

## Characteristics of Mathematics Text That Affect Comprehension Among University-Level English Language Learners in The UAE

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The United Arab Emirates has chosen English to be the medium of instruction in its universities as it rapidly develops its educational system. Language proficiency has become a critical factor in student learning, as seen in mathematics classrooms where students struggle to grasp mathematical concepts not only due to the actual content, but also because of the language barrier. Emirati students are required to take the International English Language Testing System (IELTS) as a university entrance requirement. This test has a scoring scale from 1 to 9, with 1 representing non-users, 9 representing expert users of English ([IELTS, 2014](#)). The passing score for most universities in the UAE is 5. A score of 5 corresponds to those with a partial command of the language who can handle basic communication in their own field ([IELTS, 2014](#)). Because listening, reading, writing, and speaking are all assessed, university students' overall average may reach 5 despite low reading scores.

There is a lack of knowledge regarding the reading comprehension problems faced by Emirati English Language Learners (ELL's). However, one could deduce that these Emirati students face similar difficulties as other ELL's. In a study among 6<sup>th</sup> and 8<sup>th</sup> grade Latinos, it was found that both ELL's and non-ELL's had confusion with vocabulary, but the accumulation of unknown words affected ELL's students' performance to a higher degree ([Lager, 2006](#)). [Martiniello \(2008\)](#) argued that 90 to 95% of the text must be known to the student for it to be understandable (as cited in Carver, 1994; Nagy, et al., 2000). In addition to this, language challenges go beyond the level of the word or phrase ([Schleppegrell, 2010](#)). In fact, words used in mathematics problems do not necessarily reflect the problems' structural complexity (as cited in Nesher and Teubal, 1975; Hudson, 1983) ([Adetula, 1990](#)). [Austin et al. \(1979\)](#) argued that complicated sentence constructions, long sentences, the passive voice, and conditional clauses negatively affect comprehension. [Abedi et al. \(2001\)](#) also outlined other linguistic features such as the length of nominals, relative clauses, complex question phrases, and abstract or impersonal presentations. Another researcher focused on the verb "to be" and the relational clauses they form, which may raise issues for ELL's because these structures are constructed differently in other languages ([Veel, 1999](#)). Arabic is a notable example because the verb *to be* is not generally used with the present tense meaning ([Ferguson, 1968](#)).

Although there are many hypothesized linguistic characteristics that affect performance, there is a lack of data showing which structures in particular have the greatest negative impact. One study by [Shaftel et al. \(2006\)](#) analyzed data from the United States encompassing 594 unmodified test items from a major state assessment for students in three grade levels. They found that for 4<sup>th</sup> grade ELL's and students with disabilities, ambiguous or polysemous words, mathematics vocabulary, pronouns, prepositions, and complex verbs had statistically significant negative impacts. For 7<sup>th</sup> graders, comparative terms and mathematics vocabulary had a negative effect. Finally, for 10<sup>th</sup> graders, problems aroused due to mathematics vocabulary, followed by complex verbs, which interestingly had a slightly positive effect, and then comparative phrases. In contrast to this finding, a study among 17,000 3<sup>rd</sup> grade students did not show evidence for the impact of vocabulary, passive voice constructions, subordinate clauses, and participial modifiers, but did show that item length and the type of response in the assessment had an impact ([Lord et al., 2000](#)).

In our study, we began with the list of potential characteristics that may affect reading comprehension and aimed to determine the specific word problem attributes that positively and negatively affect comprehension among the Emirati ELL university students. The instrument that was used included word problems modified in multiple ways – one presented in Arabic, a typical English textbook presentation, a simplified English version, one presented with a picture, another presented with a diagram, and lastly, a version presented with a clear Emirati context. A cohort of randomly selected students were invited to participate in personal interview surveys where different versions, or “treatments,” of mathematics word problems were presented. We collected data on whether the students were able to paraphrase and interpret the question, find the givens and unknowns, provide a solution, and explain the answer. In addition, students were asked questions on affect – how confident they were in answering the question and their anxiety levels. This presentation outlines the initial findings gathered in this ongoing research project.

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