

Math Lexical Aptitude of the Arabic Speaking EFL Sophomores

Amani Eseid Abuzied¹

Department of Mathematics,

University college of Aldayer, Jazan University, Saudi Arabia

ABSTRACT

This study gauges the mathematics lexical aptitude of the Arabic speaking EFL sophomores as college students who had their math in Arabic language at school. The study presumes that, the mostly numeric constituent of math and relatively limited lexical content, should enable faster L1-L2 transition and less language barriers. Hence, applying this math numeric-lexical association as a factor of enhancing and expediting Arabic-to-English shift, a sample of 19 Arabic speaking EFL sophomores is taken. The method used in the study is a devised test of two columns for the sophomores to match; one containing worded math terms and phrases, and the second containing numeric items, i.e., values, formulas, geometric shapes. Supposedly the sophomores must have enough math knowledge and skill that enable them to easily match the two columns correctly from their secondary school background especially after they have already “anglicized” it in the math course(s) they studied as freshman college students. This study concludes that the Arabic speaking EFL sophomores don’t reflect the expected Arabic-to-English shift as expected despite the math numeric-lexical association.

Keywords: Lexical aptitude, Sophomores, math, word, problems, numeracy.

1. INTRODUCTION

What a huge transformation it is shifting from numbers such as: [٤٣٢١] to others as completely different as 1, 2, 3, etc.! Not only that, but also shifting from orthographic right-to-left text direction to the Roman left-to-right text order. Unfortunately, a lot of Arabic speaking EFL learners had or still living this disparity. The irony is that, the second set is globally recognized to be the “Arabic numbers”, while first set of numbers round up to an Indian origin. How or why the Arabs abandoned their own numbers? Well, actually the Arabs did not have any, they just used to quantify in letters rather than in figures. The first introduction of figures is scribed to an Indian astronomer who arrived at the court of the Abbasid Caliph A-Mansur in 771 AD. That Indian scientist known as Siddhanta, introduced a book on astronomy and mathematics” that was authored by a scientist named Brahma Gupta, and it happened to be written in the numbers “١ ٢ ٣ ٤ ٥ ...” On the other hand, the quote, “math is mother of sciences” which is ascribed to Carl Friedrich Gauss, does not seem to be a hyperbolic statement. This especially true when it is within the context of two different languages. Generally speaking, the Francophone Arabs of North Africa were earlier to re-embrace the genuine Arabic numbers as a result of the colonial influence. Otherwise, only recently have the rest of Arab countries considered abandoning the Indian numbers and shifting to the Arabic numbers. Today and throughout the 1990s and 2000s more Arab countries are returning to their native numbers and many educational systems. The latest to do so, was Qatar which officially announced the re-adoption of the Arabic numbers in 2023. In Sudan though, the process was gradually induced in school textbooks through the early 1990s. The impetus behind this massive return to the original Arabic numbers, as some believe, is attributed to the revival of Arab nationalism and pan-Arab sentiments.

Statement of the problem

Whether not the students who are graduates of all-Arabic schools are necessarily ready for digesting college math textbooks and lectures in English language, is not a question with a yes/no answer. However, this question can be narrowed down by assuming that, these Arabic speaking school leavers enjoy a good mastery of math from school. Now the question becomes whether or not mastering the “numeric” language of math necessarily means mastering the math word-problems. The query this

way takes the argument to the math numeric-lexical junction. Meaning, it is about how numerically mastering math in L1 would impact learning math linguistically in L2, in terms of pace as well as depth.

Significance of the problem

The particularity of the Arabic EFL environment of 22 societies as one of the least in terms of embracing English language, raises several English language learning and teaching. The majority of the educational systems including the higher education in this region of the world, are still in the native Arabic tongue and text. The transition from school to college for the school leavers of this region therefore, is not expected to be that smooth; no matter how intensive the preparatory year (PYP) programs' English language share might be. Highlighting this English language learning and teaching issue through the perspective of mathematics therefore, can contribute and be of help to addressing the whole problem.

