

Inquiry Based Instruction on Student's Enhanced Competencies in Science

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Abstract: *This study examined the effect between the inquiry-based and traditional teaching instruction. A total of 85 respondent students of Grade 8 participated in the study. Forty student in the control group and forty five students in the experimental group. This study is a quasi-experimental pretest and posttest design. Quantitative analysis was used to determine any differences between the pretest and posttest. Based on the findings using the procedures described in this research, the answers to the problems raised in this study were ascertained and summarized as follows: Before conducting the research, pretests results showed that the learners registered the highest mean of 14.47 in inquiry based teaching approach which is slightly higher than traditional teaching approach. Meanwhile, the lowest mean of 13.00 was computed for the pretest for traditional teaching approach. After the experiments, findings revealed that in the posttests, respondents registered the highest mean of 32.20 when they were exposed to inquiry based teaching approach. On the other hand, a computed mean of 22.13 was registered for the traditional method. When the mean scores of the pretests and posttest were compared using the paired samples t-test, results revealed that highly significant differences existed between the performance of the students in the control and experimental group. Moreover, significant differences existed between the performances of the students in Science when they were subjected to Inquiry-based teaching.*

Introduction

Education is a light that shows mankind the right direction to push forward. The purpose of education is not just making the students to literate but to become rationale thinkers, as well. When there is willingness to change, there is hope of progress in any field. Education means to go beyond the quality and continue to achieve things by acquiring knowledge. Enduring learning will enable the learners enhance their ability in every aspect of their life. It may also help people to become more productive members of the society.

“Education is the wise helpful and respectful cultivation of learning undertaken in the belief that all should have the chance to share in life”(Smith, 2013). The word education is also used to describe the outcomes of educational process. Ideally, education should help people develop an appreciation of their cultural heritage and live more satisfying lives. The most common ways to get education is to attend school. (The World Encyclopedia Vol. 6, 2004).

Education involves both teaching coupled with learning. Sometimes, people learn by teaching themselves. But they also learn with the help of other people, such as parent or teachers. Parents are a child's first and perhaps most influential and important teachers. They teach their children holistically in all aspect such as their attitudes, habit and values. Teachers and school administrators have the topmost responsibility for education. Teaching approach is a set of principles, beliefs or ideas about the nature of learning which is translated into the classroom. It springs from teacher's own philosophy of education, the nature of education, the role of the teacher and that of the student (Corpuz & Salandalan, 2013)

One process cannot succeed without the success or support of the other. A teacher cannot claim she/he has taught if the learners have not learned substantially. The teaching styles of the teachers should jibe with the learner's learning styles. Unless the two fit, teachers and learners will be existing in two different worlds. Teaching as a process cannot be taken independently in its entirety. With so many ingredients needed, the most important is still the learner. The learner being the center of the teaching, will influence to a great extent of teaching. It is therefore important that the knowledge of the learner and his learning styles considered. The different teaching styles with the support of simple to sophisticated teaching materials are now necessary to effect good learning (Lucas & Corpuz, 2014)

Teacher is considered as a guide in the journey of learning because of his experience, knowledge and great interest in the learning of their students. Teacher possess exceptional knowledge and great interest in the learning of students that is why they are considered as guide in enduring knowledge. It is in this context that the personal qualities of teachers and their attitude towards work and teaching profession have significant influence on classroom learning.

In many cases, it has been observed that teaching is the cause and learning the effect. Learning outcomes can indicate teaching performance. The quality of teaching is related to the quality of learning. We always attribute the kind of learning to the kind of teaching. As the direct relationships of teaching and learning become clear, success of both brings out something like, “ learning and teaching and teaching for learning,” This means that while the teacher, teaches, he or she also learns in the process. On the other hand, as the students learn, they also teaching themselves how to learn. (Bilbao et al, 2008).

“To teach is to make someone learn.” This statement means that the end product of teaching is learning. Learning is a change as a transportation in an individual’s behavior caused by experiences or self-activity. It implies that learning can only happen through the individual’s activity or his/her own doing. Most learning is intentional, like when a learner acquires knowledge in the classroom or when one observes a demonstration activity. Intentional learning occurs when activities are purposefully arranged for the students to participate and experience. Every waking moment all individuals are engaged in learning, however learning occurs more when the various stimuli are properly arranged for the purposes of learning (Bilbao et al, 2008).

To make learning effective, teacher must involve learners in organizing and finding relationship in the information they encounter rather than being empty receptacles in need of a fill-up. The goal is to maximize the learning of all learners and to increase the mutuality of their relationships with children different from themselves. Thus there is a need to change some teaching methodologies to a cooperative learning that is centered on having learners become more willing and able to accept responsibility and control their own learning (Zulueta, 2006).

At present, in the Philippine Educational System, wherein there is a shortage in classroom throughout the country, there is no enough funds to provide for instructional materials in every classroom to provide good quality of education for the students. The main goal of teaching is to provide effective instruction to students. Considering the students that we have today. For the students’ learning science is never fun and the process is boring; thus resulting to decreasing of students’ performance. They focused on using gadgets and browsing the Internet and other related activities in the computer. Teachers are blame when the students had lower scores and did not perform well. Therefore the teacher should find ways to create interesting instructional devices that can provide necessary strategies for them to perform well (Banson, 2012)

Indirect instruction method is best used when the learning process is inquiry-based, the result is discovery and the learning context is a problem. The inquiry method may become a problem solving method when the focus of inquiry is a problem to be solved. In the process of inquiry, students are led to discover something they have not known before. These inquiry and problem solving may be made as a student project or if given a project, the students will employ a lot of inquiry and may end up with a lot of discovery.

