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# IBA (INQUIRY-BASED APPROACH) TEACHING STRATEGY AND THE GRADE 11 STUDENTS' ACHIEVEMENT IN PROTEIN SYNTHESIS

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## Abstract

This study was conducted to test the effectiveness of Inquiry-Based Approach (IBA) teaching strategy in the academic achievement of Grade 11 students of Luna National High School for school year 2016-2017 on protein synthesis. Two-group quasi-experimental research design was utilized consisting of all the 40 students of Technical Vocational and Livelihood (TVL)-A as experimental group and 40 students of TVL-C as control group. IBA teaching strategy was employed in the experimental group and lecture method in the control group. Statistical tools such as mean, standard deviation, paired samples t-test; independent means t-test and  $\eta^2$  were used to analyze the pre-test and post-test scores of the two groups. Results showed that the achievement in protein synthesis of the experimental group was outstanding compared to the control group which was satisfactory. Moreover, there was a significant difference on the pre-test and post-test scores of the two groups. In addition, post-test scores of the experimental group revealed a significant difference over the control group. It further showed that IBA had a large effect on the achievement of the students in protein synthesis. This further implied that the use of IBA teaching strategy is an effective method in improving the academic achievement of students on protein synthesis and is therefore highly recommended for use by other teachers.

**Keywords:** Inquiry-Based Approach, Academic Achievement, Protein Synthesis.

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## INTRODUCTION

School year 2016-2017 is the first year of implementation of Senior High School throughout the country and Luna National High School is one of the secondary schools offering such program in the Division of Isabela. One of the tracks it offers is the Technical Vocational and Livelihood (TVL) with an initial enrolment of 131 Grade 11



students for the first semester grouped randomly into three sections namely TVL-A, TVL-B and TVL-C.

In the school setting last June 21, 2016, a diagnostic test was conducted by the researcher among Grade 11 TVL students of Luna National High School on Earth and Life Science which is one of their core subjects. She found out that competencies on Protein Synthesis have not been mastered by the students though it is one of the competencies in Grade 10 Science with a mean score of 13.89 or 27.78% level of proficiency and this result is very alarming. Specifically, their mean score in the diagnostic test is 14.11 for TVL-A, 12.50 for TVL-B and 15.07 for TVL-C. Thus, this became the basis in grouping the students in the study as TVL-A for the experimental group, TVL-C as the control group and TVL-B as the pilot group.

To address the problem on poor performance of the students, the researcher employed the Inquiry-Based Approach (IBA) teaching strategy to improve the achievement of Grade 11 students in Protein Synthesis. Teaching strategies play a vital role in the teaching and learning process. These are used by teachers in the delivery of their lessons to become more efficient and effective. One of the strategies employed by a teacher is the Inquiry-Based Approach (IBA).

In the implementation of the K to 12 Curriculum, Inquiry-Based Approach is one of the teaching strategies to be used by the teacher as mandated in the enhanced K to 12 Basic Education Act (Republic Act 10533)<sup>[1]</sup>. Inquiry-Based Approach is an open system where students are encouraged to search and make use of resources beyond the classroom and the community. Inquiry is asking questions. However, not just any questions – but those that lead to meaningful tests and explorations (Hebrank, 2000)<sup>[2]</sup>. Furthermore, inquiry involves the development of science process skills and inquiring attitudes or habits of mind that allow students to continue their search for knowledge. The science process skills include observing, communicating, classifying, measuring, inferring and predicting (Padilla, 1990)<sup>[3]</sup>.

Considering the five features of Science inquiry, wherein, the learner engages in scientifically oriented questions; gives priority to evidence in responding to questions; formulates explanations from evidence; connects explanations to scientific knowledge; and communicates and justifies explanations (Brunsell, 2010<sup>[4]</sup> & National Research Council, 2000)<sup>[5]</sup>. These features of the IBA are geared toward the development of the 21<sup>st</sup> Century Skills of the students which make them lifelong learners. According to Schwartz (2015)<sup>[6]</sup>, inquiry-based learning uses a central question to frame a curriculum unit or module. Students answer this central question for themselves, discovering and learning through a series of guided discussions, experiments, and hands-on activities over several class periods. Teachers find that students are more



engaged in what they're learning, and have a wider context for understanding the material rather than just hearing a lecture or memorizing facts.

