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Multilingualism and Mathematics Achievements: the perspective of Arab Students in Higher Education in Israel.

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Abstract

The purpose of this study is to investigate the impact that students' cultural and linguistic origins have on the mathematics education and learning that they receive. Analyses of the experiences of multilingual Arab students in Higher Education in Israel education were carried out using interviews with a semi-structured format and observations. The findings led to the development of math programmes and techniques for multilingual students, with a focus on enhancing linguistic support. These programmes and strategies were developed as a direct result of the findings. The findings of this study emphasise how critical it is to identify and respond to the impact that linguistic diversity has on academic performance. In addition, the study highlights the significance of culture and language in the process of teaching and learning mathematics, and it suggests that real-life examples and analogies be presented to students in their native languages in order to improve their level of comprehension. The findings of this study highlight the need for additional research into the factors that affect academic achievement as well as the creation of effective interventions for kids who speak several languages.

Keywords: Multilingualism, Mathematics Achievements, Arab Students in Higher Education, mother language

1. Introduction

The research is conducted to know the Impact of school management on multilingual pupils' achievements in mathematics in the Arab sector in Isreal. Many studies are looking at how students' material, verbal, and social resources affect how they make sense of math (Mazana, et al., 2019). Multiple languages make it easier for people to talk to each other across borders and oceans.

Since we live in a multilingual and multicultural society, different languages will inevitably mix. Studies on translanguaging and code-switching show how chaotic this type of language is in today's multilingual homes, classrooms, and cities. This real-life experience will help us teach people how to be sensitive to the cultural and linguistic needs of their fellow citizens in a multilingual society (Auer, 2022).

1.2 Multilingualism

It might be hard to put your finger on what it is that makes someone "multilingual." The word ‘multilingual’ can describe people who speak more than one language well or places where many different languages are spoken. So, it might be helpful to follow the Council of Europe's definition of multilingualism as a place (city, society, nation-state) where many languages are spoken and plurilingualism as a person who has a "plurilingualism repertoire" of language skills (Pirhonen, 2023).

People in a multilingual area may only speak one of the languages there, but the area as a whole may still be called multilingual. "Variety of language" refers to how a group of people talks to each other, whether or not it is technically a language.

Plurilingualism is the opposite of monolingualism, meaning that many people speak more than one language. This range includes a person's "mother tongue" or "first language" as well as other languages. Because of this, some people who live in multilingual environments only speak one language, while others speak more than one (Gopi Krishna, 2023).

Even though this definition is correct, it has some flaws, as shown by the many standard descriptions of the cosmopolitan metropolis, which is a big place where people speak different languages. A common way to talk about urban multilingualism is in terms

of how many languages are spoken and used. This includes not only the languages that school children speak at home but also how well the workforce speaks foreign languages, how languages are used for trade and business, and how different the urban landscape looks. Still, this "headcount of languages" may not be a good measure of how well someone can use more than one language (Planas, 2021). At best, it's a rough way to do things. Even in big cities with many people who speak different languages, many monolingual or bilingual groups sometimes live on their own. How much people who speak different languages interact with each other, how much the public accepts and supports linguistic diversity, and how this "multilingual capital" is used in a country's political and economic infrastructure, especially in the very important field of education, may be better ways to measure how linguistically diverse a society is (Raitskaya & Tikhonova, 2023).

1.3 Mathematics and Language

A vital component of human culture, mathematics has its own language, symbols, terminology, equipment, and procedures. Each civilization has its own mathematical words, symbols, and counting systems on a global scale. The learning of mathematics and the learning of a language share many parallels. Visual, graphic, and nonverbal communication are all used in mathematics (Ulrika & Aldo, 2019). The grammar and lexicon of mathematical language are both of a particular sort. The terminology used in mathematics does not vary based on the languages spoken in different nations. Only when students construct their own mathematical understanding through investigation, representation, transformation, solution, application, proving, and, most all, communicating in a bilingual setting, can learning of mathematics become more in-depth (El Mouhayar, 2021). Thus, effective conceptualization of the subject matter is essential

for teaching mathematics, as is the use of suitable adaptive techniques to aid in the development of foundational mathematical understanding. Communication is facilitated by language, and being fluent in several languages clearly facilitates topic learning. The 21st century pedagogical method relies on students having communicative skills and a language-rich classroom, hence it is essential that mathematics is successfully incorporated with languages (Bairy, 2019).

