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Illustrated English Language Dictionary and Students' Achievement in Mathematics in Sharjah School in UAE

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Abstract **Original Research Article**

This logical study examined the influence of illustrated English language dictionary on students' achievement in mathematics in Sharjah school in UAE. The principal study utilized a quasi-experimental research design. A sample of 120 respondents out of 240 target population were selected using Sloven's formula. The researcher employed sampling strategies like simple random sampling and cluster sampling techniques to garner data for the research study. Data was collected using prior knowledge test, pre-test, post-test and motivation survey tools which were applied for the control and the treatment group. Data was analyzed using inferential statistics, independent t-tests, paired sample t-tests and statistical product service solutions with the significance level below 0.05 .The research study findings came up with a significant correlation between illustrated English language dictionary and students' achievement in mathematics in Sharjah School in UAE. It was therefore concluded that the dictionary contains various activities through which students are trained to predict new information from the given information, which has contributed to the development of their level of awareness of relationships. The program encouraged students to organize and sequence symbolic verbal treatment, which contribute to the development of their mathematical proof skill. The systematic research study recommended that the Student teachers in Universities and Colleges should be trained to deal with illustrated English dictionary system in their training institutions so that this can act as an impetus to improved students' learning in many subjects including mathematics.

Keywords: Illustrated English dictionary, Students, Mathematics achievement, UAE.

INTRODUCTION

In the United States, teaching foreign languages is a scientific and life necessity, as it is an urgent need and a basic requirement in contemporary life, which is witnessing a major information revolution as a result of advances in communication technology (Oneil, 2017). This has contributed to dissolving the barriers between people and cultures, and made the world a small global village that interferes with each other, just as learning foreign languages helps cultural openness to the world and helps to keep abreast of the technological and scientific development taking place in the world (Abdurrahman, 2020). Moreover, global developments in the current era impose on people contact and dialogue with each other. All of this would increase the importance of teaching and learning foreign languages.

Although it is difficult to attribute the students' poor performance to any one factor, researchers have demonstrated that students with limited proficiency in the English language often misinterpret mathematical principles, axioms, and theorems (Vukovic & Lesaux, 2018). Consequently, educators are concerned that students' lack of English language proficiency could prevent mathematics instructors from effectively teaching for English language learners (ELL) (Ministry of Education, Jamaica, 2017) because it could prevent students from effectively understanding the instruction and concurrently interfere with the students' ability to communicate with the instructor (Ngu & Phan, 2020).

Vukovic and Lesaux (2018) stated that language affects how students interpret mathematical ideas. Results from this study showed that method of human communication, knowledge, and skills gained over time are essential for mathematical development regardless of language. These findings indicate that ELL learners need more thorough and focused opportunities for developing an understanding of

mathematical principles and concepts of pivotal importance. Zhu, Chen, Moyzis, Dong, and Lin (2015) suggested that language proficiency is an important aspect in educational accomplishments; additionally, mathematical competence is fundamental to educational attainment.

Henry and Baltes (2022) have shown that language effects the teaching and learning of mathematics. Sociocultural theory encourages the teaching of mathematics around students' cultural identities, which makes mathematics accessible to those who have traditionally had difficulty learning the subject. If mathematics reforms and other jurisdictions are to benefit students who are linguistically and politically different from the majority, research should be carried out that will assist in understanding the relationship between human communication and mathematics teaching (Chitera *et al*., 2021). The researcher combined current views of mathematics scholarship with current thinking on how to use classroom communication, mastery in more than two languages, and written or spoken communication about instructors' experiences while teaching foreign languages..

METHODS AND MATERIALS

Data Capturing

Data was garnered while utilizing prior knowledge test, pre-test, post-test and motivation surveys which were applied for the control and the treatment group. Ancillary information was collected with the use of documented reviews. The scholar came up with a total of 120 respondents (sample size) while using Slovens formula to belong to the research investigation.