Inquiry method approach provide children opportunities to explore, inquire and discover new learnings. The core of inquiry is spontaneous and a self -directed exploration. Textbook-dictated procedures do not allow an active probe into the unknown. Curiosity, special interests and instant queries among young demand immediate answers. It puts premium on obtaining information through direct experiences. They are asking about something, doing something to obtain information and processing information. As more and more substantiations unravel they compare, classify, analyze and evaluate collected observations. Depending on the weight and relevance of the evidence, they formulate their own conclusion (Corpuz & Salandalan, 2004)

Inquiry-based learning is fundamental for the development of higher order thinking skills. According to Bloom’s Taxonomy, the ability to analyse, synthesize, and evaluate information or new understandings indicates a high level of thinking. Teachers should be encouraging divergent thinking and allowing students the freedom to ask their own questions and to learn the effective strategies for discovering the answers. The higher order thinking skills that students have the opportunity to develop during inquiry activities will assist in the critical thinking skills that they will be able to transfer to other subjects.

The inquiry approach is also a search for the solution to a problem through an exploration and evaluation of alternatives. This approach views a given discipline more as attitude than the body of knowledge or as method. Emphasizing the affective aspects of learning, it uses both content and processes as means toward the development of the qualities of mind as curiosity, skepticism, intellectual honesty, and others. Hence the primary aim is the development of a desirable attitude including proper appreciation and valuing (Acero, 2000).

Relative to the aforementioned, this research was conducted to find out, the effects of inquiry-based instruction on students’ competencies in science.

Statement of the Problem

This study aimed to compare traditional and inquiry based learning in the teaching science to Grade 8 students at Calawitan National High School.

Specifically it sought to answer the following questions:

1. How may the inquiry-based teaching be described in terms of:
 - a. Content
 - b. Methods
 - c. Assessment?
2. What is the performance of Grade 8 students in the pretest?

3. What is the performance of Grade 8 students in the posttest?
4. Is there a significant difference in the performance of Grade 8 students in the pretest and posttest?
5. What are the perceptions of the students on inquiry based teaching in science?

Hypotheses

The study was guided by hypotheses that there is no significant difference in the performance of Grade 8 students in the pretest and posttest

Conceptual Framework

The study of science within education had a primary focus on memorizing and organizing facts. Unfortunately, there is still evidence that some students are still receiving this type of science instruction today.

Traditional education, also known as back-to-basics, conventional education or customary education, refers to long-established customs that society traditionally used in schools. Some forms of education reform promote the adoption of progressive education practices, a more holistic approach which focuses on individual students' needs and self-control. In the eyes of reformers, traditional teacher-centered methods focused on rote learning and memorization must be abandoned in favor of student-centered and task-based approaches to learning. However, many parents and conservative citizens are concerned with the maintenance of objective educational standards based on testing, which favors a more traditional approach (Zulueta, 2006).

Inquiry guided learning has widespread appeal for a variety of institutions of education throughout the world. As a suite of teaching strategies that defies a simple prescription for practice, inquiry guided learning challenges practitioners to develop conceptual framework that describe inquiry as a site of student learning rather than of traditional scholarship (Lee, 2004).

Inquiry is a dynamic process of being open to wonder and puzzlements and coming to know and understand the world (Galileo, 2004). There are different approaches of Inquiry-Based Learning/Teaching, such as Guided discovery, the 5E Model and the 7E Model. Guided discovery model involve the inquisition, acquisition, supposition, implementation, summation and exhibition. The 5E model approaches include the following engage, exploration, explanation, elaboration and evaluation. Enhancement of Instructional Models 5E instructional model (1980s) become 7E Model which composed of elicit, engage, exploration, explanation, elaboration, evaluation and extend. Bases of expanding the 5E Model, eliciting prior knowledge is a necessary components of learning process to ensure that the concepts they develop are correct and not misconceptions (can be done by framing a “what do you think” question). Expert learners are much more adept at the transfer of learning than novices, hence, practice in the transfer of learning is required in good instruction. The goal of 7E learning Model is to emphasize the increasing importance of eliciting prior understandings and the extending, or transfer of concepts.

A student-centered classroom, students are very much a part of constructing their own learning in a holistic environment that capitalizes on student interests. The students are encouraged to reflect on their own learning, share their insights with their peers, and apply new learning to real life, authentic experiences. When learners are the focus, they become fully engaged in the process (McCombs and Miller, 2007).

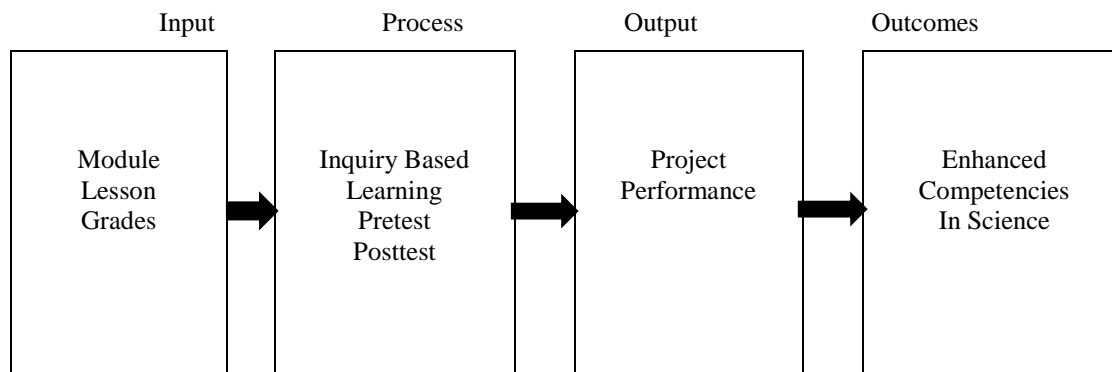


Figure 1. Paradigm of the Study

As shown in Figure 1, the paradigm includes module, lesson and grades that serve as the basis of the study. The second frame is the process which is the inquiry-based and traditional based instruction, and also include the pretest and the posttest which served as the independent variables of the study. The third frame served as the output which includes the project and performance of the students which served as the moderator variables. The last frame is the enhanced competencies in Science which served as the dependent variable.

