; Stiggins and DuFour, 2004).

In the latest version of Math Techbook (Summer 2017), the first page (Engage) within the Discover section contains two questions to activate and assess prior knowledge. Coupled with

the other activities on the Engage page and the Reach-Back Standards in the Model Lesson, this multi-pronged approach provides appropriate data to teachers to determine student readiness.

Indicator 3n
Materials provide strategies for teachers to identify and address common student errors and misconceptions.

The review claims that there are no strategies to identify and address misconceptions, but suggestions for how to address, and possibly correct, misconceptions are included throughout the Model Lesson and in the Teacher Notes that appear when teacher presentation mode is turned off.

Indicator 3p.i
Assessments clearly denote which standards are being emphasized.

The EdReports analysis claims that assessment questions are not aligned to standards, but every item is linked to at least one math standard. Within the Practice section, all items are aligned to objectives, each of which is a subcategory of the standards. Because the CCSSM standards vary in depth and breadth of content, Discovery Education generated objectives of similar size based on the CCSSM, for ease of instruction. All Coach and Play items in the Practice section are aligned to those objectives, which are viewable through the Dashboard. Similarly, all items on the unit assessments were developed in alignment with the standards to be assessed, and results within the Dashboard are grouped by standard or concept.

Indicator 3p.ii
Assessments include aligned rubrics and scoring guidelines that provide sufficient guidance to teachers for interpreting student performance and suggestions for follow-up.

The EdReports analysis suggests that Math Techbook could provide additional information to teachers for follow-up. There are several areas where guidance is provided to teachers regarding student performance. For each open-ended problem in Math Techbook, a sample student response suggests how a top-level student might respond. In addition, the Model Lesson contains a description and possible uses for each Apply problem, which provides guidance to teachers.

Indicator 3s
Materials provide teachers with strategies for meeting the needs of a range of learners.

The EdReports analysis suggests that Math Techbook could do more to provide differentiation strategies for teachers. Math Techbook provides significant differentiation strategies throughout the Model Lesson and Teacher Notes. As a digital service, Math Techbook was designed on the principles of Universal Design for Learning (UDL) and provides multiple ways

for students to learn, whether through different language settings, speak-aloud text, the ability for teachers to easily assign different activities to students, engaging interactives, or video. Additionally, Math Techbook provides multiple ways for students to demonstrate their learning—through traditional assessments, TEIs, teacher-scored open-ended responses, and the ability to upload graphic representations, video, and audio files.

Indicator 3u

Materials suggest support, accommodations, and modifications for English Language Learners and other special populations that will support their regular and active participation in learning mathematics (e.g., modifying vocabulary words within word problems).

The analysis by EdReports states that parent letters are available in Spanish. This statement, though accurate, overlooks a number of other accommodations, including the ability to display both the Discover section and the glossary in Spanish. In addition, there are suggestions within the Teacher Notes and the Model Lessons on how to provide support to both low-achieving and high-performing students. Math Techbook provides opportunities for ELL students to learn vocabulary in a more robust way; repeatedly, examples and counterexamples are available for students, asking them to discuss their own definitions with classmates before comparing their definitions to those in the glossary. The glossary includes Spanish definitions, animations, and videos; the animations and videos provide nonlinguistic representations, which help many students overcome language barriers. This presentation of vocabulary leads to greater understanding and retention than simply providing the corresponding word from other languages.

Indicator 3v

Materials provide opportunities for advanced students to investigate mathematics content at greater depth.

Math Techbook was designed so that all students can develop a deep understanding of each concept. In addition to the carefully crafted investigations, the extensions and Apply problems can be used to extend learning. The open-ended Apply problems implicitly provide differentiation, as students can finish them within one class period or spend a week exploring the topic. In addition, opportunities to extend learning are presented throughout the Model Lesson and Teacher Notes. For example, in the Model Lesson for Geometry, Concept 5.1, teachers are encouraged to “challenge students in honors courses by having them develop an induction proof of [the fundamental theorem of dilation].” Similarly, the interactives that appear throughout Math Techbook allow for intrinsic differentiation. For instance, the Half-Life interactive in Algebra II, Concept 2.2, Investigation 2 allows students to investigate filtration of chemicals in the human body; students get to choose which chemical and the amounts that they’ll investigate, yet they are held accountable by the follow-up tasks that validate their understanding of the mathematics.

References:

Black, P., and Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, *80*(2), 139-148.

Stiggins, R. & DuFour, R. (2009). Maximizing the power of formative assessments. *Phi Delta Kappan*, *90*(9), 640-644.