Sampling Techniques

The scholar used simple random sampling and cluster sampling techniques to collect information from the respondents for the research scientific study. The study target population involved the groups like students, teachers, parents and school administrators.

Research Instruments

In this search several tools were used, including: The Prior Knowledge Test, the Pre-Test, the Post- Test and the Motivation Survey. The prior knowledge test will be given first and later the pre-test and post-test before and after the intervention is applied for the control and the treatment group.

Reliability and Validity

Validation of the Instruments

The researcher reviewed all the research tools that included the prior knowledge test, the pre-test, the post test, and the illustrated dictionary strategy before giving it to three experts who have been working in a school as: Curriculum coordinator and assistant principal, Head of mathematics department and Social worker and Psychotherapist senior.

The three experts use the American Curriculum Specifications in the ninth and tenth grades. The California Curriculum Specifications (CCSS) is used as a validation standard for all instruments used in the research, as it has been adopted locally in the United Arab Emirates and internationally in many countries of the world. There are also many studies that confirm its validity and stability.

These experts were requested to support and examine the language, learning objectives, students' level of mathematical thought, lucidity of the questions, difficulty level of questions and the appropriateness of the content. Answer schemes for the pre-test and post-test also were provided to the validators to ensure that the answer form is appropriate for the questions.

Validity

Content Validity

i) Pre-test and Post-test

The validity of the instrument was gained with the support of the high school mathematics experts. Three experts who were experienced in teaching mathematics for more than 16 years were chosen to check Validity of the instruments. Since the test was taken from the exercise and work book. The experts validated the questions in the test and verified that they were according to the learning objectives of grade ten of the Mathematics Syllabus (American curriculum). Two forms of validation, the pre-test and post-test with their respective answer scheme were validated. The form was prepared with the learning outcome that was tested in the pre-test and post-test instrument. Each learning outcome was followed by a scale of 1 to 10. The experts circled the scale after validating the pre-test, post-test and the answer scheme provided for both pre-test and post-test. The content validity form was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20. The forms were validated, and the index for agreement measurement indicator was verified using Cohen Kappa. Table 1 shows how the value of K in Cohen Kappa is interpreted.

Table 1: The K value in Cohen Kappa (Altman, 1991)

Value of *K*	Strength of agreement
< 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good
0.81 - 1.00	Very good

Note: An adaptation from Altman DG (1991). *Practical statistics for medical research. London: Chapman and Hall*

ii) The illustrated dictionary

The experts also evaluated the illustrated dictionary. They studied all the learning outcomes for each lesson constructed based on the curriculum

specification for mathematics grade ten. The experts also evaluated the illustrated dictionary according to the lesson plan.

The experts made sure that each learning outcomes for the control and treatment group covered the content of the right triangles and trigonometry concept. The lesson plan was provided for the treatment group and also for the control group. They made some adjustments on the lesson plan especially for the control group since it was too simple. The illustrated dictionary was reconstructed again.

Reliability

The internal consistency in answering the questions was studied and the value of the Cronbach's alpha was compared. Table 2 shows the Internal Consistency Index that was obtained from the pilot test.

Table 2: Reliability Index

Cronbach's alpha	Internal Consistency
$\pm 0.70 - 1.00$	Excellent
$\pm 0.30 - 0.69$	Moderate
$\pm 0.00 - 0.29$	Weak

Note. An adaptation from Jackson S.L, (2003). Research Methods and Statistics: A Critical Thinking Approach, USA: Thomson Wadsworth

Depending on the Internal Consistency Index, the pre-test and post-test got the internal consistency. Based on Jackson (2003), instruments with high alpha Cronbach ratings of more than 0.7 can be accepted on the basis of reliability.

Data analysis

Data in this research was combined in the form of marks from the pre-test and post-test. This analysis is used to check the significance difference between the treatment and control group. All analysis was conducted using the Statistical Product and Service Solutions, with the significance level below 0.05. Data was further analyzed using; inferential statistics, independent t-tests, and paired sample t-tests.