Significance of the Study

The findings of the study will be beneficial to the following:

Learners. The study will be helpful to the students for they could be informed of what Inquiry-based learning is. Grade 8 students with difficulties in studying science would have less difficulties in their lessons.

Parents. The findings of the study will increase the participation of the parents in supporting the needs of their child and their partnership in the school in achieving high scholastic performance of their children.

Administration. The major provider of instructional material needs of the teacher, they will encourage to upgrade the information technology resources in the school so that the teacher may find making module tool for instruction.

Science Teachers. The result of the study may serve as encouragement and inspiration to science teacher as they perform their duties, it will lessen the everyday task and improve knowledge of their learners. .

Students. The study may be a great help learners' performance, will increase the level of understanding, uplift confidence resulting to become more independent individual.

Other Researchers. The result of this study may also enlighten other concern educators towards having another related research in the future.

Scope and Limitation of the Study

This research compared the performance of the students in science at Calawitan High School using two different strategies of teaching the traditional and inquiry-based learning.

The study was limited only on the performance and achievement in science

lessons of Grade 8 students during the school year 2016-2017. The experiment made use of two strategies encompass to heterogeneous students of Grade 8 sections 8 Molave with 40 students and Grade 8 Yakal with 45 students in class. A pretest was administered to test the prior knowledge of the students in Science.

Location of the Study

This study was conducted at Calawitan High School in San Ildefonso, Bulacan. Calawitan National High School was formally opened last July 1969 with 73 initial students and 3 pioneer teachers, thru the effort of barangay officials, parents and concerned citizen in neighboring barangays. Despite the problems encountered by the school, still they progressed. They acquired their new site, which is almost 10,000 sq. meters. The school caters children coming from Malipampang, Calasag, Telapatio, Pulong Tamo and Pangclara Candaba Pampanga.

The school has 29 regular permanent teachers and 595 students for the school curriculum year 2016-2017. Grade 8 students composed of 132 regular students in 3 sections namely Narra, Yakal and Molave. The two sections that served as the subjects of the study were 8 Yakal with 45 students and 8 Molave with 40 students.



Figure 2. Map of San Ildefonso

Definition of Terms

To ensure thorough understanding of the terms used in this study, the following terms were defined operationally.

Academic performance. This is the learning outcome of the student respondents using the inquiry-based approaches in teaching science.

Active learning. This term refers to the student who actively response to the learning environments that allow students to talk and listen, read, write, and reflect as they approach course content through problem-solving exercises, informal small groups, simulations, case studies, role playing, and other activities -- all of which require students to apply what they are learning using the inquiry-based strategies.

Cooperative learning. This refers to the systematic pedagogical strategy that encourages small groups of students to work together for the achievement of a common goal. The term will be used when the students perform their group activity.

Grades. It refers to the numerical achievement and progress report of the students

Grade 8 Students. It refers to the students who were the subjects of the study.

HOTS. It means Higher Order Thinking Skills .It uses six levels of thinking such as knowledge, comprehension, application, analysis, synthesis and evaluation for critical decision making. This will be used in the art of questioning in the inquiry-based approach.

Inquiry-based learning- this will be the approach used in the study which starts by posing question, problems or scenarios—rather than simply presenting established facts or portraying a smooth path to knowledge. This approaches was used as the main tool in this study to enhance the competencies in science. The inquiry-based instruction is principally very closely related to the development and practice of thinking skills

Lecture. This method is one of instructional strategies in traditional learning approaches. The lecture still remains an important way to communicate information.

Module. This is the instrument used to conduct the inquiry-based learning approaches in the study. This instructional device served as the basis on how the students increased their learning and understanding in the field of science.

Posttest. This is an assessment test given to the students' respondent after exposing them inquiry-based teaching instruction.

Pretest. This is an assessment test given to the students at the beginning of the study

Project. This is an assign task for the students like poster or collage made by a group of students' to supplement and apply classroom studies.

Traditional method of teaching .This method of teaching and learning lies mainly on the teacher and it's believed that the students will be able to use the knowledge if they are present in the class discussions and listen to the teacher's explanation and examples. The teaching is teacher-centered. This is the teaching strategies used as the control group.

METHODOLOGY

This chapter presents the research design, data gathering techniques, sampling procedure and data analysis scheme of the study.

Research Design

This research used mixed methods. The study was experimental and used the pretest and posttest experimental design. Quantitative analysis was used to determine any differences between the pretest and posttest means. Descriptive statistics was used in the presentation of analysis and interpretation of data collected.

Data Gathering Techniques

The researcher sought permission from the Schools Division Superintendent of Bulacan. The researcher personally handed over the endorsement to the school principal of Calawitan High School in San Ildefonso. After the receipt of the approval, coordination with the advisers of the two sections schedule was made for the administration of Inquiry-based learning approach to the students. The researcher personally administered the module for the accuracy of the responses. After gathering the previous grades of the students in Science a pretest was given to the students before the conduct of the research. After six weeks a posttest was administered to the students involved in the study. Grade 8 Yakal used the Inquiry based learning modules and will serve as the experimental variables while Grade 8 Molave will used the Traditional based learning which will serve as the control group. Project and Performance ratings of the students were gathered to measure the reliability of the results. A corresponding Rubrics was designed and used to evaluate the Project.

