

Text Analysis & Critique

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For this text analysis the subject of discussion will be a 9th grade Earth Science book, [Chapter 3, Models of the Earth](#). Earth Science is the knowledge and organized methods of observing the earth and its processes using appropriate tools to create models that describe and explain how the earth works. Chapter 3, Models of the Earth is a complex chapter of the textbook that explains many details and facts about finding locations on Earth, mapping Earth's surface, and the different types of maps that are used. There are many aspects of this chapter that help make the reading accessible to ELL students, but also aspects that can make the text challenging for these students to read and fully comprehend. Overall, the chapter includes many text features that help make the text more comprehensible for ELL readers, but can be considered a complex text.

Before analyzing the text, I needed to understand what standards and grade level the content of this chapter corresponds to. The content of this chapter discussing models of the Earth provide a basis for understanding of how to read maps, the different types of maps and what they describe, along with how to describe locations on Earth. This is a base for building up more information about Earth's systems that allow the students to master more detailed standards as they progress through their schooling. According to the New York State P-12 Science Learning Standards, two of the standards that students will master in high school are: "HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive processes (such as volcanism, tectonic uplift, and deposition) and destructive processes (such as weathering, subduction, and coastal erosion)]," and "HS. ESS2-3. Develop a

model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Rocks and minerals can be identified and classified using various tests and protocols that determine their physical and chemical properties. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]” (New York State Education Department [NYSED], 2017). These standards are more complex and detailed than this chapter dives into, but students will first need to know and understand the content explained in this chapter, Chapter 3, Models of the Earth, before moving on to explain these other concepts.

As well as NYSED science standards, NYS also has provided standards regarding ELL students. Standard 1 for ELL students explains how “English for information and understanding refers to the competencies and knowledge of English that students must obtain in order to communicate effectively in social and academic settings. Students learning English as a second language learn, use, and reflect on English language and concepts from the core content areas, such as social studies, sciences, and mathematics. The organization of information and the ability to explain the relationships among pieces of information (in forms such as cause and effect, chronological order, problem/solution, comparing and contrasting, and interpreting) are the essential concepts in Standard 1” (Williamsville Central School District, 2020). Specifically, Williamsville Central Schools District gives further details on what this standard entails. They state that for Standard 1, “Students will listen, speak, read, and write in English for information

and understanding. Students learning English as a second language will use English to acquire, interpret, apply, and transmit information for content area learning and personal use. They will develop and use skills and strategies appropriate to their level of English proficiency to collect data, facts, and ideas; discover relationships, concepts, and generalizations; and use knowledge generated from oral, written, and electronically produced texts” (Williamsville Central School District, 2020). To understand the content in Chapter 3 of this text, ELL students will need to meet this standard to interpret and apply what they are reading, and collect the facts and ideas supplied in the text.

Lexile Levels and ATOS Levels are used to analyze texts and books. Both of these systems, as well as others, determine the readability of a text. “ATOS is a measure of readability—in other words, a readability formula designed to guide students to appropriate-level books. ATOS takes into account the most important predictors of text complexity—average sentence length, average word length, and word difficulty level” (ATOS, 2022). When analyzing this text, Chapter 3, Models of The Earth, using the ATOS Levels, I analyzed a section discussing topographic maps. It stated, “Earth scientists use a wide variety of maps that show many distinct characteristics of an area. Some of these characteristics include types of rocks, differences in air pressure, and varying depths of groundwater in a region. Scientists also use maps that show locations, elevations, and surface features of Earth. One of the most widely used maps is called a topographic map. Topographic maps show the surface features, or topography, of Earth. Most topographic maps show both natural features, such as rivers and hills, and constructed features, such as buildings and roads. Topographic maps are made by using both aerial photographs and survey points collected in the field. A topographic map shows the elevation, elevation, or height above sea level, of the land. Elevation is measured from mean sea

level, the point midway between the highest and lowest tide levels of the ocean. The elevation at mean sea level is 0,” (Allison, 2009). Through lexical analysis, I determined that the ATOS Level was a 9.0, meaning that this text is appropriate for 9th grade students. The average Word Length is a 5.1, average Sentence Length is 15.3, and the average Vocabulary Level is a 3.6. For Grade 9, the ATOS Levels of 9.0—9.9 can be compared to the Lexile Levels of 1030—1160. The ATOS level being a 9.0 shows that this text does line up with the NYS high school standard for science and is seen as appropriate for a 9th grade student. The vocabulary in the text may make this text more difficult for an ELL student to comprehend fully without features and scaffolding to help make the text more comprehensible.

While analyzing this text, I asked what aspects of the text help make the content comprehensible. There are many aspects of this text that can benefit ELL students while reading the chapter. The text includes many text features throughout the chapter to help the readers further understand what is being conveyed. The chapter had many elements of text engineering throughout. The text included elements of “strategic amplification” of the language of the text by adding additional linguistic clues, as well as “adaptation of key structural elements such as chunking the text into meaningful units, adding headings and subheadings between the chunks that alert the student as to what is coming next, and incorporating focus questions to guide the student as s/he reads” (Billings & Walqui, n.d.). Billings and Walqui also explain how “LLs/MLLs need as many opportunities as possible to latch onto a concept or theme as well as access to good language models that demonstrate important language qualities” (Billings & Walqui, n.d.).

