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Switching It Up: Bilingual Education Fostering Cognitive Flexibility and Math Achievement

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Switching It Up: Bilingual Education Fostering Cognitive Flexibility and Math Achievement

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Many students begin to struggle with mathematical concepts around late elementary school due to the increasing complexity and abstract density. Matthews, J. S. (2018)

Cognitive function is associated with math achievement. Code switching is a cognitive process that helps people with comprehension with concepts that use different areas of the brain—for example images and numbers Matthews, J. S. (2018), Duval, R. (2006)

Bilingual education promotes cognitive flexibility as people use code-switching to switch between languages, Bialystok 2001; Christoffels, 2015

Research question:
Does the cognitive flexibility that is gained through bilingual education translate into math achievement?
Does the cognitive flexibility that is gained through bilingualism translate into math achievement

Method

The Woodcock-Muñoz Language Survey was used both in English and in Spanish in order to test the children’s proficiency in their language.
The Bivalent Shape Task

Mediation effect of BST in the relation between Language Program and Math EOG

Math Scores
• Math End Of Grade (EOG) exam scores- 4TH grade standardized math test

Results

Two mediation models were examined.
The first examined whether Cognitive Flexibility mediated the relation between Language Program and Math Performance.
Language Program predicted Math Performance.
Language Program predicted Cognitive Flexibility.
Cognitive Flexibility significantly mediated the relation between Language Program and Math Performance such that those in the dual-language education program showed better cognitive flexibility that explained the higher math scores.
The second examined whether Cognitive Flexibility mediated the relation between Bilingualism and Math Performance.
Bilingualism did not significantly predict Math Performance or Cognitive Flexibility; thus, mediation was not examined.

Discussion

Not all contexts of bilingualism are sufficient to significantly affect executive function.
Learning and engaging in multiple languages within the environment of dual-language classrooms develops the students’ cognitive flexibility.
Future studies should include how bilingual education promotes diversity and if this would affect the achievement of minority students.
These results supported that cognitive flexibility gained through bilingual education translates into math achievement.

Key references