Thus, in this study, IBA teaching strategy was utilized to improve the academic achievement of Grade 11 students on protein synthesis. This action research aimed to determine the effect of IBA teaching strategy in the academic achievement of Grade 11 students on protein synthesis. Specifically, it sought to determine the pre-test and post-test scores of the control and experimental groups on protein synthesis; to determine the difference on the pre-test and post-test scores of the control and experimental groups; to determine the difference on the post-test scores between the control and experimental groups; and to determine the effect size of the Inquiry-Based Approach in the achievement of the Grade 11 TVL students on protein synthesis.

## **METHODS**

Quasi-Experimental research design was utilized in the study because it involves two groups of respondents: all 40 TVL-A students as experimental group and 40 TVL-C students as control group. The experimental group received the intervention. The researcher applied IBA in teaching the topic on Protein Synthesis after administering the pre-test to determine students' strengths and weaknesses regarding the competencies desired for them to master. After using the IBA, post-test was administered. For the control group, IBA was not utilized but the lecture method.

On the other hand, TVL-B students were used as respondents for the pilot testing of the pre-test and post-test instrument which consisted of 25 test items on protein synthesis to test its reliability and validity for revision or improvement prior to its utilization among the target groups. Moreover, total enumeration of respondents was employed. Further, pre-test and post-test scores of the target groups were utilized in gathering the data. The learner's material utilizing Inquiry-Based Approach used in the study and the pre-test/post-test instruments were checked by at least three research experts in Chemistry and Life Sciences. The instruments underwent through a series of validity and reliability test to ensure its effectiveness in measuring the achievement of the students. Collection of data lasted for two weeks. Prior to the conduct of the study, the researcher sought the approval of the Schools Division Superintendent with the permission and endorsement of the Principal of the Luna National High School. The researcher also asked permission from the parents of the target participants. Further, the researcher assured the respondents that all information gathered were treated with high confidentiality and exclusively used in this study. The study was conducted after its approval. In the study, the students (experimental group) were exposed to the intervention learners' material with interactive activity using models employing inquiry-based approach to explain the process of protein synthesis.



The learners’ material has the following parts: activity, competency and objectives, materials and models, procedure, application, valuing, and bibliography.

In the utilization of the Inquiry-Based Approach students worked with the intervention learners material in small groups. Small group discussion was intended to increase interaction between students and the instructional materials because the students read the instructions and questions while one of their group mates manipulated the model to try solve the processes of DNA transcription and translation on protein synthesis until they were able to answer the central question asked. During group discussion, students clarify their own ideas and communicate with each other.

Class presentation of results and teacher’s discussions with students followed. Hence, the teacher served as the facilitator in the learning process. The intervention was implemented for two- week period of Earth and Life Science instruction. The pre-test and post-test scores of the students were compared after employing the intervention. In the analysis of data, (1) mean and standard deviation were utilized to get the mean pre-test and post-test scores of the students; (2) paired samples t-test was used to test the significant difference on the pre-test and post-test scores of the control and experimental groups; (3) independent means t-test was utilized to test the significant difference in the post-test scores of the control and experimental groups; and (4)  $\eta^2$  was used to determine the effect size of the Inquiry-Based Approach to the achievement on protein synthesis of the respondents.

## RESULTS AND DISCUSSION

This section presents the analysis of data gathered.

*The Pre-Test and Post-Test Scores of the Control and Experimental Groups on Protein Synthesis*  
 Table 1. Scores on Protein Synthesis *before* and *after* Using the Lecture and IBA Teaching Strategies

Group (N=40)	Achievement Test	Mean	SD	Description Equivalent
Control Group	Pre-test	7.93	2.92	Fair
	Post-test	12.15	2.70	Satisfactory
Experimental Group	Pre-test	7.95	1.95	Fair
	Post-test	21.20	1.49	Outstanding

The students in the control and experimental groups achieved a mean score of 7.93 and 7.95 respectively in pre-test which is interpreted as **fair**. This signifies that both groups have the same level of understanding on protein synthesis before the implementation of the intervention. On the other hand, post-test scores of the two groups vary. The experimental group achieved better scores than the control group



with mean scores of 21.20 described as **outstanding** and 12.15 or **satisfactory** respectively. This provides information that the used of Inquiry-Based Approach in teaching better improved the achievement of the students in protein synthesis.

