

Research Article

Language Proficiency and Academic Performance in Science: Basis for Developing Intervention Activities

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Abstract: This research paper was conducted with the aim of determining the language proficiency of the students particularly in syntax and semantics and level of academic performance in Science subject, and the significant relationship between language proficiency and academic performance of the students. Descriptive-Quantitative Method has been utilized in this study to analyze and interpret the results. Researcher-made test was used to gather data. To interpret the data, Pearson-r moment of correlation was utilized to determine the significance of the hypothetical problem of the study. The findings revealed that the language proficiency of the students in terms of syntax and semantics is on beginning level leading to the hypothesis that there is significant relationship between the level of language proficiency and academic performance in science. The results signify that linguistic proficiency affects the academic performance of the students in science subject. In this regard, both teachers in English and Science subject could create tasks and activities where they can let the students master both skills in language use and knowledge in science. More so, integration of tasks is proposed to let the students accomplish more than one competency for both learning areas.

Keywords: Language Proficiency, Academic performance, Intervention Activities, Integrative Tasks, Communication.

Introduction

Nowadays, English has been regarded as a medium of communication. In every aspect of society, English is used in most of human undertakings like business transactions, telephone calls or even face to face conversations, media and advertisements, court trials and proceedings and other aspects of man's life. In most of the countries in the world, they consider English as a second language which is very essential in terms of globalization as it plays a very important role in connecting with people.

Communication is one of the skills required by the 21st century generation which are expected to meet the demands of the fast changing world. According to Applied Educational Systems (n.d.) Communication, critical thinking, creativity and collaboration, are the skills in the 21st century education. Communication is defined as an act of posing and stating ideas smoothly and clearly. Thus, a person must be knowledgeable enough in using language effectively and efficiently in order for them to perform and survive in the challenges of the present generation.

Ho (2014) pointed out that effective communication must consider the purpose on the part of the students why they are communicating. There is a need to give emphasis on the 21st century competencies. Likewise, it is also important to note the function of language in constructing meaning and view communication as an interactive activity. Effective communication will occur if both the

listener and the speaker comprehend and understand the message being conveyed. This is true on the part of students and teacher of any subject/learning area he/she is teaching using English as a medium of instruction.

In the Philippines, English has been part of the instruction and introduced in the schools from primary to higher level of education. Based on the Executive Order No. 210-Establishing The Policy To Strengthen the use of the English Language as a Medium of Instruction in the Educational System, it was cited under Sec. 7, Article XIV of the 1987 Constitution that:

“...strengthening the use of the English language as a medium of instruction also depends on the improvement of the entire educational system, particularly in the training of educators and the provision of learning materials and resources...”

Moreover, section 1.b, declaration of policies of the aforementioned Executive Order 210, it was mentioned that:

“As provided for in the 2002 Basic Education Curriculum, English shall be used as the medium of instruction for English, Mathematics and Science from at least the Third Grade level.”

Science is one of the subjects being offered in the basic education curriculum. Scientific concepts and theories are presented logically and comprehensively using English as a medium in all of the materials used and instruction in teaching the subject. Most of the students are complaining about the complexity of the subject since it requires different experimentations and observations which also need to be documented using the English language.

According to Ho (2014), Science is a field of study that requires facts as we consider its different aspects. There is a need for a person to know how to observe occurrences, formulate hypothesis to test what you have observed based on the facts gathered, and use the result of hypothesis testing to modify one's idea. Furthermore, in teaching, there is a need for the teacher to help the students to construct their own idea that would suffice the need for an answer on a specific question. In addition, the student should also learn how to deal and present arguments in a logical manner. Through posing effective communication, even if as a science teacher, the students would be knowledgeable enough on the rules of reading as well as in writing, speaking and cognition. This could be a way in order for the teachers to be aware of what is to be considered because the main goal is to help the students specifically those who are not that good in English particularly in grammar and comprehending meanings. In linguistics, the area where grammar would fall is syntax and semantics for comprehending meanings.