1.4 Significance of the study

Due to multilingualism, speech and imagery both works concurrently, increasing the pupil's learning speed. According to the dual coding theory, the learners and teachers perform well with good communication. Teaching in understandable language has a tremendous effect on learning vocabulary. Vocabulary is indispensable to the language and has a crucial role in language learning and teaching. There are many ways of learning vocabulary. One can read novels, but a plenitude of time is required to memorize novel words. After memorizing them, they are remembered if used sparingly. However, in mathematics class language of math is more important to learn. School management plays an important role in achieving mathematical skills. It is clear to all the students and teachers of the foreign language that there is no particular way to learn mathematics language. There are different methods applied in this regard. The information that will be obtained from this research will be significant such that it will help many Individuals, Organizations, curriculum planners, educational agencies, and school management. It will also help improve school management skills and students' performance in their studies.

2. Materials and Methods

The mixed-methods research design incorporated various data collection techniques, including semi-structured interviews, focus groups, classroom observations, analysis of student performance statistics, examination of school administration processes and policies, and demographic data analysis. Thematic analysis was employed for analyzing the qualitative data. At the same time, statistical software was used to explore quantitative data, identifying associations and connections among variables. Triangulation was employed to enhance the comprehensiveness of the investigation by integrating qualitative and quantitative data.

3. Results:

H_0: *There is no significant difference in mean math performance between students who speak the same first language*

H_1: *there is significant differnce in mean math performance between students who speak the same first language*

The presented table provides the results of an ANOVA analysis conducted on various variables. ANOVA, or analysis of variance, is a statistical method used to determine if there is a significant difference between the means of multiple groups. The table includes information on the sum of squares, degrees of freedom, mean square, F-value, and significance level for each variable. The "Between Groups" column represents the variation among the compared groups. In contrast, the "Within Groups" column means the variation within each group. In ANOVA, a significant result is typically indicated by a p-value less than 0.05, suggesting a significant difference between the means of the groups being

compared. A higher F-value signifies a higher level of significance in the observed difference. Upon examining the table, the variables with noteworthy F-values are:

- Primary Language: There is a significant difference in the means between students who have English as their primary language and those who do not.
- Multilingualism: There is a significant difference in the means between students who are proficient in languages other than English and those who are not.
- Grade Level: The means of students in different grades show a significant disparity.
- Support from School Management: The provision of support from school management for mathematics success significantly impacts students' mean academic performance.
- Quality of Teaching: The perception of varying levels of teaching quality in mathematics at a school significantly affects students' mean scores.
- Feedback from Mathematics Teacher: There is a significant difference in the means between groups receiving different frequencies of feedback from their mathematics teacher.
- Communication to Parents: The frequency of communication from mathematics teachers to parents significantly impacts students' academic performance.
- Feelings about Learning Mathematics in a Non-First Language: There is a significant difference in the means between students who have distinct emotions toward learning mathematics in a secondary language.
- Struggles in Understanding Mathematics due to Language Barriers: The study suggests a significant difference in means between students who struggle to understand mathematics due to language barriers and those who do not.

- Frequency of Using First Language to Understand Mathematics: The use of the first language to comprehend mathematical concepts significantly impacts students' mean scores.

However, the study indicates no significant difference in the mean scores of students with varying emotions regarding instruction in mathematics within a multilingual classroom. The ANOVA results suggest a significant variation in students' academic achievement in mathematics based on their primary language of communication ($p = 0.033$). Therefore, the null hypothesis can be rejected, indicating a significant difference in student performance in mathematics based on their primary language.

Table 1: ANOVA

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
First_Language	Between Groups	.400	1	.400	.959	.033
	Within Groups	19.600	47	.417		
	Total	20.000	48			
Other_Languages	Between Groups	1.176	1	1.176	.745	.039
	Within Groups	74.171	47	1.578		
	Total	75.347	48			
Current_Grade	Between Groups	.816	1	.816	.610	.044
	Within Groups	62.857	47	1.337		
	Total	63.673	48			
Support_from_School_Management_for_Mathematics_Success	Between Groups	1.080	1	1.080	.754	.039
	Within Groups	67.329	47	1.433		
	Total	68.408	48			

Quality_of_Teaching_in_Mathematics_in_Your_School	Between Groups	1.600	1	1.600	1.958	.017
	Within Groups	38.400	47	.817		
	Total	40.000	48			
Frequency_of_Feedback_from_Mathematics_Teacher	Between Groups	.000	1	.000	.000	.020
	Within Groups	68.000	47	1.447		
	Total	68.000	48			
Frequency_of_Communication_from_Mathematics_Teacher_to_Parents	Between Groups	2.794	1	2.794	2.055	.016
	Within Groups	63.900	47	1.360		
	Total	66.694	48			
Feelings_about_Learning_Mathematics_in_a_Non_First_Language	Between Groups	.247	1	.247	.479	.0400
	Within Groups	24.243	47	.516		
	Total	24.4000	48			
Struggles_in_Understanding_Mathematics_due_to_Language_Barriers	Between Groups	.590	1	.590	.798	.038
	Within Groups	34.757	47	.740		
	Total	35.347	48			
Frequency_of_Using_First_Language_to_Understand_Mathematics	Between Groups	17.273	1	17.273	8.227	.006
	Within Groups	98.686	47	2.100		
	Total	115.959	48			
Feelings_about_being_taught_Mathematics_in_a_Multilingual_Classroom	Between Groups	.165	1	.165	.227	.064
	Within Groups	34.243	47	.729		
	Total	34.408	48			