RESULTS

Relationship between illustrated English language dictionary and students achievement in mathematics.

Table 3 below shows behavioral procedural objectives of the knowledge and skills associated with the tenth-grade mathematics book in UAE.

Table 3

No	Objective
1	Use special triangles to determine trigonometric ratios geometrically.
2	Use trigonometric functions to find missing side lengths.
3	Use trigonometric functions and the Pythagorean Theorem to find missing side lengths.
4	Identify trigonometric identities.
5	Explain trigonometric identities.
6	Find the measures of an angle in standard position.
7	Find the measures of an angle in standard position and its reference angle.
8	Use degree measure on the unit circle to find arc length.
9	Use radian measure on the unit circle to find arc length.
10	Convert between degrees and radians.
11	Use reference angles and triangles to evaluate trigonometric functions.
12	Use reference angles and triangles to evaluate trigonometric functions and their reciprocal functions.
13	Use the Pythagorean Identity to find the sine, cosine, and quadrant of an angle.
14	Graph the sine and cosine functions.
15	Graph and identify the key features of sine and cosine functions.
16	Compare key features of different periodic functions.
17	Describe and compare key features of the graphs of trigonometric functions.
18	Graph functions of the form f(x) = a tan bx and relate the graph of a function to the graph of the form f(x) = tanx
19	Identify the key features of tangent functions.
20	Identify how changing the parameters of the sine or cosine function affects the graph
21	Identify how changing the parameters of the tangent function affects the graph
22	Use trigonometric functions to model situations with specified amplitude, frequency, and midline.

In order to verify the validity of the list of objectives and link it to the test vocabulary, it was presented in its initial form to a group of specialists in the field of educational technology, curricula and teaching methods for approval. The opinions of the arbitrators agreed to make some modifications, including:

- Modifying some wording of procedural goals such as the verb (recognize) to not being measurable and replacing it with the verb (define).
- Transferring some goals from one level of knowledge to another in the list of goals such as the act (clarify) moving from the level of (application) to the level of (understanding).
- Elimination of some repetitive phrases in the formulation of some goals.

After making adjustments to the list of goals, the arbitrators, experts and specialists, were distributed among the educational units, with each unit having its associated goals.

Table 4 below shows the results of the control and experimental groups in mathematics achievement.

Table 4:

	Group	N	Mean	Std. Deviation
plan1	experimental	30	3.07	.868
	control	30	3.13	1.024
plan2	experimental	30	4.70	.794
	control	30	4.00	1.033
draft1	experimental	30	2.77	1.104
	control	30	2.84	1.267
draft2	experimental	30	4.47	1.042
	control	30	4.10	1.165
edit1	experimental	30	2.683	1.1780
	control	30	2.839	1.1135
edit2	experimental	30	4.567	1.1198
	control	30	3.710	1.2634

The two groups' results in the achievement

The results of the previous table 4 above, can be displayed as follows:

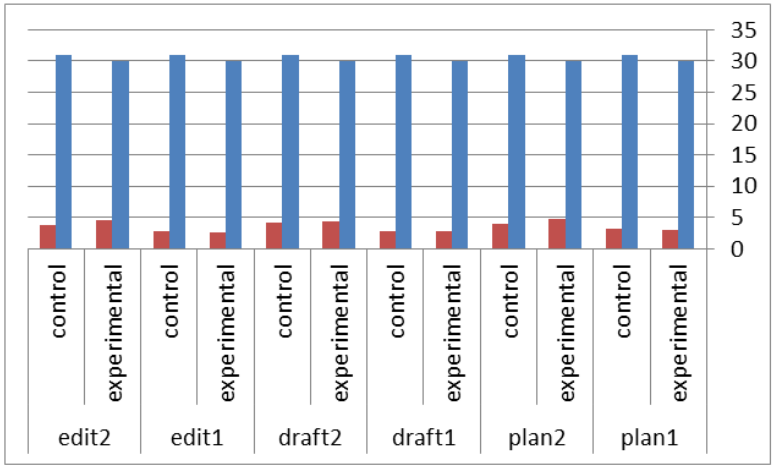

Figure 1: The difference between the mean scores of the study sample as a whole in the cognitive achievement test in mathematics