Nordquist (2019) said that syntax in linguistics focuses on the rules wherein the words are combined to form phrases, clauses and sentences. It gives idea to the language user on how to construct grammatically correct language. Meanwhile, Linguistic semantics has been considered as a field that focuses on how languages organize and express meanings. In addition, Ladusaw (2019) pointed out that semantics includes different field of language study: how words and fundamental concepts and ideas are provided by language which is termed to be lexical semantics and how each content of the sentence structure creates meaning to be understood as these are integrated on each other.

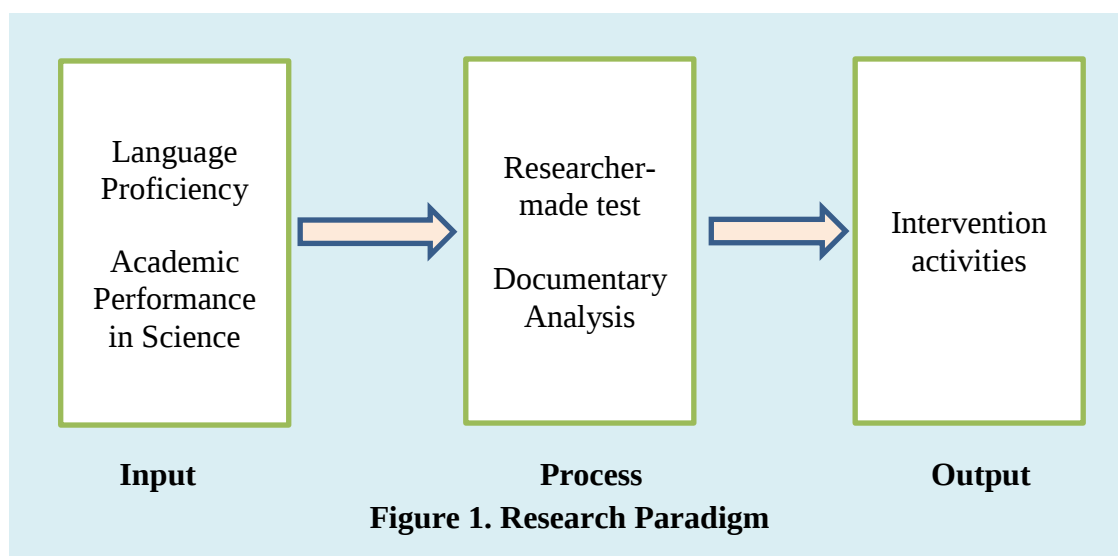
As claimed by Jacob *et al.*, (2013), English language proficiency has a significant relationship with their performance in different academic learning areas. Academic area like Science really needs the understanding of the language use since it would make their learning more effective where it plays an important role in different learning opportunities of a child. Thus, if a student could master English language, it would be easier for him to maximize understanding of different academic learning area. However, Brucat *et al.*, (2017) said that most of the students are still complaining with

the complexity of language use particularly in comprehending structures and meaning. This condition leads for them not to perform well in most of their tasks. In spite of the fact that there so many innovations in teaching the language, most of the students still find it hard to use the language effectively especially for those non-native speakers of the language. This situation of language learning is the same with the students of Baybayin National High School where some of the students still fail to communicate well not only during English classes but also in some other classes where English is used as a medium of instruction.

In connection with this, the researchers wanted to assess whether the student's language proficiency could affect their academic performance in science. Specifically, the researchers aimed to know the level of language proficiency of the students in terms of syntax and semantics and level of academic performance in science subject of the respondents.

Hypothesis testing was focused on the significant relationship between the language proficiency and academic performance of the students in science. Particularly, the null hypothesis is, There is no significant relationship between language proficiency and academic performance of the students. Furthermore, the result of the study can be the basis of the teachers in teaching language and science effectively.

Research Paradigm



This research used the IPO model. The language proficiency and academic performance are the inputs. A researcher-made test was used to determine the level of the language proficiency and documentary analysis of the grades of the students in science was used in determining the level of academic performance of the students. Whatever the result of the assessment is, that could be the basis for proposed intervention activities and that will serve as the output of the study.

