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Word and Sentence Power: How Much Does It Matter In Mathematical Problem Solving

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Abstract

English language skills are perceived to be inversely correlated with mathematics proficiency. This forethought attunes with the traditional perception on language and mathematics education which is the locus of this study. In particular, word order and basic sentence patterns are specific language skills which in this study are investigated for significant influence on the mathematical problem solving proficiency of the first year secondary teacher education students of Nueva Vizcaya State University- Bambang Campus, Bambang, Nueva Vizcaya. This educational endeavor which made use of descriptive design and involved 44 respondents disclosed the level of proficiency of the respondents in the three factors which form vertices of the triangle of focal variables: word order, basic sentence pattern and mathematical solving skills. Significant relationship transpired between the two language skills in here cited and significant influence of both language skills on mathematical problem solving proficiency. These results urged more relevant reading activities to enhance the respondents' language skills; the use of various task-based activities; use of outcomes-based education in the English and Mathematics subjects; and other researches for the improvement of the language skills and problem solving skills of students.

Keywords: Word order skills; Basic sentence pattern skills; Mathematical problem solving skills; Secondary teacher education

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Introduction

Times and the world have changed as globalization has expanded men's horizons In today's global society, second language skills have become vital to the learners' future as members of the workforce and to the nation's future success. Language is the primary means by which people communicate with and relate to each other. It is informative, and serves as the channel for learning new concepts and gaining knowledge. It is expressive of ideas and feelings. It is also a formative force. Identities, territories, personal and social spaces are determined by language.

Learners achieve fluency in a foreign language primarily within the confines of the classroom. The English classroom provides training in many aspects of language skills development. The concept of pattern is one of the essential principles of English language teaching. Specifically, it speaks of the basic sentence patterns and grammatical structure in which Filipino students should do well in order to understand, speak and write English well. Learners should know them thoroughly and make sentence according to the basic sentence patterns.

Another advantage of being able to recognize sentence patterns is that they can serve as a guide for writing or as a checklist for revising. You are not expected to follow these patterns slavishly, but when you choose to break a pattern, you should be making a conscious choice based on your reader's needs and your purpose in writing. The changes or breaks that you make in the patterns should not be oversights or errors. Understanding the sentence patterns will also help you understand the logic of English sentences and lead you to a better understanding of style, usage, and punctuation.

Word order is another important aspect of the English language. It is the arrangement of the words in parts of segments to convey meaning. It gives significance to the features of form that operate as the devices of structural meaning. English has relatively fixed word order. Word order is important in English sentences. Since sentences do not have many endings on nouns, pronouns, and adjectives to indicate how they function in a sentence, word order and sentence patterns are being relied on more heavily than other more highly inflected languages. Being able to recognize the sentence patterns will help one to be a better writer and a

better editor of his own writing.

Having word order and sentence pattern mastery brings forth competence in many aspects of pedagogy. Mathematics learning particularly on problem solving is one among subject areas whose requisites include linguistic competence. Does word and sentence power matter in improving mathematical problem solving skills?

Word problem is an integral part of the Mathematics curricula. However, students face difficulties in solving mathematical word problems as most of the time they do not comprehend the wording of the problem.

Mathematics problem solving can be broken down into two problem solving processes, problem representation and problem solution. As viewed by Mayer (1985), problem representation includes two steps: problem translation and problem integration; while problem solution involves solution planning and solution execution.

In schools, proficiency in mathematics skills are necessary for students to demonstrate performance on high stakes tests, successfully show progress on benchmark formative assessments, and achieve passing grades in course work required for graduation and eligibility for higher education. In the long term, adequate mathematics skills are needed to manage personal finances in adulthood and compete for employment in increasingly technical labor markets. These requirements constitute particularly high barriers for students who experience extreme difficulties learning and performing in mathematics.

Throughout the 20th century, education has been important in building the knowledge of the student in the concept of mathematics. The role of educational institutions is to address the needs in preparing students to acquire the knowledge, skills and training for them to be a part of shaping our country's economy and improving the social conditions relevant to our present and future needs. Educators play a vital role in developing these students and must look for or find a way to improve the performance of students.

With the foregoing concepts, the researcher embarked on this study entitled "Word and sentence power: How much do they matter in mathematical problem solving?" hence focused on the word order and basic sentence pattern skills among BSED freshmen and how these constructs may have influenced their mathematical problem solving skills.

Objectives of the Study

The findings of this study may provide some bases for considering innovations in the curriculum that will certainly contribute to the effectiveness of teaching English language and mathematics. Further, this study may give firsthand information on the current status of the learners' strengths and weaknesses in language skills particularly word order and basic sentence pattern skills. With this information, they will be guided in streamlining efforts and limited resources and restricting the curriculum, particularly the English and mathematics program.

This research aimed at obtaining information on the proficiency of the freshman secondary teacher education students of Nueva Vizcaya State University, Bambang, Nueva Vizcaya, in two language skills particularly word order and basic sentence patterns. It further aimed at unveiling possible relationship between these two variables as well as how they may correlate with mathematical problem solving skills.

