

EVALUATING THE EFFECTIVENESS OF CHESS-BASED INSTRUCTIONAL MATERIALS IN IMPROVING STUDENTS' UNDERSTANDING OF SPECIES DIVERSITY: A QUANTITATIVE STUDY

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ABSTRACT

Instructional materials are important since it helps the learner and teachers to make learning more interesting, practical, realistic and appealing. This study deals with the integration of chess-based instructional material. This study aimed to quantitatively evaluate the effectiveness of chess-based instructional materials in improving Grade 8 students' understanding of species diversity in Libertad National High School, Libertad Sta. Monica, Surigao del Norte. The researcher used quasi-experimental design to determine the effectiveness of the chess-based instructional materials. A pre-test and post-test design were used for comparison. The pre-test has a mean of 18.28 with a standard deviation of 4.96 and the post-test has a mean of 28.04 with a standard deviation of 5.91. It was hypothesized that there is no significant difference between the mean score of the pre-test and the mean score of the post-test since there is significant increase between the mean score of both pre-test and post-test. It further indicates that the Pvalue = $P < 0.05$ with the used of paired sample t-test. The Pearson Correlation of 74.24% explains the relationship between pre-test and post-test. This implies that there is a significant increase in the student performance with the integration of chess-based instructional material within the lesson since the students understand more the topic being discussed.

Keywords: Instructional Material, Mean, t-test, quasi-experimental design

1. INTRODUCTION

Filipino students' performance in global assessments of science literacy has always been low, and this was confirmed again in the PISA 2018, where Filipino learners' average science literacy scores ranked second to last among 78 countries (Bernardo A.B et.al, 2023). Results from international assessments like the Programmed for International Student Assessment (PISA) show the real problem of education in the Philippines. This data reported by these international assessments awaken us that science education is still a major concern that experts and policymaker needs attention (Von Lorenz A. C. et.al, 2024). Science proficiency among Filipino students is still at lower levels in fact PISA 2024 result Philippines placing in the bottom four among 64 countries meaning they lack critical thinking skills and problem solving which is an important skill among 21st-century learners.

The low achievement in Science of Filipino students is not a new trend in Philippine education. Local studies have long documented this science education dilemma (Orleans, 2007). Jamalsco (2017) stated that the lack of science education facilities reflected on the poor quality of basic science as seen by low achievement test scores of Filipino students in various test. Facilities and instructional material in science could affect and motivate the learners to engage in the classroom. Motivation has a significant influence on student's learning and performance (Pintrich, P.R et.al 2002). Yet studies have shown that there is a decline in student motivation toward science learning going from elementary to secondary school (Osborne, J. 2003).

Considering the educational problem presented above are enough evidences that the Philippine educational system should change to a new trend of education in terms of teaching learning process. Teacher should adapt the use of improvised instructional materials as a method in teaching science since it is found most effective (Affiah, D. et.al, 2022). Specifically, game-based instructional material, learning in the form of a game is one of the oldest and most useful pedagogical ideas that has been applied throughout the history of mankind (Ferreira, S.M. et.al, 2016).

Incorporating the chess game principle into explaining the concept of science specifically species diversity can significantly improve the performance of the students by blending educational content with interactive learning. Gamified and immersive educational interventions have proven to be powerful motivators to encourage participation in unattractive activities (Yuan, Q. et.al 2024). Chess game activities ensures the effective development of cognitive and intellectual abilities of students, motivation to study science and mathematics, and productive development of its problem areas (Dvoryatkina, S. N et.al 2021). By simulating diverse ecosystems through game mechanics, students can explore the roles of various species, their interactions, and the impact of diversity on ecosystem stability. This approach not only makes the concept more engaging but also helps students grasp complex ecological relationships through

practical, hands-on experience. Thus, this study aimed to quantitatively evaluate the effectiveness of chess-based instructional materials in improving students' understanding of species diversity in Libertad National High School, Libertad Sta. Monica, Surigao del Norte. The study will determine whether integrating chess into the learning process leads to a significant improvement in students' understanding of ecological concepts compared to traditional instructional methods.

2. METHODOLOGY

This chapter presents the research design, research respondents, instrument, data gathering procedure and data analysis.