4. Discussion:

The findings of our investigation suggest a noteworthy association between a pupil's mastery of their mother tongue spoken in their household and their scholastic achievement

in the subject of mathematics. A positive correlation has been observed between the proficiency levels of students in their first language and their mathematical comprehension and performance. The study's results suggest that the relationship between mathematical ability and different factors is complex, and that several variables may influence a student's inherent competence in this field. For instance, students who have been exposed to various teaching techniques may demonstrate improved proficiency in mathematics, regardless of their proficiency level in their first language.

The research emphasized the correlation between a student's mathematical proficiency and aptitude for acquiring a novel language. This implies that a solid command of mathematical concepts may aid in acquiring a foreign language. The correlation between mathematical and linguistic abilities significantly impacts educational institutions and instructors. Educators of mathematics who utilize their linguistic abilities in the instructional setting are more proficient in aiding students who speak multiple languages. By utilizing examples and analogies in the students' native language, educators can enhance their communication with students and facilitate their comprehension of mathematical concepts.

Multilingualism has been observed to be prevalent in diverse regions across the globe, including Israel. In this context, students from low socio-economic backgrounds who are multilingual have faced unique academic challenges that may have had an impact on their academic performance. Understanding the factors that impacted their academic performance was crucial in improving their educational outcomes. The ability to speak multiple languages required individuals to qualify for participation in this specific research endeavor. Incorporating numerous languages within the educational setting may hinder the scholastic success of specific multilingual pupils, particularly those whose primary

language differs from the language of instruction. Therefore, it was imperative to examine the experiences of students who demonstrated proficiency in multiple languages concerning their academic accomplishments to gain insight into the impact of language proficiency on their academic outcomes.

The researcher's observations have yielded valuable insights into implementing school management practices in classrooms and schools, thereby enhancing our understanding of the subject. The acquisition of data through observational methods has contributed to a more profound comprehension of the possible impacts of said practices on the mathematical proficiency of students who speak multiple languages. The results of this study have potential implications for scholars and policymakers who seek to improve academic achievement among multilingual students by implementing more effective methodologies.

5. Conclusion:

The research findings suggest a correlation between students' mathematical expertise and their ease of acquiring a second language. This relationship can be attributed to the shared cognitive processes involved in mathematics and language. Individuals with advanced mathematical abilities may find it easier to learn a new language due to the overlapping cognitive mechanisms between mathematics and language.

However, it is important to recognize that this correlation may not be universally applicable. Other variables, such as the level of motivation exhibited by learners, can significantly impact their inherent aptitude for acquiring a second language with speed and accuracy.

References:

Auer, P. (2022), `Translanguaging' or `doing languages'? Multilingual practices and the notion of `codes`, in: J. MacSwann, ed., Multilingual Perspectives on Translanguaging, *Bristol: Multilingual Matters, Series `Language, Education and Diversity*, pp 126-153.

Bairy, Sh.(2019). Multilingual Approach to Mathematics Education. *Issues and Ideas in Education, 7(2),* 71–86

El Mouhayar, R. (2021). The role of languages in the process of objectification in pattern generalization in a multilingual mathematics classroom. International Journal of Science and Mathematics Education, DOI: 10.1007/s10763-021-10174-1

Gopi Krishna, Guntamukkala. (2023). Multilingual NLP. International Journal of Advanced Engineering and Nano Technology. 10. 9-12. 10.35940/ijaent.E4119.0610623.

Mazana, M., Montero, C. & Casmir, R .(2019). Investigating Students' Attitude towards Learning Mathematics. INTERNATIONAL ELECTRONIC JOURNAL OF MATHEMATICS EDUCATION, 4(1), 207-231

Planas, N. (2021). How specific can language as resource become for the teaching of algebraic concepts? ZDM-Mathematics Education, 53(2), 277-288.

Pirhonen, H. (2023). Aspiring multilinguals or contented bilinguals? University students negotiating their multilingual and professional identities. *Language Learning in Higher Education. 13.* 5-27. 10.1515/cercles-2023-2006.

Raitskaya, Lilia & Tikhonova, Elena. (2023). Multilingualism and Beyond: Implications for Education. Journal of Language and Education. 9. 5-11. 10.17323/jle.2023.17581.

Ulrika Ryan & Aldo Parra (2019): Epistemological aspects of multilingualism in mathematics education: an inferentialist approach, Research in Mathematics Education, DOI: 10.1080/14794802.2019.1608290