Specifically, it endeavored to seek answers to the following questions:

1. What is the respondents' level of proficiency in word order and basic sentence patterns?

2. What is the respondents' level of proficiency in mathematical problem solving?

3. Does significant relationship exist between the respondents' proficiency in word order and their proficiency in basic sentence patterns?

4. Do the respondents' level of proficiency in basic sentence and word order influence significantly their level of mathematical problem solving skills?

Methodology and Procedure

This study was conducted through the use of descriptive research, using an examination as a research instrument to generate data on the proficiency of the BSED freshmen students in writing basic sentence patterns and word order.

The research was conducted at Nueva Vizcaya State University, Bambang Campus, Bambang Nueva Vizcaya, involving 44 student respondents from both sections of Bachelor of Secondary Education freshmen who are enrolled under the College of Teacher education at Nueva Vizcaya State University during the school year 2014-2015.

The questionnaire and the examinations were personally administered to the students. The help of the teacher handling the subject was sought to ensure unbiased results.

Forty-four 44 were considered from the total of BSED 1A and 1B classes taking 25.88% of the total population sufficing the Central Limit Theorem which stipulates that data extracted from at least thirty (30) respondents would assume normal distribution. Randomization was then used to identify the specific respondents. The names of BSED 1A and 1B were arranged alphabetically and every 4th student in the list was selected as respondent (k=4).

To determine the proficiency in basic sentence patterns and word order, the respondents were made to write the correct order and identify the five basic sentences patterns through a 40-item examination adopted from Broko (2012). The test and questionnaire have undergone expert validation and test-retest to establish validity and reliability.

After checking the papers and tabulating the respondents' proficiency in word order and basic sentence patterns, as well as their level of mathematical problem solving skills through a questionnaire that dealt on their proficiency on problem representation and solution, means were determined. Significant relationships were then tested using t-test.

Means were used to identify the proficiency of the respondents in basic sentence patterns, word order, and mathematical

problem solving. To reveal significant relationship between the proficiency of the respondents in basic sentence patterns and word order, Pearson correlation coefficient (r) was used, while coefficient of determination was used to figure out the influence of the proficiency of the respondents in basic sentence patterns and word order on their mathematical problem solving skills.

Results and Discussion

This section presents the result of the study including analysis and interpretations. The organization of this part follows the sequence of the specific problems advanced in the research problems stated earlier.

Respondents' levels of proficiency in word order and basic sentence patterns

The respondents' proficiency in word order is described by the mean equivalent to 9, which is qualitatively interpreted as satisfactory. This mark is relatively higher than the respondents' proficiency in basic sentence patterns which is attributed to the lower level of difficulty it entails. This language skill speaks of the arrangement of words in a sentence which can vary meanings intended to be revealed in a communicative process. Shows the frequency and percentage distribution of respondents in terms of their proficiency in word order **Table 1.**

The arrangements of words somehow depend on the structure of the sentence. Further, this skill pertinent to sentence construction are among those which the second language learners find challenging.

Table 2 shows the frequency and percentage distribution of respondents in terms of their proficiency in basic sentence patterns Table 2.

The respondents' proficiency in basic sentence patterns is described by the mean equivalent to 7, which is qualitatively interpreted as poor. Skills pertinent to sentence construction are among those which the second language learners find challenging. A sentence is a group of words that are put together to mean something. A sentence is the basic unit of language which expresses a complete thought. It does this by following the grammatical rules of syntax [1] which may be challenging to second language learners like the respondents of this study.

Table 1 Frequency and percentage distribution of respondents in terms of their proficiency in word order

Score	Frequency	Percentage	Verbal Description
17-20	0	0	Excellent
13-16	8	18.18	Very Satisfactory
09-Dec	11	25	Satisfactory
05-Aug	21	47.73	Poor
01-Apr	4	9.09	Needs Improvement
Total	44	100	
Mean	9		Satisfactory

Table 2 Frequency and percentage distribution of respondents in terms of their proficiency in basic sentence patterns.

Score	Frequency	Percentage	Verbal Description
17-20	0	0	Excellent
13-16	3	6.82	Very Satisfactory
09-Dec	7	15.91	Satisfactory
05-Aug	26	59.09	Poor
01-Apr	8	18.18	Needs Improvement
Total	44	100	
Mean	7		Poor

Respondents' level of proficiency in mathematical problem solving

Data pertinent to the respondents' level of proficiency in mathematical problem solving were based on how the respondents' perceive their skills in two problem solving processes: problem representation and problem solution **Table 3** presents the summarized data which spoke of the respondents' mathematical problem solving skills.

The table provides that there are more students who fall below the average level with 32 respondents taking 72.73% of the total number of respondents. Only 10 are on the average level and 2 above the average level or 22.73% and 4.54% respectively. These finding shows that the respondents are generally deficient in mathematical problem solving which is supported by Fuchs & Fuchs (2002) who disclosed that solving mathematical word problems, in particular, is an area of great difficulty for students. Table 3.