In Table 4 the scores obtained in all the achievement in the post-test exceed those scored in the pre-test. This implied that the difference between the means of the control group and the experimental group might appear to be slight and consequently giving an indication of the ineffectiveness of illustrated dictionary in teaching achievement as a foreign language. However, there are many factors such as language mastery in interpreting mathematical concepts that might change this opinion and add to the effectiveness of illustrated English dictionary.

Table 5: The mean differences among the achievement in the pre-post tests

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference
plan1	Equal variances assumed	.558	.458	-.256	59	.799	-.062
	Equal variances not assumed			-.257	58.006	.798	-.062
plan2	Equal variances assumed	2.080	.155	2.960	59	.004	.700
	Equal variances not assumed			2.973	56.174	.004	.700
draft1	Equal variances assumed	.557	.458	-.236	59	.814	-.072
	Equal variances not assumed			-.237	58.370	.814	-.072
draft2	Equal variances assumed	.017	.896	1.306	59	.197	.370
	Equal variances not assumed			1.308	58.641	.196	.370
edit1	Equal variances assumed	.425	.517	-.530	59	.598	-.1554
	Equal variances not assumed			-.529	58.530	.599	-.1554
edit2	Equal variances assumed	1.009	.309	2.800	59	.007	.8570
	Equal variances not assumed			2.806	58.557	.007	.8570

In Table 5 the scores obtained in all the achievement in the post-test significantly exceed those scored in the pre-test. This suggested that there is a significant correlation between illustrated English language dictionary and student achievement in mathematics. The Mean Difference achieved in editing in the post-test is the biggest difference (.86). The Mean Difference achieved in drafting in the post-test is the smallest difference (.37). Therefore, the stated null hypothesis was not supported. There is no significant difference between the mean scores of the control group students' performance and the treatment group students' performance in mathematics before any intervention is implemented. This hypothesis was rejected implying that there is a significant relationship between illustrated English language dictionary and student achievement in mathematics in Sharjah School in UAE.

DISCUSSION

The discoveries showed that the association between illustrated English language dictionary and students achievement in mathematics was statistically significant in Sharjah School in UAE. This inferred that the illustrated English language dictionary really affects the students' achievement in mathematics.

This finding was in agreement with the schoolwork conducted by Abdurrahman (2020) on Factors influencing students' performance, who found out that the use of language dictionaries helps boost performance of learners in all fields.

However, these results are in opposition to a widespread study conducted by Ngu &Phan (2020) on problems on Trigonometry studies who found out that studying and passing mathematics can be considered to be a talent in itself.

CONCLUSION

The students played an active role through the illustrated dictionary, as under the program they are undertaking the process of arriving at a general rule (result - theory - law) by studying a number of mathematical problems and extracting the common feature between them, i.e. reaching from generalities to specifics. The dictionary contains various activities through which students are trained to predict new information from the given information, which has contributed to the development of their level of awareness of relationships. The program encouraged students to organize and sequenced symbolic verbal treatment, which contributed to the development of their mathematical proof skill. Therefore, there is a significant relationship between illustrated English language dictionary and student achievement in mathematics in Sharjah School in UAE.

Implications for the study

Methods of teaching English as a foreign language in general and Writing skills to solve mathematical problems specifically, should be modified by ministry of education in UAE so as to cope with the recent advanced educational technology especially those that are implied in the illustrated English dictionary System.

Student teachers in Universities and Colleges should be trained to deal with illustrated English dictionary system in their training institutions so that this can act as an impetus to improved students' learning in many subjects including mathematics.

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