Methodology

This part presents the research design, the materials used, and the target population of the study and the statistical treatment of data.

Research Design

The study made use of descriptive method of research. McNeil (2018) mentioned that descriptive research is a methodology which is not intended solely for market researchers but also a method which could be utilized in researches related to healthcare, psychology, and education. As what is given by its essence, it sought to explore and to define the features and other aspects of the target respondents. Usually it is considered in describing both qualitative and quantitative data.

Instruments Used

The main source of data was a researcher-made test which was validated by experts. The instrument is composed of 40 item test questions about language, 20 questions for grammar which could measure students' proficiency in syntax and another 20 items for vocabulary which could measure students' proficiency in syntax. For students' academic performance, the recorded average of the student's grade in science was considered likewise.

The proficiency scale as stated in DepEd Order No. 73, series of 2012 or the Guidelines on the Assessment and Rating of the Learning Outcomes under the K-12 Basic education Curriculum was utilized to determine the level of linguistic proficiency and academic performance of the students. The scale is shown in the table below:

Scale	Level of Proficiency
90 and above	Advanced
85-89	Proficient
80-84	Approaching Proficiency
75-79	Developing
74 and below	Beginning

Participants of the Study: The total population of Grade 10 students in Baybayin National High School with a number of 210 students was considered.

Statistical Treatment: Statistical tools used were frequency and Pearson r moment of correlation.

Frequency: A distribution of frequencies is a tabular representation of the data set used to organize and summarize the data. In particular, it is a list of either qualitative or quantitative values that a variable takes in a data set and the number of times each value is associated with it (Lavrakas, 2008).
Pearson r moment of correlation: This type of non-parametric statistics is based on ranks of the observations and requires the data to be correlated in an ordinal scale for ranking to be applied (Tolentino & Tenorio, 2013).

Results and Discussions

This part presents interpretations, analyses, and data about the linguistic proficiency level, level of academic performance and the result of hypothesis testing.

Level of Language Proficiency

This section presents data about the language proficiency of the students for both syntax and semantics.

Table 1. Language Proficiency of the students in terms of Syntax and Semantics

Level of Proficiency	f	
	Syntax	Semantics
Advanced	0	0
Proficient	2	6
Approaching Proficiency	10	5
Developing	18	35
Beginning	180	164

It can be gleaned on the table that out of 210 students, for syntax, 180 students are on the beginning level, 18 students are on developing level, 10 are on the approaching proficiency level and only students are in the proficient level and none on the advanced level. Meanwhile for semantics, there are 164 students are on the beginning level, 35 in developing level, 5 in approaching proficiency

level and 6 in proficient level. Thus, the students' level of language proficiency is on the beginning level for both syntax and semantics. This means that students find it hard to perform well which are related to structure of the language and meaning of the language used.

Level of Academic Performance

Table 2. Level of Academic performance of the students

Level of Proficiency	f
Advanced	19
Proficient	53
Approaching Proficiency	56
Developing	64
Beginning	18

As shown in the table, the students' level of academic performance is on developing level since it got the highest frequency where there are 64 students fell on this level. Also, there are 19 students who are in advanced level, 53 in proficient level, 56 in approaching proficiency and 18 in the beginning level.

Relationship between Linguistic Proficiency and Academic Performance of the Students

Table 3. Significant Relationship between Language Proficiency and Academic Performance of the Students

Mean of Language Proficiency	Mean of Academic Performance	r-value	Description	P-value	Decision	Verbal Interpretation
Syntax 67.94	81.83	0.418	Moderate Correlation	2.66E-10	Reject Ho	Significant Relationship
Semantics 67.76		0.515	Moderate Correlation	1.31E-15	Reject Ho	Significant Relationship

As shown on the table presented, the mean level of the language proficiency in syntax and semantics is 67.94 and 67.76, respectively. Meanwhile, the mean level of the academic performance is 81.83. The computed r-value for syntax is 0.418 and 0.515 for semantics, verbally interpreted as both in moderate correlation. The computed p-values are less than 0.05 level of significance which led to reject the null hypothesis. Thus, there is a significant relationship between language proficiency and academic performance of the students in science subject. This means that language proficiency affects the academic performance of the students in Science because students' knowledge on structure and meaning of a language plays a vital role in comprehending different processes explained through English language.