Purpose of the study

The purpose of this study is to gauge the math lexical aptitude of the Arabic speaking EFL sophomore college students who are graduates of all-Arabic schools and have done 2 years in college. The study examines the students' familiarity with the basic math English terms & phrases and whether their school numeric math background is of any enhancing and/or expediting factor in the Arabic-to-English shift. This investigation therefore involves ensuring the validity of the gauging instrument; numeric test items as well as basicness of the lexical ones, as well using the relevant pedagogical, linguistic, cognitive and analytical instruments.

Study questions

- Does mastering math in L1 necessarily enhance/expedite learning it in English?
- Is a satisfactory level of English proficiency tantamount to math lexical aptitude?
- Should English math be addressed in the college preparatory year programs?

LITERATURE REVIEW

Examining the relationship between math scores and English language proficiency, is whole study by Walden University researchers Nistor & Baltes (2012). The researchers found that, students' mathematics and their English proficiency are inversely proportional with grade level. Grade level moderates the influence of English proficiency on mathematics scores. Gender and SES have no significant moderating influence. Even though, the study was conducted among school graders who are native, yet establishing this correlation, may have some findings to draw in the ESL and EFL contexts. A more relevant examination is by Kieffer et al (2009) who studied the children of immigrants who were born in the United States in 2009, to establish this math-Lounge variance compared to their "born and bred" American counterparts. Now that Kieffer supports the idea of the students being low in English proficiency experiencing more difficulties on mathematics assessments, this finding maybe of significance to the ESL and EFL contexts. This is exactly the topic a study by Alwanah (2019) who examined the process by which non-English speaking students, whose first language is Arabic, learn mathematics in English. The study confirms the presence of learning difficulties/language barrier, and in bridging the English-Arabic among a great deal of the students. Assessing the response of bilingual Arab students to pre-calculus word problems in English language, is the subject of a paper by the researchers Yushau, Omar & Alaimia (2016). The key finding of the study is that. Word problems represent a challenges for nearly two-thirds, and perceived with disinterest for the majority of the students. Whereas, Swan (2018) who specifically studied the impact of vocabulary on numeracy attempted to interpret the lexical-numeric factor saying it is because there is nothing such as fully numeric math, and only a small portion of questions are presented without any words at all. According to him math vocabulary constitutes a great deal of English vocabulary and this explains English proficiency-math proportionality. Even further, a whole literature review on mathematics vocabulary intervention for students with mathematics difficulty, is dedicated by

Lariviere, Arsenault & Payne (2024). The reviewed literature wide coverage included a majority studies with dual foci on vocabulary and other mathematics content, including whole number computation, word problem solving, fractions, algebra, or geometry. Several findings were drawn from the reviewed literature including that six (6) instructional practices across studies bolstering the math vocabulary performance of students with mathematics difficulty. The study as points out to corrective teaching practices such a including formal vocabulary use, explicit instruction, use of representations, repeated exposures, pre-teaching, and graphic organizers.

Theoretical framework

In situations where English is the foreign (EFL) language, even the basic arithmetic terms such as plus, minus, multiplication table, etc.; represent essential area of literacy that some EFL learners may lack. This linguistic-cognitive connection was proposed by researchers such as Sharma (1981) who conjoins the mathematics, cognitive and perceptual skills. Hence, the math lexical aptitude can widely range from the basic arithmetic terms to the more demanding match word-problems solving and as deep as domain of the advanced applied math. Furthermore, in mathematics

This study proposes that, the numeric form of math problems are much of "hints" or bridges for such low proficiency sophomore to overcome English language barriers. This is especially true with the learners who had a sufficient dosage of math in their L1 and then most likely have studied more s PYP freshman and more sophomores

2. METHOD

It is a small size sample, mainly quantitative method of data collection that uses lexical-numeric math test in surveying the EFL participants' aptitude in this area. The test is developed from the Global Proficiency Framework for Mathematics or the (GPF) framework which itself was developed by the UNESCO Institute of Statistics (UIS) besides several other organizations. It namely adopts GPF Framework's Minimum Proficiency Level Descriptor (6) in devising the test items. Thus, the devised short test includes 10 English math lexical items (terms & phrases) presuming that the surveyed Arabic speaking EFL sophomore are familiar with from their 2-year college programs.