TIMETABLE OF ACTIVITIES**S.Y. 2016-2017**

| | | |
|----------------------|-------|--|
| JANUARY 30-31, 2017 | Day 1 | Pretest in Science 8 |
| | Day 2 | Introduction to Biodiversity |
| | Day 4 | ACTIVITY # 1: What's in a Name? |
| FEBRUARY 6-9, 2017 | Day 1 | Archaeobacteria and Eubacteria |
| | Day 2 | ACTIVITY 2: How do Bacteria in Yogurt |
| | | Look Like? |
| | Day 3 | Kingdom Protist |
| | Day 4 | Kingdom Fungi |
| FEBRUARY 13-16, 2017 | Day 1 | Plant Kingdom |
| MODULE 2 | Day 2 | ACTIVITY # 3: Classifying Vascular and |
| | | Non Vascular Plants |
| | Day 3 | Gymnosperm, Angiosperm and Harmful Plants |
| | Day 4 | ACTIVITY # 4: Monocot and Dicot |
| FEBRUARY 20-24, 2017 | Day 1 | Introduction of Animal Kingdom |
| | Day 2 | Cnidarians, Mollusks, Echinoderm |
| | | and Arthropods |
| | Day 3 | Flatworm, Roundworm and Segmented Worms |
| | Day 4 | ACTIVITY # 5: Classifying Worms |
| FEBRUARY 27-28 | Day 1 | Vertibrates: Fishes, Amphibians and Reptiles |
| | Day 2 | Birds and Mammals |
| MARCH 1-2 | Day 3 | ACTIVITY # 6: The Importance of Biodiversity |
| | | in Ecosystem |
| | Day 4 | INTERACTION: Food Chain and Food Web |
| MARCH 6-9, 2017 | Day 1 | ACTIVITY # 7: How do you Identify the |
| | | components of a Food Chain in an Ecosystem |
| | Day 2 | Biochemical cycles |

| | | |
|--|-------|---|
| | Day 3 | Biodiversity Collage/Poster Making(Project) |
| | Day 4 | Posttest in Science |

Sampling Procedures

Table 1 presents the lessons included in the study two heterogenous section were used. Both sections were exposed to the same lessons but one section used Inquiry-based learning module while the other section used the Traditional based of learning approaches. Universal sampling or total enumeration will be utilized in selecting the students. A total of 85 students participated in the study.

Table 1. Distribution of the Respondents of the Study

| | Calawitan High Schools Grade 8 Section | Number of Students | | |
|---|--|--------------------|--------|-------|
| | | Male | Female | Total |
| 1 | Molave | 23 | 17 | 40 |
| 2 | Yakal | 29 | 16 | 45 |

Data Analysis Scheme

The results of the study were tabulated, analyzed, interpreted and represented in textual and tabular form using the mean, standard deviation and independent samples t-test.

Results and Discussion

This chapter presents the analyses and interpretation of all the data gathered in this study in accordance with the problems stated in Chapter I. It looked into the effects of inquiry-based instruction and traditional teaching strategies on the performance of Grade 8 learners in Science at Calawitan High School, San Ildefonso, Bulacan during the school year 2016-2017.

Inquiry Based Teaching

Table 2 presents the mean, standard deviation of the students view on the content, method and assessment of the Grade 8 students towards inquiry based teaching.

It can be seen from the table that the student respondents strongly agree on the content, method and assessment of the inquiry based teaching strategies.

It can be noted from the table that the item “Present objectives that are easily understood” garnered the highest computed mean of 4.78 with a verbal interpretation of “strongly agree”. Meanwhile, item “Use effective techniques that improves learning of the students” received the lowest computed weighted mean of 4.58 with a verbal interpretation of “strongly agree”. The overall mean was computed at 4.668 which was verbally described as “strongly agree”.

Further, table based on content showed that the highest computed mean of 4.80 with a verbal description of “strongly agree” has recorded for the item “Provide different ways of exploring the lesson like games, puzzle, collage making, activities, reporting, role play and group work. However, the item” Use localized materials that can be found inside the school ground” received the lowest computed mean of 4.58 with a verbal description of strongly agree. The overall mean was computed at 4.658 which was verbally described “strongly agree”

However, students assessed the inquiry based teaching strategies based on content, method and assessment was verbally described as “strongly agree”

These results imply that inquiry approach sometimes termed as “discovery” heuristic” and problem solving” is defined simply as a teaching method which is “modelled after the investigative processes of scientists”. These results imply that students can acquire an orderly and logical arrangement that may produce quality education and quality learners (Aquino, 2003).