Moreover, students also use English language in writing and note taking of observation during scientific experiments. More so, English language is also used in explaining how the processes were done in specific activities to explore ideas. The results of the study coincide with the idea of Racca and Lasaten (2016) in their research where they found out that language proficiency is significantly related with their Science academic performance.

The results indicated that students with high English language proficiency tend to perform, as well, in Science. In addition, the results of the study is in consonance with the study of Brucal *et al.*, (2017) about linguistic performance of the students and academic performance where it was revealed that there is significant relationship between the two variables.

Intervention Activities in Teaching English and Science

Since the researchers found out that the students' language proficiency affects their performance in science, intervention activities are proposed to effectively cater their difficulties in language used and at the same time make their understanding and performance of science concepts be enhanced. These intervention activities include integrated exercises for both English and Science by considering its content and learning competencies as stated in the curriculum guide given by the Department of education.

Activity 1: The Eruption of Modals and Pronouns

Topics Covered

English: Modals, Reflexive and Intensive Pronouns

Learning competency/ies:

- ✓ Observe correct grammar in making definitions (different forms of modals, reflexive and intensive pronoun) (EN10G-IIa-d-29)

Science: Light

Learning competency/ies:

- ✓ describe the distribution of active volcanoes, earthquake epicenters, and major mountain belts; (S10ES – Ia-j-36.1)
- ✓ describe the different types of plate boundaries; (S10ES –Iaj-36.2) and
- ✓ describe the possible causes of plate movement(S10ES –Iaj-36.5)

In this activity, the students will be asked to watch a video clip about Plate Tectonics. The following link may be used <https://www.youtube.com/watch?v=RA2-Vc4PIOY> and <https://www.youtube.com/watch?v=ZTRu620bIsE>. After watching the clip, the students will write 5 sentences using modals, reflexive and intensive pronouns. The sentences should all be about describing the relationship among the locations of volcanoes, earthquake epicenters, and mountain ranges.

Activity 2: AOR-Approval, Objection and Reflection

Topics covered

English: Adverb of Affirmation and Negation

Learning competency/ies:

- ✓ Use words and expressions that affirm or negate (EN10G-IIe-28)

Science: Light

Learning competency/ies:

- ✓ predict the qualitative characteristics (orientation, type, and magnification) of images formed by plane and curved mirrors and lenses(S10FE-IIg50)

Below is an essay about Light and its importance. Fill in the blanks with appropriate adverb of affirmation and negation to complete the thought of the selection.

The importance of Light

_____, natural light, daylight, is a source of life. _____ light, life is not possible; it is _____ that, without light, animal and human life would not even exist. _____, we believe that humankind's greatest invention was fire. Fire as a source of heat, as a source of protection and, above all, as a source of light. Fire's light allowed us to have longer days and, thus, to control our surroundings. And fire, strictly as light, emerges in Pre-history and lasts until Edison, only 137 years ago.

From the late 1800 to date, light sources have _____ evolved and have been able to improve our comfort in a spectacular way: at home, at work, in leisure, and everywhere else. Thus, we can _____ that artificial light has allowed us to work, to live, and, _____, to enjoy time periods that, otherwise, it would be _____ for us to take advantage of. Still, we are fully

aware –and it is scientifically proved– that natural light is a better option for most human activities than artificial light, health wise. But, at the same time, it is also _____ that daylight lasts only for so many hours–and, in some spaces, not even that. That’s the reason why industry has developed a wide variety of options that allow us to light up all kind of areas, to achieve the most comfortable solutions depending on the needs of each room and the people that are going to enjoy it.

Source: <http://www.ca2l.com/the-importance-of-light-i-in-life/>

Activity 3: Mechanics to survived!