Research Design

The researcher will employ quasi experimental design to evaluate the effectiveness of chess-based instructional materials in improving students' understanding of species diversity. In this design, there is only one group and all of them were in the experimental condition. Before the proper class instruction, a pre-test was administered, followed by a treatment, and then a post-test.

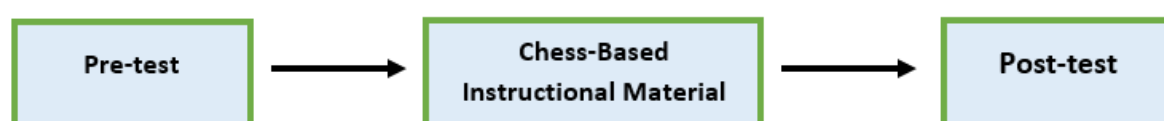


Figure1: Quasi-experimental Design specifically Pre-test and Post-test Design

Participants

The participants of the study were the Grade 8 students of Libertad National High School – Libertad, Sta. Monica, Surigao del Norte, S.Y. 2024-2025.

Instrument

This study used researcher made test questionnaire. There will be 50 items of multiple type of test being prepared. This will be administered in the pre-test and the post-test. Two experts from different schools were asked to validate the content of the questionnaire with the table of specification. The items were divided based on the level of blooms taxonomy.

Administration of the Pilot testing. It was conducted test the validity and the reliability of the test questionnaire. Correlation was computed using Pearson Product Moment Coefficient of Correlation, to get the reliability index of research instrument. The obtained value is 0.76 which mean that it has a high relationship, thus the result of reliability coefficient is good for classroom test.

Data Gathering Procedure and Ethical Consideration

The researcher writes a letter of request to the school principal of Libertad National High School asking approval to conduct a study. Another letter of request will be sent to the experts asking their expertise to validate the table of specification and researcher made test questionnaire. After approval of the request, the researcher administered the pre-test. After the pre-test, the researcher starts the class instruction with the integration of chess-based instructional material in understanding species diversity. Each topic had the allotted time of one hour. The assessment and evaluation were given to the student every after end of lesson to determine whether the students understand the lesson about species diversity.

Administration of the Post-test. The post-test will be conducted after the treatment being applied in the same manner as the pre-test.

Table 1. Lesson Coverage

THIRD QUARTER	LIVING THINGS AND THEIR ENVIRONMENT
Module 1	Introduction to species diversity
Lesson 1	Factors affecting species diversity
Lesson 2	Measuring species diversity
Lesson 3	Ecosystem Examples and Species Diversity

After the administration of pre-test and post-test, the researcher checked the papers. The result were recorded and tabulated.

Data Analysis and Statistical Tool

The statistical tools used in the interpretation of the data were as follows:

Frequency Count and Percentage Computation. These will be used to describe the the profile of the participants.

Arithmetic Mean and Standard Deviation. These will be used to determine the pre-test and post-test mean scores.

T-test. used to determine the significant difference between the mean gain scores of the experimental group and the control group.

3. RESULT AND DISCUSSION

Profile of the Students

Table 2 present the profile of the students according to sex, number of siblings in the family and educational attainment of the parents.

Based on the result, it was found out that as to sex most of the respondents are females (31 or 62%) and there are less males (19 or 38%); as to age, it shows that most of the students were 14 years old which covers 56%; as to the number of siblings, the table shows that the bracket of 1-3 siblings in the family is dominant, 24 or 48%; as to educational attainment of father, most fathers are high school level, 18 or 36%; and as to educational attainment of the mother, mostly of the mother are High School graduate, 23 or 46%. Epis (2003), as cited by Gravino (2010) in her study, the number of children in the family differs as to its effects to education.

The result show that majority of the father and mother are high school level and high school graduate. This only mean that not all the parents can afford to send their children in school.