Table 2. Inquiry-based teaching

| A. Content | N=45 | | |
|--|-------|------|-------------|
| | Mean | SD | Description |
| 1. Present objectives that are easily understood. | 4.78 | .420 | SA |
| 2. Use effective techniques that improve learning of the students. | 4.58 | .554 | SA |
| 3. Use different question such as what, where, when, why and how in guide question and in exploring the lesson | 4.67 | .522 | SA |
| 4. Various ways of presenting the lesson such as concept map, graphic organizer, puzzle (word, picture loop a word, and cryptogram) | 4.67 | .603 | SA |
| 5. Show organized content of the lesson that enhance the learner knowledge in science. | 4.64 | .529 | SA |
| Overall Mean | 4.668 | SA | |
| B. Method The Teacher; | N=45 | | |
| | Mean | SD | Description |
| 1. Provide different ways of exploring the lesson like games, puzzle, collage making, activities, reporting, role play and group work. | 4.80 | .405 | SA |
| 2. Use (localized)materials that can be found inside the school ground. | 4.58 | .543 | SA |
| 3. Show clear and step by step procedure of the activities. | 4.62 | .614 | SA |
| 4. Use instructional materials like manila paper, cartolina, localized materials, colored paper, charts, powerpoint presentation and video lesson. | 4.62 | .490 | SA |
| 5. Present a detailed outline of the lesson. | 4.67 | .477 | SA |
| Overall Mean | 4.658 | SA | |
| C. Assessment The Teacher; | N=45 | | |
| | Mean | SD | Description |
| 1. Help the learners increase their level of understanding. | 4.76 | .435 | SA |
| 2. Provide different ways in assessing the learners. | 4.60 | .495 | SA |
| 3. Increase the knowledge of the learners in scienc.e | 4.80 | .405 | SA |
| 4. Provide updated way of evaluating the learner. | 4.56 | .503 | SA |
| 5. Show clear instruction in pretest and posttest. | 4.67 | .477 | SA |
| Overall Mean | 4.678 | SA | |

Legend:

| Rating Scale | Description |
|--------------|--------------------------|
| 4.21 - 5.00 | Strongly Agree (SA) |
| 3.41 - 4.20 | Agree (A) |
| 2.61 - 3.40 | Moderately Agree (MA) |
| 1.81 - 2.60 | Moderately Disagree (MD) |
| 1.00 - 1.80 | Strongly Disagree (SD) |

Performance of the students in the pretest and posttest (Control Group)

Table 3 exhibits the performance of the Grade 8 Molave in the pretest and posttest (50 item test) using the traditional teaching strategies.

It can noted from the table that in the pretest for traditional teaching strategy, the scores of the students ranged from 11 to 20 with a computed mean of 13.00 and standard deviation of 2.819. A closer look at the table reveals that the majority of the students' 82.5 percent of the respondents got scores of 11 to 20 and the remaining 17.5 percent obtained scores from 0 to 10.

Also the same table shows that the score in the posttest for traditional teaching strategy, ranged from 21 to 30 with a computed mean of 22.125 and standard deviation of 4.931. Furthermore, it can be seen from the table that half or 50 percent of the respondents had a registered scores from 21 to 30. Meanwhile, 37.5 percent of the respondents got scores of 11 to 20 and the remaining 12.5 percent obtained scores of 31 to 40.

Traditional teaching is concerned with the teacher being the controller of the learning environment. Power and responsibility are held by the teacher and they play the role of instructor (in the form of lectures) and decision maker (as regards to curriculum content and specific outcomes). They regard students as having 'knowledge holes' that need to be filled with information. Traditional methods of teaching will not be complete without mentioning lecture. Students focus on memorizing what they are told. "Experiments" follow cookbook-style procedures to produce the expected results (Salandalan, 2008)

Table 3. The students' test scores in the pretest and posttest

| Score | Pretest (N = 40) | | Verbal Description | Posttest (N = 40) | | Verbal Description |
|-------------------|---------------------|------|-----------------------|----------------------|------|-----------------------|
| | f | % | | f | % | |
| 41 – 50 | | | | | | |
| 31 – 40 | | | | 5 | 12.5 | VS |
| 21 – 30 | | | | 20 | 50.0 | S |
| 11 – 20 | 33 | 82.5 | FS | 15 | 37.5 | FS |
| 0 – 10 | 7 | 17.5 | BS | | | |
| Range | 17 – 5 | | | 34 – 12 | | |
| Mean | 13.00 | | | 22.125 | | |
| Std. Deviation | 2.819 | | | 4.931 | | |

Legend:

- VS – Very Satisfactory
- S – Satisfactory
- FS – Fairly Satisfactory
- BS – Below Satisfactory

Performance of the students in the pretest and posttest (Experimental Group)

Table 4 presents the results of the pretest before and after exposing the students to inquiry-based teaching strategy.

Examination of the tabulated results shows that in the using inquiry-based teaching strategy, the scores of the students' ranged from 11 to 20 . Meanwhile, the mean was computed at 14.47 while the standard deviation which measures the deviation of scores of the students from the mean was recorded at 3.188. Further examination of the results reveals that majority or 82.2 percent

of the respondents got the scores of 11 to 20, 8.9 percent got scores of 21 to 30 and the remaining 8.9 percent obtained scores of 0 to 10.

Further examination of the Table 3 reveals the posttest after exposing of the learners to inquiry-based teaching strategy, the scores of the respondents in the posttest ranged between 31 and 40 with a computed mean of 32.20 and standard deviation of 6.170. Majority or 57.8 percent of the respondents obtained scores of 31 to 40; 33.3 percent got scores of 21 to 30; 6.7 percent got scores of 41 to 50; and the remaining 2.2 percent obtained scores of 11 to 20.

Inquiry-based learning increase the level of performance of the students and inspire them to learn more thoroughly. Inquiry guided learning also develops sense of independence among learners. It is considered as a self-directed learning wherein it focuses more on discipline as a framework and not on scholastic. It also serves as the dominant mode of learning and the primary stimulus for knowledge acquisition (Lee, 2011).

Inquiry based teaching is a teaching that focused on inquiry or question. But effective inquiry is more simply answering questions and getting the right answer. It spouses investigation, exploration, search, quest, research, pursuit and study. It is enhanced by involvement with the community of learners, each learning from the other in social interaction (Kuklthan, Maniotes & Caspari, 2007).