Topics covered

English: Definite and Indefinite Pronouns

Learning competency/ies:

- ✓ Use pronouns effectively (EN10G-IIIa-31)

Science: Ecosystem

Learning competency/ies:

- ✓ explain how species diversity increases the probability of adaptation and survival of organisms in changing environments (S10LTIIIh-41)

Write an essay on the importance of adaptation as a mechanism for the survival of a species. Highlight in your essay the influence of biodiversity on the stability of ecosystems and an ecosystem as being capable of supporting a limited number of organism. The rating scale below will be used:

Requirements	Score					Comments
Introductory paragraph with clearly-stated point	5	4	3	2	1	
3 supporting paragraphs containing specific details about ecosystem	5	4	3	2	1	
Demonstration of clear understanding of main concepts	5	4	3	2	1	
Grammar and Mechanics: The sentences are well structured and there is evident of correct usage of definite and indefinite pronouns.	5	4	3	2	1	
Ideas are logically presented and there is a smooth flow of thought.	5	4	3	2	1	

Total Points: _____

Activity 4: Search and Solve!

Topics covered

English: Campaigns and Advocacies

Learning competency/ies:

- ✓ Observe the language of research, campaigns, and advocacies (EN10G-IVa-32)

Science: Matter

Learning competency/ies:

- ✓ explain how the factors affecting rates of chemical reactions are applied in food preservation and materials production, control of fire, pollution, and corrosion (S10MTIVh-j-24)

Immerse with your community and try to observe the actions done by the residents pertaining to the use of chemicals in the environment. Make a poster-slogan that would present chemical reactions involved in biological and industrial processes affecting life and the environment. Highlight your campaign on intelligent use of chemicals in order to avoid harmful effects to the environment. Use the rating scale below.

Category	4	3	2	1
Required Elements (Poster)	The poster includes all required elements as well as additional information	The poster includes all the elements but no additional information added.	1 of the required elements is missing.	Several required elements were missing.
Required Elements (Slogan)	Ideas of the slogan are clearly stated in line with the theme or purpose.	Ideas of the slogan are most likely clearly stated and in line with the theme or purpose.	Ideas of the slogan are vague but in line with the theme or purpose.	Ideas in slogan are not stated based on the theme or purpose.
Creativity	The poster slogan presents adhere exceptional creativity in design and layout and neatness.	The poster slogan is creative in design and layout but not so neat.	The poster-slogan is somehow creative but a bit messy.	The poster slogan do not present creativity and not attractive.
Grammar	The poster-slogan is free from error.	There are 1-2 grammatical mistakes in the poster-slogan	There are 3-4 grammatical mistakes in the poster-slogan	There are more than 5 grammatical mistakes in the poster-slogan

Conclusions and Recommendations

Based on the results of the study, the researchers concluded that students' level of language proficiency in terms of syntax and semantics is on beginning level. Meanwhile, the respondents' level of academic performance is in developing level. As for the hypothetical statement of the study, there is a significant relationship between the language proficiency and academic performance in science subject. The results further emphasized that linguistic proficiency of the students affects their academic performance since most of students' undertakings in studying science concepts deal primarily on how they would use and understand the language as a medium of instruction in the teaching-learning process. From this notion, the researchers suggest that teachers in both English and Science subject could create activities where they could integrate students' knowledge in both learning areas. English teachers may use science concepts to teach language rules that would pave the way for the students to easily understand the language since it is used in a practical situation.

According to Richards (2006), some of the aspects of knowledge of communicative competence is how the students know how to use language for a range of different purposes and functions and manage to know how to vary the use of language according to the setting and the participants. Meanwhile, teachers of both disciplines could think of integrative exercises under the principle of integrative approach. Dimalanta (2016) pointed out that the integrated approach aids students to enhance their capacity to gain real-life skills. It is done by connecting content of one learning area to another subject area. Effective learning in the part of the students will be achieved if it is done through integration of information rather done by learning it in separate chunks. This could be in a form of performance tasks. For instance, after making a scientific experiment, students can be asked to note the procedures and let the students present it orally and prepare a narrative report. As such, teachers could assess students in a single learning activity with different competencies in both subjects particularly in making an experiment likewise in using language in both written and oral form.

Conflicts of interest: There is no conflict of interest of any kind.

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