CURRENT RESEARCH JOURNAL OF PEDAGOGICS (ISSN: 2767-3278)

VOLUME: Vol.06 Issue05 2025
DOI: - 10.37547/pedagogics-crjp-06-05-08
Page: - 35 -38
RESEARCH ARTICLE OPEN ACCESS

Psycholingutic Approach to Teaching English As A Second Language for Mathematics Students

Feruza Odilovna Djabbarova

Senior teacher, Chirchik State Pedagogical Institute of Tashkent region, Uzbekistan

Received: 24 March 2025 **Accepted:** 20 April 2025 **Published:** 22 May 2025

ABSTRAC

This article explores the linguistic challenges encountered by English as a Second Language students in mathematics education and introduces a psycholinguistic approach to mitigate these challenges by integrating principles of second language acquisition and cognitive psychology. The study employs a mixed-methods design, combining quantitative assessments of language proficiency and mathematical problem-solving with qualitative data from classroom observations and student interviews. Key findings reveal a significant correlation between language proficiency and mathematical performance, highlighting the importance of targeted language support. The article concludes with practical recommendations for educators to enhance ESL instruction in mathematics, fostering improved comprehension and academic success.

Keywords: ESL, mathematics education, psycholinguistics, language proficiency, word problems.

INTRODUCTION

Mathematics education is crucial in today's world, fostering critical thinking and problem-solving skills essential for various fields. The increasing globalization of education has led to a growing number of ESL students pursuing mathematics, highlighting the need for effective instructional strategies that address their unique linguistic needs. ESL students often face linguistic hurdles in understanding mathematical concepts and word problems [Fatmanissa & Novianti, 2022], stemming from the distinct vocabulary and grammatical structures inherent in the mathematical register [Chan, 2021]. These challenges include not only understanding technical vocabulary but also interpreting the syntax and semantics of mathematical language, which can differ significantly from everyday English. As Ling and Mahmud note, mathematics requires specific high-level thinking skills.

Psycholinguistics, the study of the psychological processes involved in language acquisition and comprehension, offers a valuable framework for enhancing ESL instruction. Purba highlights that by examining how language is processed, psycholinguistics provides insights into the cognitive mechanisms that underpin language learning (Purba, 2018). The intersection of psycholinguistics and second language acquisition provides a potent method for supporting language learning, especially when coupled with the cognitive demands of mathematical study. This interdisciplinary approach recognizes that language proficiency is not merely a tool for communication but a fundamental aspect of cognitive development and academic achievement. Recent studies show increasing interest in applying a psycholinguistic approach to language teaching Djabbarova, 2024. This article explores the application of psycholinguistic principles to improve ESL instruction for mathematics students, aiming to bridge the gap between language proficiency and mathematical achievement. By integrating psycholinguistic strategies, educators can create more inclusive and effective learning environments that support the success of ESL students in mathematics.

METHODS

To explore the complex interplay between English language proficiency and mathematical problem-solving abilities among English as a Second Language (ESL) learners, this study employed a mixed-methods research design, combining both quantitative and qualitative approaches. This methodological choice was aimed at achieving data triangulation, enhancing the depth and reliability of the findings (Creswell & Plano Clark, 2018).

Participants

The study involved 50 ESL students at the secondary level, all of whom specialized in mathematics. The participants were selected using purposive sampling from diverse linguistic and cultural backgrounds to ensure a representative cross-section. Eligibility criteria included a minimum of one academic year of continuous enrollment in an ESL program and current participation in secondary-level mathematics courses. This ensured that participants had both foundational language exposure and simultaneous engagement with mathematical content delivered in English (Hakuta, 2011).

Instruments and Procedures

Data collection employed four main tools:

1. English Language Proficiency Assessment

The English Language Proficiency Test (Mallika & Mohammed, 2024) was used to assess language competence. This standardized instrument evaluates proficiency across the four primary linguistic domains—listening, speaking, reading, and writing—offering both domain-specific and aggregate scores. The test has demonstrated strong psychometric properties in similar ESL contexts.

2. Mathematical Word Problem-Solving Test

A researcher-designed test, aligned with international mathematics curricula (OECD, 2021), was administered to assess students' ability to comprehend and solve word-based mathematical problems. The instrument emphasized both the linguistic decoding of problems and analytical reasoning, providing a direct measure of the linguistic-cognitive demands involved in mathematical tasks (Prediger et al., 2019).

3. Semi-Structured Interviews

A subset of 10 participants engaged in semi-structured interviews designed to explore their lived experiences and perceived linguistic barriers in understanding mathematical tasks. The interview guide was informed by sociolinguistic and educational frameworks (Cummins, 2000), focusing on issues such as terminology, sentence structure, and instruction clarity.

4. Classroom Observations

Structured classroom observations were conducted over a four-week period in mathematics lessons. Observers used an analytic rubric adapted from Echevarría, Vogt, and Short's (2017) SIOP Model, focusing on teacher scaffolding strategies, student engagement, and language use during instruction.