It can be noted from the table that the posttests registered the highest mean of 32.20 when students were exposed to inquiry based teaching strategies.

In this note it can be said that the fifty item pretest /posttest that covers the different topics using inquiry-based teaching has increased the competency level of the students in science.

Table 4. The students' test scores in the pretest and posttest

| Score | Pretest (N = 45) | | Verbal Description | Posttest (N = 45) | | Verbal Description |
|-------------------|---------------------|------|-----------------------|----------------------|------|-----------------------|
| | F | % | | f | % | |
| 41 – 50 | | | | 3 | 6.7 | O |
| 31 – 40 | | | | 26 | 57.8 | VS |
| 21 – 30 | 4 | 8.9 | S | 15 | 33.3 | S |
| 11 – 20 | 37 | 82.2 | FS | 1 | 2.2 | FS |
| 0 – 10 | 4 | 8.9 | BS | | | |
| Range | 21 – 8 | | | 44 – 17 | | |
| Mean | 14.47 | | | 32.20 | | |
| Std. Deviation | 3.188 | | | 6.170 | | |

Legend:

- O – Outstanding
- VS – Very Satisfactory
- S – Satisfactory
- FS – Fairly Satisfactory

Differences among groups in the pretest and posttest

To determine if the scores of the students were significantly different from their scores in the posttest, dependent samples t-test or paired sample t-test was employed. This statistical tool tells the researcher if the difference between two means is larger than would be expected by chance (i.e. statistically significant). Results of the analysis are presented in Table 5.

Findings revealed that highly significant differences existed between the pretest and posttest. This highly significant differences were brought about by the fact that the computed probability values is less than 0.05 significance level.

Table 5 and 6 show that there is a significant difference between the pretest and posttest scores of the students ($t = -13.858, 0.05$). This shows that the students had a significant increase of 58.74 percent in their posttest scores as compared with their pretest scores.

Table 5. Paired samples t-test of the pretest and posttest (Control Group)

| Variable | N | Correlation | 2-tail sig. | Mean | Std. Dev. | SE of Mean |
|----------|----|-------------|-------------|-------|-----------|------------|
| Pretest | 40 | .637 | .000** | 13.00 | 2.819 | .446 |
| Posttest | | | | 22.13 | 4.931 | .780 |

** highly significant

Table 6. Paired differences between pretest and posttest (Control Group)

| Mean | Std. Dev. | SE of Mean | t-value | df | 2-tailed sig. | 95% confidence interval |
|--------|-----------|------------|---------|----|---------------|-------------------------|
| -9.125 | 4.164 | .658 | -13.858 | 39 | .000** | -10.457(L) |

** highly significant

A thorough examination of Table 7 shows that before exposing the students to inquiry based approach, the pretest had a mean score of 14.47 with a computed standard deviation of 14.47. After subjecting to inquiry based approach, posttest was administered and a computed mean of 32.20 was registered with a standard deviation of 6.170. Based on the t-test analysis, the difference of 17.733 was found highly significant as shown.

To assess the effectiveness of inquiry-based teaching approach in teaching

Science, paired samples t-test was used in the study. The results showed that there is a highly significant difference in the students with a computed value of -17.650. This indicated that highly significant differences between the pretest and posttest of the students in science when they were subjected to inquiry-based teaching strategies.

Results showed that the inquiry-based teaching strategies is effective in teaching Science. This indicated that the students learned the lesson when the teacher applied these strategies. Therefore, it helpful enhanced their level of competencies in science.

Table 7. Paired samples t-test of the pretest and posttest (Experimental Group)

| Variable | N | Correlation | 2-tail sig. | Mean | Std. Dev. | SE of Mean |
|----------|----|-------------|-------------|-------|-----------|------------|
| Pretest | 45 | .715 | .001** | 14.47 | 3.188 | .475 |
| Posttest | | | | 32.20 | 6.170 | .920 |

** highly significant

Table 8. Paired differences between pretest and posttest (Experimental Group)

| Mean | Std. Dev. | SE of Mean | t-value | df | 2-tailed sig. | 95% confidence interval |
|---------|-----------|------------|---------|----|---------------|-------------------------|
| -17.733 | 6.740 | 1.005 | -17.650 | 44 | .000** | -19.758(L) |

** highly significant

Differences between groups in the pretest and posttest

In this part of the study, the performance of the Grade 8 students respondents in the pretest using the inquiry based teaching strategies were compared using the t-test with a value of 2.251, with a mean difference of 1.467 a 2-tailed significant of .056 which is described as not significant. Results of the analysis are shown in Table 9. Findings revealed that there is no significant differences in the pretest scores of the students.

Student learning is strongly steered by assessment tool (Willis, 2002). Traditional methods of assessment have often used only “objective” measures such as examinations and test to assess learning. Student perceptions of assessment requirements directed their approaches to learning and affected their learning outcomes.

Table 9. Independent samples test in the pretest (Control vs. Experimental)

| Mean Difference | Std. Error Diff | t-value | df | 2-tailed sig. | 95% confidence interval |
|-----------------|-----------------|---------|--------|---------------|-------------------------|
| 1.467 | .652 | 2.251 | 82.999 | .056ns | .171(L) 2.763(U) |

ns - not significant

Table 10 reveals the results of the analyses when paired samples t-test was utilized to determine the differences of the posttest scores between the control and experimental groups of Grade 8 students.

A closer look of the tabulated results shows that significant differences existed in the pretest scores performance of the students who were taught the traditional way and the inquiry –based strategies. The mean difference is 10.075 with t-value of 8.355. Findings indicated that two tailed significance is at .027 which is less than the .05.

