

Native and Non-Native English Speakers in an Introductory Proof-Based College Math Course

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Research on the influence of language on mathematics learning at the K-12 level (see de Araujo et al., 2018, for a review of this literature) suggests that in primarily English-speaking classrooms, perceptions of non-native English speakers as “deficient” can harm their learning of mathematics, but with appropriate supports, non-native English speakers can flourish. This study compares native and non-native English speakers’ perceptions of the effects of their language status with their performance on proof-based assessments at the university level in a course taught and assessed in English. We sought to answer two questions: (1) to what extent do non-native English speakers perceive their language background as an advantage or a disadvantage in an introduction to proof course taught in English? And (2) to what extent do assessment outcomes between native and non-native English speakers align with students’ perceptions?

Methods

Data were collected from a discrete math course focused on proofs at University of Manitoba where English was the language of instruction. Just before the end of the term, a questionnaire was sent to all students enrolled in all sections of the course. This questionnaire asked each student to indicate (Q1) whether they considered themselves a native speaker of English or a non-native English speaker and (Q2) whether they believed their English-speaker status contributed positively or negatively to their learning in their discrete math course. Respondents’ itemized final exam scores were also obtained. The final exam in the course contained 12 questions with two questions consisting of two sub-parts; we treated these sub-parts as independent questions, yielding a total of 14 questions for analysis.

Respondents were sorted into two groups: native English speakers and non-native English speakers, as indicated in their response to Q1. Each respondent was then assigned a Perception Score (PS) of -1, 0, or +1 based on their response to Q2. A respondent was assigned a PS of -1 if they indicated a belief that their language status negatively impacted their learning, a PS of +1 if they indicated a positive impact, or a PS of 0 if their response was neutral.

A *t*-test was performed comparing the PS of native English speakers against the PS of non-native English speakers. Additionally, a *t*-test was performed on each final exam question, comparing the numerical scores earned by native English speakers against those earned by non-native English speakers.

Findings

The native English speakers ($n_1 = 40$, $M_1 = 0.675$, $SD_1 = 0.616$) had a significantly higher PS than the non-native English speakers ($n_2 = 52$, $M_2 = -0.0769$, $SD_2 = 0.788$, $p < 0.001$). There was a significant difference in scores on only two questions from the final exam: Q6(a) ($M_1 = 0.363$, $SD_1 = 0.660$; $M_2 = 1.010$, $SD_2 = 1.374$, $p = 0.00386$) and Q7 ($M_1 = 6.475$, $SD_1 = 3.772$; $M_2 = 8.298$, $SD_2 = 3.365$, $p = 0.0184$); in both cases, non-native English speakers outperformed native English speakers. These preliminary results suggest that, despite perceptions to the contrary, non-native English speakers perform at least as well as native English speakers on proof-based assessments in university math courses taught in English.

References

- de Araujo, Z., Roberts, S. A., Willey, C., & Zahner, W. (2018). English learners in K-12 mathematics education: A review of the literature. *Review of Educational Research*, 88(6), 879–919. <https://doi.org/10.3102/0034654318798093>