Participants

The participants in this study are 19 sophomore students of an all-English Saudi university. As per Montori, Keitz & et al (2004) peer review the minimum sample size that require statistics is 19. The participants are all male students who had studied math in Arabic language at school, and then as sophomore students, studied at least one math course in English language. The sophomore students had finished their 8th or 9th semester when they volunteered to take the test in November 2024; thus, their ages range between 19 and 24. The participants' school math knowledge –as per the Saudi secondary school curricula, covers all the sub-fields of math including algebra, analytic geometry, trigonometry and calculus.

The instrument

The 10-item test is given in a two-list format for the participants to match. The main list; List A, includes 10 math lexical items od terms and phrases. While the second List B, includes 10 numeric representations of the main list, i.e., algebraic values, equations, and geometric figures. The participants are asked to match the two lists by filling in the matching number from List B in the space given besides List A. The time set for the students to finish the test, even though they were just told to do it as fast as possible, is maximum 10 minutes. The two lists of the test are shown below:

List A

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

$\frac{1}{2} + \frac{2}{3} + \frac{1}{6}$		$2.7844 = 2.785$	$\sqrt[3]{y}$			$\frac{\Delta v}{\Delta t}$	$\neq$	$N \Rightarrow M = b^N$	$x = \frac{1}{y^{-2}}$
---	--	------------------	---------------	--	--	-----------------------------	--------	-------------------------	------------------------

List B

	Term/phrase	Match
	Cubic root of the variable	
	Transversal line of two parallel	
	Radius across the circumference	
	Numerator and denominator multiplied by coefficient	
	Rounding to the 3rd decimal	
	Greatest common factor among fractions	
	Supplementary angle of a scalene triangle	
	Permutations	
	Bisecting a sector	
	Acceleration	

3. RESULTS AND DISCUSSION

3.1. Results

RESULTS

Table 1. Students Test Score

Score Intervals	Category	Frequency	Percentage (%)
90-100	Very High	2	10.52%
80-89	High	6	31.58%
65-79	Medium	7	36.84%
55-64	Low	3	15.78%
0-54	Very Low	1	5.26%

An overview on the results shown in Table (1) above, highlights the Medium category of score as the highest at 36.84%, followed by the High category at 31.58%. Whereas, the Very High category score recorded as low as 10.52%. Thus, the overall degree of lexical aptitude averages 34.21%

3.2. Discussion

The overall “medium to high” level of math lexical aptitude the sophomores have shown; averaging 34.21%, is unsatisfactory. This is because the sophomores have undergone math classes both as a separate subject and as part of the other college programs they have enrolled and studied. Even if some of 19 sophomores were weak in math back in school, they necessarily have taken and passed math course exams in their junior year. This disparity can be interpreted by referring to the argument by Al-Mahrooqi & Denman (2018) that the math curricula mostly contain more numeric than word math problems, and that most of the math teachers avoid assigning them. Therefore, these sophomores must have been exposed to limited math lexical items and this reflected in their scores. This is besides the fact noted by Daroczy, Wolska., et al (2015) that math word problems can be rich with themes from all the walks of life and this requires bigger vocabulary size and wider vocabulary diversity. Also, in connection with the argument by Alawneh (2019), that the level of English proficiency in the context of the Arabic speaking environment, the rate “high” is a relative matter that should be taken as between Intermediate and Beginner by the internationally recognized Standardized Test for English Proficiency (STEP) such IELTS leveling.