Table 10. Independent samples test in the posttest (Control vs. Experimental)

| Mean Difference | Std. Error Diff | t-value | df | 2-tailed sig. | 95% confidence interval |
|-----------------|-----------------|---------|--------|---------------|-------------------------|
| 10.075 | 1.206 | 8.355 | 82.117 | .027* | 7.676 12.474 |

*significant

Inquiry based learning promotes the acquisition of new knowledge, abilities and attitudes through students increasingly independent investigation of questions, problems and issue, for which there often is no single answer (Lee, 2004).Through this strategy students could utilized and develop HOTS which a great help in increasing the level of knowledge among the respondents.

Qualitative Analysis

To determine the perception of the students on inquiry based approach, qualitative data were collected by means of a questionnaire. It identified students’ view on inquiry-based teaching instruction by giving the respondents a seven item questionnaire on their perceptions when they were exposed to inquiry-based teaching approach.

Qualitative researchers are concerned with making inference based on perspective, so it is extremely important to get as much data as possible for later analysis. Researchers spend a considerable amount of time designing interview questions. Interviews are designed to generate participant perspectives about ideas, opinions, and experiences.

A repertory grid was used by the researcher to further describe the students’ perspectives. The Repertory Grid is an instrument designed to capture the dimensions and structure of personal meaning. Its aim is to describe the ways in which people give meaning to their experience in their own terms. It is not so much a test in the conventional sense of the word as a structured interview designed to make those constructs with which persons organized their world more explicit. The way in which we get to know and interpret our milieu, our understanding of ourselves and others, is guided by an implicit theory which is the result of conclusions drawn from our experiences. The repertory grid, in its many forms, is a method used to explore the structure and content of these implicit theories/personal meanings through which we perceive and act in our day-to-day existence.

Students’ perception on Inquiry-based Teaching in Science

The students participated when sharing their perception about the inquiry based teaching instruction. They gave their insights and comments on the teaching strategies used in this research. This showed that the students of Grade 8 Yakal in Calawitan High School were very appreciative and eager to learn the new method of teaching.

Repertory Grid 1. Students’ insight on Applying Inquiry based teaching approach

| Theme | Subtheme | Significant Statement |
|---|--|---|
| <ul style="list-style-type: none"> The students want to know more about the inquiry-based strategy | <ul style="list-style-type: none"> Knowledge and awareness about inquiry based teaching Inquiry based strategy is a different method of learning Effects of the inquiry based in learners | <ul style="list-style-type: none"> To know how students will handle their works and what are the different strategies in way of teaching I need to know the different instructional way of teaching like problem solving etc. To have an idea about the different method and if it is effective To know more ways of learning It is about student centered problem solving group activities and discovery approach To make our activities easier and to know about the teaching method, we want to know it is effective To know what inquiry based learning approach is I need to know about how will they enlighten the students through this strategies |

Main Theme 1. The students are interested to know more about the inquiry-based teaching strategy.

Insight and perception about the content of inquiry-based teaching instruction

Students gave their points of view on what are their perceptions were on the content of the Inquiry-based teaching instruction. They were given the ideas needed for them to learn more about the new teaching method introduced to them.

An old adage states: "Tell me and I forget, show me and I remember, involve me and I understand." The last part of this statement is the essence of inquiry-based learning, says the workshop author. Inquiry implies involvement that leads to understanding. Furthermore, involvement in learning implies possessing skills and attitudes that permit you to seek resolutions to questions and issues while you construct new knowledge (Exline, 2004)

Repertory Grid 2. Students need to learn about inquiry-based learning approach

| Theme | Subtheme | Significant Statement |
|---|---|---|
| <ul style="list-style-type: none"> The students want to learn more about inquiry based teaching approach | <ul style="list-style-type: none"> Inquiry-based is discovery approach Inquiry based is more on students centred Inquiry based gained Is more comfortable for the learners Inquiry based is effective teaching approach | <ul style="list-style-type: none"> I learn about problem solving, group activities and discovery approach I learned how to cooperate with my groupmates and how to solve problems I learn more when the teacher use different ways of teaching in science I learned the lesson in easily using this teaching method I learn how to be a good leader and a better follower and also helped me build my self confidence in doing different activities in the classroom I learned that the leader only leads not to do all the activities Yes it is effective in our learning we do the activities by ourselves |

Main Theme 2: Students want to learn more about inquiry-based teaching

Perception of the students about the method used in inquiry based teaching

The students shared their idea on the method used in inquiry-based teaching instruction. They perceived that these teaching strategies make them independent and interested with what they are doing. Students performed the varied tasks in this approach through learning by doing. Like what Aristotle said that "For the things we have to learn before we can do them, we learn by doing them". Learning by doing means learning from experiences resulting directly from one's action (Reese, 2011).

Repertory grid 3. Activities and techniques of inquiry-based teaching approach

| Theme | Subtheme | Significant Statement |
|---|---|--|
| <ul style="list-style-type: none"> Students do the different task and activities using varied techniques of inquiry- based teaching approached | <ul style="list-style-type: none"> Inquiry-based approach made the learners more active and independent Inquiry-based approach helped the students do the various learning activities Inquiry-based is a multi-tasking technique | <ul style="list-style-type: none"> It became easier for us to learn the lesson It helped us the to be active in our classroom discussions Group activities, were and focused on the students It helped us in our learning We enjoyed the lessons because we were solving puzzles We were aware of other ways of other ways of learning of science. |

Main Theme 3: The students become aware of other teaching techniques through inquiry-based teaching strategy.