Table 2. Profile of the Students

Profile of the Students	No. of Students (n=50)	Percentage (%)
Sex		
Male	19	38%
Female	31	62%
Age		
13	28	6. %
14	17	56%
15	2	34%
16		4%
Number of Siblings		
1-3	24	
4-6	20	48%
7-9	5	40%
10-12	1	10%
Educational Attainment of Father		
Elementary Level	3	2.0%
Elementary Graduate	2	6%
High School Level	18	4%
High School Graduate	11	36%
College Level	10	22%
College Graduate	6	20%
With MA units	0	12%
		0%
		2%
Mother		
Elementary Level	1	2%
Elementary Graduate	1	16%
High School Level	8	46%
High School Graduate	23	18%
College Level	9	16%
College Graduate	8	0%
With MA units	0	

Pre-test and Post-test of Grade 8 Students of Libertad National High School

Table 3 shows the pre-test and post-test scores of participants.

Table 3. The Pre-test and Post-test Scores of the participants

PRE-TEST			POST-TEST		
Mean	VI	SD	Mean	VI	SD
18.28	Fair	4.96	28.04	Good	5.91

Parameter:

0-10	-	Poor
11-20	-	Fair
21-30	-	Good
31-40	-	Very Good
41-50	-	Outstanding

As shown in table 3, the pre-test has a mean of 18.28 with a standard deviation of 4.96 and the post-test has a mean of 28.04 with a standard deviation of 5.91. the value of the standard deviation of the pre-test which is 4.96 implies that the scores of the students are closer to each other and this means that the subject matter was not yet taught, majority of the students has less prior knowledge about the topic. While in the post test, the value of standard deviation of 5.91 shows that the scores of the students are more scattered which implies that after the intervention of chess-based instructional material in understanding species diversity, mostly of the student understand the lesson being discussed and got higher score compared to the pre-test.

The students got a mean score in their pre-test of 18.28 with standard deviation of 4.96. this showed that although the lesson were not yet familiar and the intervention is not yet applied, they were able to show that they have a prior knowledge about the subject matter. The difference is evident by looking at the post means score of 28.04 with the standard deviation of 5.91. This means that the group showed improvement in their performance.

Significant Difference between the Mean score of the Pre-test and Post-test.

Table 4, Shows the significant difference between the mean score of the pre-test and the post-test.

Table 4. Significant Difference between the Mean score of the Pre-test and Post-test.

	M	VI	SD	Pvalue	Remarks	Decision
Pre-test	18.28	F	4.96	P<0.05	Highly Significant	Reject H ₀
Post-test	28.04	G	5.91			

Parameter:

0-10	-	Poor
11-20	-	Fair
21-30	-	Good
31-40	-	Very Good
41-50	-	Outstanding

It was hypothesized that there is no significant difference between the mean score of the pre-test and the mean score of the post-test. Table 4, however, shows the significant increase between the mean score of both pre-test and post-test. It further indicates that the Pvalue = P<0.05 with the used of paired sample t-test. The Pearson Correlation of 74.24% explains the relationship between pre-test and post-test.

This implies that there is a significant increase in the student performance with the integration of chess-based instructional material within the lesson since the students understand more the topic being discussed.

Based on the result, it denotes that the use of chess-based instructional material in understanding species diversity is effective in delivering the lesson. Salili (2005) mentioned that learning materials should be available in the classroom for they help teachers clarify vague points and facilitate better understanding among students. Moreover, Sibayan (1998), cited by Salili (2005) and Gravino (2010), in his article stressed that not only the parental background and teacher factor play an important roles in educative process of the learners, but also the school facilitates and instructional materials count to enhance the learning experience of the learners.

4. FINDINGS

After a thorough analysis of data, the following are the major findings of the study.

1. Mostly of the respondents are females (31 or 62%) and there are less males (19 or 38%); as to age, it shows that most of the students were 14 years old which covers 56%; as to the number of siblings, the table shows that the bracket of 1-3 siblings in the family is dominant, 24 or 48%; as to educational attainment of father, most fathers are high school level, 18 or 36%; and as to educational attainment of the mother, mostly of the mother are High School graduate, 23 or 46%.
2. The mean score of pre-test was 18.28 (SD=4.96)
3. The mean score of post-test was 28.04 (SD=5.91)
4. There is significant difference between the score of pre-test and post-test. The computed t-test correlated sample got Pvalue=P=0.05 and Pearson Correlation of 74.24.

5. CONCLUSION

Based on the result of the study, it was concluded that Chess-Based Instructional Material in Understanding Species Diversity has a significant improvement on the students' performance.

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