On the other hand, the bottom and top scores of the sophomores are of some noteworthy points. Having 2 or 10.52% out of the 19 sophomores scoring very high, is indicative of the validity of the test reset and that the math terms and phrases are supposed to be within the gist of the sophomores of the sophomores. This being said, the overall “level of math lexical aptitude is still unsatisfactory and the missing points in the score of these two sophomores would have resulted in losing heavier had they been in the context of math word problems. This is because as Montori, Keitz & et al (2004) emphasize, in other math-related such as physics, finance, engineering, etc., the math-cognitive aptitude is inseparable from the math-lexical pair. It cannot therefore be ruled out that the poor math lexical aptitude is behind the overall poor academic performance of the Arabic speaking college students and not only in English language.

4. CONCLUSION

It is evident that and despite the math numeric-lexical association at one hand, and the sophomores’ mathematical background, this doesn’t seem to enhance or expedite their Arabic-to-English shift satisfactorily. This conclusion maybe attributed to several factors, among which is the common one that all EFL Learners everywhere share: which is the limited exposure to math word-problems both at school and at their freshman period. Another factor that may exclusively pertain to the Arabic speaking EFL sophomores is the limitedness of exposure to English language at all, due to limited the limited popularity of this language in environment as well as its radical differences to English.

ACKNOWLEDGEMENTS

Author thanks In most cases, sponsor and financial support acknowledgments.

REFERENCES

- [1] Alawneh, H.I. (2019). Arabic Speaking Students' Experiences in Learning Mathematics in English. Full text available on ERIC Number: ED601568. Dissertation, Wayne State University. Front Psychol 2015 Apr 1;6:348. DOI: [10.3389/fpsyg.2015.00348](https://doi.org/10.3389/fpsyg.2015.00348)
- [2] Al-Mahrooqi, R., & Denman, C. (2018). Issues in English Education in the Arab World. PDFs No. 978. Cambridge Scholars Publishing. First Published 2015, at Lady Stephenson Library. <https://www.cambridgescholars.com/pdfs-978>.
- [3] Dominnquez, M., Viera, M., & Vidal, J. (2012). The impact of the Programme for International Student Assessment on academic journals. Assessment in Education Principles Policy & Practice 19(4):1-17. DOI: [10.1080/0969594X.2012.659175](https://doi.org/10.1080/0969594X.2012.659175)
- [4] GAMI Org (2018). Global Proficiency Framework for Mathematics. UNESCO Organization. Sites 2/2021/03/ <https://gaml.uis.unesco.org/wp-content/Framework-Math.pdf>
- [5] Lariviere, D., Arsenault, T. & Payne, B. (2024). Literature review on mathematics vocabulary intervention for students with mathematics difficulty. School Science & Mathematics. DOI: [10.1111/ssm.12684](https://doi.org/10.1111/ssm.12684)
- [6] Montori, M., Keitz S. & et al (2004). Tips for learners of evidence-based medicine: Measures of precision confidence intervals. CMAJ 2004; 171:611–5. DOI: [10.1503/cmaj.1031667](https://doi.org/10.1503/cmaj.1031667).
- [7] Nistor, M., & Baltes, B (2012). Examining the Relationship Between Math Scores and English Language Proficiency. journal of Educational Research & Practice; Vol. 4, Issue 1. Walden University. DOI: [10.5590/JERAP.2014.04.1.02](https://doi.org/10.5590/JERAP.2014.04.1.02)
- [8] Swan, P. (2018). The impact of vocabulary on numeracy. U.S. Department of Education (.gov). Cited at: <https://files.eric.ed.gov/fulltext>

- [9] Yunus A., et al. (2004). Mathematics and Language. Journal of the Korea Society of Mathematical Education Series: Research in Mathematical Education 8.1 (2004): 31-37.
- [10] Yushau, B., Omar, H., & Alaimia, R. (2016). Assessing the response of bilingual Arab students to pre-calculus word problems in English language. KFUPM University, Dhahran, Saudi Arabia.
<https://faculty.kfupm.edu.sa/MATH/files/wordproblemdraft2.pdf>.