This text provides a good amount of these text engineering aspects. Each page is chunked into different sections with headings to break up the content. Some examples of these chunks are

“Latitude,” which is further broken down into smaller sections for “Degrees of Latitude” and “Minutes and Seconds.” Under each heading and subheading, there is a small paragraph that dives into the details of each topic. Besides chunking the text into different sections, there are also multiple visuals and pictures on each page that relate to the content written. Most of the pictures and visuals have labels and captions that further explain what it is showing the reader. Along with these elements of text engineering, the chapter has “reading checks” built in throughout the chapter. These reading checks are a factor of “adaptation of key structural elements” that help guide the students to check for their own understanding of what they read. For example, in the chapter Models of the Earth, the “Reading Check” question of “Why is the equator the only parallel that is a great circle?” is written at the bottom of the page that relates to what the students read in the section above. These questions are spread out through the chapter.

There are many examples of strategic amplification of the language in the text by adding different linguistic clues. At the beginning of each section in the chapter, a list of key ideas and key terms are provided to give the students background before reading the chapter. Kristina Robertson from Colorín Colorado explains how it is important to prepare students with key vocabulary by writing, “Choose the vocabulary that your students need to know in order to support their reading development and content-area learning, in addition to key content vocabulary. Remember to prepare student-friendly definitions for TWIPS ahead of time” (Robertson, 2021). This can be helpful when providing the students with scaffolding during the lesson. The teacher can build background on the vocabulary prior to reading the text. This is an example of pedagogical scaffolding that can engage the students and set them up for success when they read. Billings and Walqui explain this concept by writing, “Pedagogical scaffolding occurs when the teacher invites students to engage in activities before, during, and after reading a

text which provide them with opportunities to make sense of, analyze, connect and finally apply their newly gained understanding in novel situations” (Billings & Walqui, n.d.). The teacher would have to make sure that their teaching is comprehensible for the students to learn and build background as well. According to Echevarria, it is crucial to build this background with ELL students. Echevarria explains the importance of building this background with ELL students by writing, “Connecting students' experiences to a text, developing background knowledge, and teaching key vocabulary are all effective ways to increase comprehension and achievement. Teachers can assist students in developing background knowledge by: Including techniques in lessons such as chapter previews or anticipation guides. As students begin to develop a conceptual framework for their own learning and understanding, they build a repertoire of background experiences from which to draw...” (Echevarria, 2017). While reading the chapter, the students are able to read the definitions of these key terms as they are presented. The definitions are provided on the side of the page where the word is introduced. Along with giving the definition of the vocabulary words, the reader is provided with how to pronounce some of the words. At the end of the chapter, there is a page that reviews the key ideas from each section. This is a good way to give the readers, especially ELL students, a quick summary of what they read to make sure they understand the key ideas presented in the content.

Although there are many aspects of this text that aid in making the content more comprehensible for ELL students, this text can still be considered a “complex text.” The quantitative elements of this text exemplify the complexities of the chapter. Quantitative elements of a text refer to factors “such as word length, word frequency, and sentence length” (Billings & Walqui, n.d.). Throughout the text, there are many vocabulary words that can be tricky and long, especially for ELL students. These words are used throughout each section

repeatedly, possibly making it difficult for an ELL student to fluently read the text and comprehend the content. For example, some difficult vocabulary words from the text are, “longitude,” “parallel,” “meridian,” “geomagnetic poles,” “magnetic declination,” “cartography,” “azimuthal projection,” and many other words and phrases that appear in the chapter. When most of a student’s focus is spent on trying to decode these words, the student may tend to lose interest in what they are reading, as well as not being able to comprehend the content. This is explained by Billings and Walqui by how they wrote, “when the emphasis is on quantitative measures, the focus is shifted away from the reader and the substance of the text and equally if not more important factors are minimized, such as the reader’s interest in and knowledge of the topic, familiarity with the text genre, and understanding of a text’s purpose,” (Billings & Walqui, n.d.).

Vocabulary is a key to understanding a text. “Vocabulary knowledge is one of the most important predictors of reading comprehension. According to the DVC (decoding, vocabulary, comprehension) reading skill triangle model, reading comprehension is dependent on knowing the meanings of words being read. At the same time, readers can infer the meanings of unfamiliar words encountered in reading” (Chen, Zhao, Wu, Sun, Xie, Feng, 2019). This may be even harder for ELL students as their vocabulary already might not be up to par with their fellow classmates while reading this text. The reasoning behind why vocabulary is crucial for reading comprehension is also explained by Biemiller when he wrote, “Vocabulary is the most important determinant of language comprehension. The vocabulary needed to comprehend a specific story or expository text amounts to knowledge of all or most of the words in that text. Some word meanings are usually learned earlier than other words. Thus, if most of the words in a text are known by the majority of children by age 5, that text would be considered appropriate for

reading to kindergartners, or for reading by beginning readers. Conversely, a text with 5% or more words not known by most children in grade 2 is not appropriate for primary-grade children. By grade 4, texts with more than 15% of words unknown by grade 2 will prove difficult to understand. For grade 6, texts with more than 20% of words unknown by grade 2 will be difficult (Chall & Dale, 1995)” (Biemiller, 2014). Depending on when the ELL student arrived to learn English and their English proficiency level, the student might not have acquired the previous vocabulary taught early on, meaning that they would need to catch up on the prior vocabulary, as well as learn the new vocabulary, making this chapter of the text more difficult to read for these students.

Overall, Chapter 3, Models of the Earth, contains many aspects and text engineering factors that can help make this content more comprehensible for ELL students while reading, as well as starting points for teachers to scaffold and build background for these students. This text can be seen as a complex text as it contains much information and advanced vocabulary that ELL students might not be familiar with, but can be broken down by teachers to further assist their students.

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