In particular, the BSED students in this study displayed difficulties in problem representation which includes problem translation and problem integration; and in problem solution which involves solution planning and solution execution as supported by Mayer (1985), [2] Problem representation refers to the ability to translate the language that is imbedded in mathematics word problem into a coherent internal representation, indicating that the solver has understood the problem; while problem solution involves planning, monitoring, and execution of the mathematical computation.

Relationship between the respondents' proficiency in word order and their proficiency in basic sentence patterns

Table 4 shows the statistics of the test of relationship between the proficiency of the respondents in basic sentence patterns and their proficiency in word order [3].

Table 3 Frequency and percentage distribution of respondents in terms of their proficiency in mathematical problem solving.

Level of Proficiency	Frequency	Percentage
Above Average	2	4.54
Average	10	22.73
Below Average	32	72.73
	44	100

Table 4 Test of relationship between the proficiency of the respondents in word order and their proficiency in basic sentence patterns.

Variables	Computed r	*p*-Value
Word Order Proficiency and	0.5869	>0.0001*
Basic Sentence Patterns' Proficiency		

Table 5 Influence of the proficiency of the respondents in basic sentence patterns and their proficiency in word order on their level of mathematical problem solving skills.

Mathematical Problem Solving Skills Vs.	Pearson r	r2 (%)	Computed t	Critical t
Word Order Proficiency	0.6568	43.14	5.6445*	2.019
Basic Sentence Pattern Proficiency	0.3458	11.96	2.3882*	2.019

The computed correlation coefficient is equal to 0.5869 which corresponds to a *p*-value equivalent to 2.8228E-05 which is apparently less than the critical P value of 0.05. This means that the null hypothesis is rejected; hence, there is a significant relationship between the proficiency of the respondents in basic sentence patterns and their proficiency in word order Table 4.

These two language skills as closely related to each other. If the language learner is proficient in word order which gives focus on what meaning should be brought out and given emphasis, he tends to be proficient as well in basic sentence patterns which speak of the skeletal structure of the sentence. The patterns of sentences are based on the key words which can stand independently to consist the sentence form.

Relationship of respondents' levels of proficiency in basic sentence patterns and word order on their level of mathematical problem solving skills

To unveil significant influence of word order and sentence pattern skills of respondents' on their mathematical problem solving proficiency, the coefficient of determination was computed and presented in **Table 5**.

The computed Pearson-r values, considering the analysis of correlation of word order proficiency and basic sentence pattern proficiency with the mathematical problem solving skills of respondents, are 0.6568 and 0.3458 respectively which correspond to coefficients of determination equal to 43.14% and 11.96% which both values indicate significant influence of both variables on the mathematical problem solving skills of respondents. This suggests that high proficiency in linguistic skills like word order and basic sentence patterns means high proficiency in problem solving skills in mathematics [4-6].

This finding runs parallel with the many studies which have shown that pupils 'failure on word problem solving is due to a lack of linguistic knowledge. According to Hegarty, Mayer and Monk (1995) two distinct paths are used by students while comprehending text: the direct translation approach and a problem model approach. The former rely on key words rather than forming mental representations of the problems. What research has found is that if students are asked to rely solely on knowing certain key words it can actually detract them from trying to understand the problems [7,8] Key words can cause confusion in differentiating between everyday language and mathematical language [9,10]. Therefore, the task of comprehending word problems is critical and represents the threshold to successful solutions [11].

Conclusions and Recommendations

This research aimed at obtaining information on the proficiency of the freshman secondary teacher education students of Nueva Vizcaya State University, Bambang, Nueva Vizcaya, in two language skills particularly basic sentence patterns and word order and how they correlate with problem solving skills.

After careful investigation and handling of data collected and organized under this study, the following questions were derived:

1. The respondents' proficiency in word order is qualitatively interpreted as satisfactory while their proficiency in basic sentence patterns is described as poor.

2. Most of the respondents have proficiency in mathematical problem solving described as below average.

3. There is a significant relationship between the proficiency of the respondents in word order and their proficiency in basic sentence patterns.

4. The respondents' level of proficiency in basic sentence patterns and word order influence significantly their level of mathematical problem solving skills.

Recommendations

After having unveiled significant findings in this study, it is recommended that:

1. The BSED freshmen who served as respondents of this study may embark on more reading activities which can help them enhance their skills in identifying and using the basic sentence patterns and word order;

2. The language teacher may prepare various task-based activities which can expand the interest of students in sentence construction which is a requisite of more complex skills like essay writing, extemporaneous speaking, film analysis, and even solving word problems;

3. The supervisor or administrator of the College of Teacher Education may consider outcomes-based education in the English and Mathematics subjects so as to encourage students to make use of the language and numbers in authentic situations which can be considered their best learning experience;

4. Other researches may be conducted considering some other dependent or independent variables to unveil possible differences or relationships which may look into the improvement of the language skills and problem solving skills of students.

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