Data Analysis

Quantitative data were analyzed using SPSS. Descriptive statistics were generated, and Pearson's correlation coefficient was used to examine the strength and direction of the relationship between language proficiency and mathematical problem-solving scores. Additionally, linear regression analysis was performed to determine the predictive power of language proficiency on mathematical performance. Qualitative data—interview transcripts and observation notes—were subjected to thematic analysis (Braun & Clarke, 2006). This entailed a rigorous coding process to identify emerging themes concerning linguistic challenges, instructional accommodations, and student coping strategies. Themes were validated through peer debriefing and triangulated with quantitative findings to ensure credibility and consistency across date sources

RESULTS

The findings revealed a significant positive correlation between English language proficiency and mathematical problem-solving abilities ($r = 0.65$, $p < 0.01$). Students with higher English proficiency scores demonstrated greater accuracy and efficiency in solving mathematical word problems. Qualitative data highlighted specific linguistic challenges faced by ESL students, including difficulties with vocabulary (e.g., understanding technical terms and multiple meanings of words), grammatical structures (e.g., interpreting complex sentence structures), and the interpretation of mathematical terminology (e.g., recognizing implicit relationships expressed through mathematical symbols and notations). Classroom

observations indicated that targeted language support, such as vocabulary pre-teaching and explicit instruction in mathematical discourse, positively impacted student engagement and comprehension. Specifically, strategies such as providing visual aids, using simplified language, and encouraging collaborative problem-solving were found to be effective in supporting ESL students' learning.

DISCUSSION

The results underscore the critical role of language proficiency in mathematical performance among ESL students. The linguistic challenges identified in this study align with previous research, emphasizing the need for tailored instructional strategies [Fatmanissa & Novianti, 2022]. The application of psycholinguistic principles, such as providing explicit language support and promoting active engagement with mathematical discourse, shows promise in improving student outcomes. The study's limitations include the relatively small sample size and the focus on secondary students. Future research should investigate the effectiveness of psycholinguistic interventions across different age groups and educational settings. Moreover, longitudinal studies could examine the long-term impact of psycholinguistic interventions on ESL students' mathematical achievement. In conclusion, a psycholinguistic approach offers a valuable framework for enhancing ESL instruction in mathematics, fostering improved comprehension and academic success by moving students from informal ways of talking about mathematics [Schleppegrell, 2007]. By addressing the linguistic needs of ESL students, educators can create more equitable and effective learning environments.

REFERENCES

Chan, S.. Linguistic challenges in the mathematical register for EFL learners: linguistic and multimodal strategies to help learners tackle mathematics word problems. Asian Englishes, 23, 208-224.

Djabbarova, F. O.. PSIXOLINGVISTIK YONDASHUVNING INGLIZ TILINI O‘RGATISHDA SO‘NGGI YILLARDAGI SAMARDORLIGI TAHLILI. Academic Research in Educational Sciences, 5, 112-119. (Djabbarova, 2024)

Fatmanissa, N., & Novianti, M. N. R.. Linguistic Challenges in Solving Mathematics Word Problems: A Case of EFL University Students. Journal of English Language Teaching and Learning, 3, 114-120.

Ling, A. N. B., & Mahmud, M. S.. Challenges of teachers when teaching sentence-based mathematics problem-solving skills. Creative Education, 13, 24-38.

Mallika, S., & Mohammed, L. A.. Mathematics Through a Linguistic Lens: The impact of English Language Proficiency in Solving Mathematical Word Problems Among Secondary ESL Students. International Journal of Academic Research in Business and Social Sciences, 14, 295-309.

Purba, N.. The Role of Psycholinguistics in Language Learning and Teaching. Jurnal Bahasa Lingua Scientia, 9, 37-44. (Purba, 2018)

Schleppegrell, M. J.. The Linguistic Challenges of Mathematics Teaching and Learning: A Research Review. Reading & Writing Quarterly, 23, 139-159.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.

Cummins, J. (2000). Language, power, and pedagogy: Bilingual children in the crossfire. Multilingual Matters.

Echevarría, J., Vogt, M. E., & Short, D. J. (2017). Making content comprehensible for English learners: The SIOP model (5th ed.). Pearson.

Hakuta, K. (2011). Educating language minority students and affirming their equal rights: Research and practical perspectives. Educational Researcher, 40(4), 163–174.

Mallika, R., & Mohammed, K. (2024). English Language Proficiency Assessment Toolkit for Secondary ESL Learners. Global Academic Press.

OECD. (2021). PISA 2021 Mathematics Framework. OECD Publishing. https://www.oecd.org/pisa/

Prediger, S., Wilhelm, A., Büchter, A., Gürsoy, E., & Benholz, C. (2019). Language proficiency and mathematics achievement: Empirical evidence from a German multilingual context. ZDM–Mathematics

Education, 51(1), 57–69.