*Test of Difference on the Pre-test and Post-test Scores of the Control and Experimental Groups*

Table 2. Paired Samples t-test on Protein Synthesis Achievement Test of the Control and Experimental Groups

Group (N=40)	Achievement Test	Mean	SD	Paired Difference		t-value	p-value (5%)	Interpretation
				Mean	SD			
Control Group	Pre-test	7.93	2.92	4.23	2.96	-9.01	0.00	Significant
	Post-test	12.15	2.70					
Experimental Group	Pre-test	7.95	1.95	13.25	2.10	-39.90	0.00	Significant
	Post-test	21.20	1.49					

Data reveals that **there is a significant difference** between the gain scores of the control and experimental groups who were exposed on the use of the lecture and inquiry-based approach with t-values of -9.01 and -39.90 respectively which generate a p-value of 0.00 at 5% level of significance. Moreover, the table also shows that mean gain score of the experimental group is higher than (13.25) the control group (4.23) which implies that the use of IBA as teaching strategy to improve students' achievement in protein synthesis is better than the use of lecture method.

*Test of Difference on the Post-test Scores between the Control and Experimental Groups*

Table 3. Independent Means t-test on the Post-test Scores of the Control and Experimental Groups

Group(N=40)	Mean	SD	t-value	p-value (5%)	Interpretation
Control group	12.15	2.70	18.55	0.00	Significant
Experimental group	21.20	1.49			

Data above indicates a **significant difference** on the post-test scores of the respondents which means that the use of inquiry-based approach in teaching protein synthesis is more effective than the lecture method.

*Effect Size of the Inquiry-Based Approach in the Achievement of the Grade 11 TVL Students on Protein Synthesis*

Table 4. Effect Size of Inquiry-Based Approach in Teaching Protein Synthesis

T	N1	N2	ETA <sup>2</sup>	Interpretation
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18.55	40	40	0.815	Large effect
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Table 4 shows the effect size of Inquiry-Based Approach in teaching protein synthesis among the grade XI students. It generated an  $ETA^2$  value of 0.815 which signifies **large effect**. Thus, the use of IBA in teaching protein synthesis significantly contributed a **large effect** on the achievement of grade XI students in protein synthesis.

The results of the study is supported by the citation of Schwartz (2016)<sup>[7]</sup> who said that inquiry-based learning tends students to be more engaged in what they're learning and have a wider context for understanding the material rather than just hearing a lecture or memorizing facts. Since, students were exposed to interactive activity using models employing inquiry-based approach to explain the process of protein synthesis this provided them an avenue to engage in scientifically oriented questions, give priority to evidence in responding to questions, formulate explanations from evidence, connect explanations to scientific knowledge, and communicate and justify explanations which all of these are the features of science inquiry.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were drawn:

1. That the achievement of the Grade XI students before the use of IBA teaching strategy was **fair** in both control and experimental groups and the achievement of the experimental group improved significantly to **outstanding** when IBA teaching strategy was utilized in teaching protein synthesis compared to the achievement of the control group which is only **satisfactory** using the lecture method.
2. That there is a significant difference on the pre-test and post-test scores of the control and the experimental groups. Hence, the use of lecture method and IBA teaching strategy significantly improve the achievement of Grade XI students in protein synthesis.
3. That there is a significant difference on the post-test scores between the control and experimental groups. Since, mean score of the experimental group is significantly higher than the control group, the use of IBA teaching strategy better improve students' achievement in protein synthesis than the lecture method.
4. Finally, the effect of IBA teaching strategy on the achievement of Grade XI students in protein synthesis is large.

The researcher recommends the following:



1. That the use of **IBA teaching strategy** be adopted in the delivery of the lesson on protein synthesis in Earth and Life Science subject in Senior High School.
2. That a parallel study should be conducted to further test the effectiveness of IBA teaching strategy.
3. That IBA teaching strategy should also be used to test its effectiveness in other topics in the different Science subjects and in other learning areas in Senior High School.

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Educational researches in the parlance of teaching are indeed indispensable in the realization of every dream. This paved way to the attainment of quality education anchored on academic excellence, moral recovery, and community service. In realizing this vision, the researcher came up with a simple study focused on the Inquiry-Based Approach teaching strategy and the Grade 11 students' achievement in protein synthesis. The researcher extends her sincerest gratitude to the following individuals for their endless support and guidance in the realization of this humble masterpiece: to the SHS students of LNHS for being the participants of this study, to the parents of the SHS students for the consent given, to the LNHS family for the genuine camaraderie, to SDO-Isabela and DepEd Region 02 for the approval granted in the conduct of the study and constant encouragement for teachers to conduct researches, to her family members for the strength they provide, and most of all to Almighty God for the fountain of her life and the spring of her knowledge.

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