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# Exploring English Language Learners' Performance on Online, Asynchronous Science-Based Examinations

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## ABSTRACT

This study explored the relationships between English language proficiency and performance in online, asynchronous science courses. Each participant completed a Language Background Questionnaire (LBQ) to indicate if English was not their native language, thus categorizing them as an English Language Learner (ELL). The Combined English Language Skills Assessment (CELSA) measured English language proficiency. Of 25 ELLs 13 were interviewed to elicit their perspectives of learning strategies used in an online environment. Quantitative analyses involved t-tests and Pearson's correlation among 91 participants' CELSA scores and final exam results. For non-ELL students, there were weak to moderate, positive correlations for Bacteriology 2: $r(57)=.47$, $p<.00$, Clinical Chemistry 1: $r(33)=.36$, $p=.04$, and Clinical Chemistry 2: $r(33)=.44$, $p=.01$; no other significant correlations were found. This study may inform interventions and strategies that enhance learning and performance in science-based coursework in courses taught in asynchronous, online programs for all students, particularly ELLs.

## KEYWORDS

English Language Proficiency, Online Education, Science Education, Assessment

## INTRODUCTION

The popularity of online learning has risen steadily over the past decade, accelerated by the COVID-19 pandemic (National Center for Education Statistics, 2023). The flexibility of online education has driven its growth, with many institutions expanding their virtual course and degree offerings to meet demand. While less than 25% of students were enrolled in online courses before 2012 (Hamilton & Beagle, 2024), by 2021, more than 50% were taking some online courses, and 26% were fully online.

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## English Language Learners in Higher Education

Higher education institutions are increasingly under pressure to graduate professionals prepared to address shortages in essential, in-demand fields like healthcare. According to the U.S. Bureau of Labor Statistics (2024), healthcare industry jobs are projected to grow by 16% over the next decade, adding 2.6 million new positions. As the U.S. population becomes more racially, ethnically, and culturally diverse, increasing the diversity of the healthcare workforce is vital for delivering tailored, equitable, and high-quality care (National Institutes of Health, 2022). Diversifying healthcare professions may be achieved through targeted recruitment of immigrants and international students.

Most health professional programs require proficiency in English reading, writing, math, and critical thinking skills, which can pose challenges for English language learners (ELLs). ELLs include recent immigrants from countries where English is not the primary language of instruction, international students studying in higher education institutions, and individuals from "Generation 1.5," who arrived in the United States as children or teenagers but whose parents speak a language other than English at home (Bergey et al., 2018). ELLs comprise nearly 20% of the college population (Fishman et al., 2017; Hussar et al., 2020). It is estimated that 10% of all public school students are ELLs (Hussar et al., 2020), 18% of incoming college students are non-native English speakers (Fishman et al., 2017), and international students make up approximately 5.6% of the higher education institution population (Knox, 2023). This diverse group of learners faces unique challenges, particularly in asynchronous online environments (Bogunovich, 2018).

## English Language Learners in Online Learning Environments

Previous research indicates that ELLs tend to underperform on in-person exams, partly due to English proficiency barriers (Lakin et al., 2012). Lakin et al. noted that English proficiency may negatively influence ELL performance on tests primarily intended to assess their content knowledge and skills. These challenges may be further exacerbated in science-based courses due to the complexity of the language used in teaching and assessment (Lee & Avalos, 2002). Several accommodations have been considered and implemented to mitigate these barriers and reduce the disadvantage to ELL students. Abedi et al. (2000; 2004) have extensively discussed assessment accommodations for ELLs, particularly in science and mathematics in secondary education. Kieffer et al. (2009) demonstrated that providing English dictionaries or glossaries significantly improved ELL test performance. Marinho et al. (2023) noted that English language accommodations often involve simplification, repetition, and clarification. However, the resources needed for ELLs in higher education post-matriculation remain largely unexplored (Harrison & Shi, 2016). Consequently, more research is required to determine the appropriate accommodations for ELL students in higher education.

A significant challenge of asynchronous online learning is that students must work independently without face-to-face faculty and peer interaction. Studies have shown that ELL students benefit from more interactive activities aimed at expanding their language use, particularly discipline-specific language, than their peers (Billings & Mueller, 2017). These types of learning activities may be lacking in an asynchronous online environment, creating a potential learning barrier for ELL students. Additional language-related obstacles in asynchronous online assessments may hinder ELL achievement (Andrade, 2014). For example, cultural differences and underdeveloped English skills may negatively impact ELLs' test performance, especially in science courses requiring complex language (Bogunaovich, 2018). Asynchronous online assessments also differ from in-person exams, where instructors can directly address questions, presenting further challenges for ELLs.

Current literature on ELL performance in online learning environments is limited. A practical theory of transactional distance, described by Moore (1997), highlights a pedagogical challenge that occurs when instructors and students are separated by space, time, or both. Stein et al. (2005), using Moore's theory of transactional distance, found that students' perceived knowledge gain and satisfaction increased with more opportunities to interact with instructors in distance learning environments. However, they did not evaluate assessments or ELLs specifically. Andrade (2014)