Perception of the students on how inquiry based teaching instruction enhanced learning in science

Students perceived that using the inquiry based teaching enhanced their learning in science. This made the students involve in the activities and the tasks needed in the lesson.

Repertory grid 4: Students insights on how inquiry based enhanced learning in science

| Theme | Subtheme | Significant Statement |
|---|---|---|
| <ul style="list-style-type: none"> The students want to enhance their learning competencies in science | <ul style="list-style-type: none"> Inquiry-based approach enhanced the learning abilities of the students Inquiry-based improve the progress report of the students Inquiry-based made the students become familiar with learning by doing | <ul style="list-style-type: none"> It change us and it enhanced our learning in science by means of sharing knowledge With collaborative activity we enhanced our skills and talents to make an activity easier to perform It helped me study to improve my grade In this strategy we were are not just using 2 senses but all 5 senses which helped us |

Main Theme 4: The students experienced the teaching techniques of inquiry-based strategy.

Perception of the students on the impact of inquiry-based teaching

The students believed that inquiry-based learning approach helped them gain knowledge and skills in doing different activities using inquiry-based teaching. One of the important outcome of inquiry should be useful knowledge about the natural and human-designed worlds. These broad concepts contain important issues and questions that individuals will face throughout their lives. Also, these concepts can help organize the content of the school curriculum to provide a relevant and cumulative framework for effective learning. An appropriate education should provide individuals with different ways of viewing the world, communicating about it, and successfully coping with the questions and issues of daily living. Likewise, happened in classroom situation that this teaching strategies can boost the student performance in activities in science lesson. (paraphrase) (Exline, 2004)

Repertory grid 5: The inquiry based approach promote efficient techniques that increase the learners knowledge in science

| Theme | Subtheme | Significant Statements |
|---|--|--|
| <ul style="list-style-type: none"> Students want to find out which serve as more efficient the inquiry based approach or traditional approach in their lesson in science | <ul style="list-style-type: none"> Inquiry based teaching approach is more effective than traditional Inquiry based teaching approach is easy to follow and understand the lesson Inquiry based teaching instruction enhanced the students confidence | <ul style="list-style-type: none"> Yes, because students will know about the inquiry based learning Yes unlike on traditional way which more and lectures and discussion Yes this is effective because they help the students more active Yes, its makes all activity easier Yes because the students makes as cooperative to the teacher and co-students |

Main theme 5: Students learned that inquiry based learning is an effective technique in teaching science.

Perception of the students on assessment using inquiry-based teaching

Students perceived that using inquiry-based teaching increases their Learning in science. Through this method students become aware and familiar on the lessons being taught since they are the one who search and discover it. This strategy gained more knowledge for the students, thus it enhanced their learning.

Repertory grid 6: Inquiry based approached increased the learning ability of the students in science.

| Theme | Subtheme | Significant Statements |
|---|--|--|
| <ul style="list-style-type: none"> Students want to test how inquiry based teaching instruction increase learning. | <ul style="list-style-type: none"> Inquiry based learning used different strategies Inquiry based increase the learning experience of the students | <ul style="list-style-type: none"> It increase my learning using the different strategies It helps me to learn well in every lessons I use a lot of my senses to increase my strategies on how to learn science |

Main theme 6: Inquiry based teaching instruction increased the level of learning skills of the students using varied strategies in science lesson.

Perception of the students on how inquiry based teaching instruction enhanced their competency level in science

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 (Lucas, 2017).

Students perceived that when learning in science lessons is inquiry-based, their competency in science will also increase. Using this strategy, the students were ready to cooperate with others and ready to face the learning tasks in the classroom.

Repertory grid 7: Inquiry-based approached enhance the competency level in science

| Theme | Subtheme | Significant Statements |
|---|--|--|
| <ul style="list-style-type: none"> Students want to know if the inquiry based teaching instruction will increase the competency in science | <ul style="list-style-type: none"> Inquiry-based teaching instruction enhanced the competency in science Inquiry-based made the lesson more understandable for the student | <ul style="list-style-type: none"> It enhanced the competency level by making the students study Yes, it made me understood the lesson Yes, compared with the traditional way of teaching |

Main theme 7: Inquiry based teaching instruction enhanced the students' level of competency in science.

FINDINGS, CONCLUSIONS AND RECOMMENDATION

This chapter presents the summary of the major findings, the conclusions drawn based on the findings, and the recommendations given in accordance with the conclusions.

Findings

This study compared the traditional and inquiry based teaching approach in Grade 8 students of Calawitan National High School.

Using the procedures described in the preceding chapters, the answers to the problems raised in this study were ascertained and summarized as follows: Before conducting the research, pretests results showed that the learners registered the highest mean of 14.47 in inquiry based teaching approach which is slightly higher than traditional teaching approach. Meanwhile, the lowest mean of 13.00 was computed for the pretest for traditional teaching approach.

After the experiments, findings revealed that in the posttests, respondents registered the highest mean of 32.20 when they were exposed to inquiry based teaching approach. On the other hand, a computed mean of 22.13 was registered for the traditional method.

When the mean scores of the pretests and posttest were compared using the paired samples t-test, results revealed that highly significant differences existed between the performance of the students in the control and experimental group.

Moreover, significant differences existed between the performances of the students in Science when they were subjected to Inquiry-based teaching.

Conclusions

Based on the findings of the study, it is therefore concluded that there is a significant difference between the students' performance in Grade 8 science when they were subjected to Inquiry-based teaching.

Henceforth, the inquiry-based teaching enhanced the competency levels of the students in Science.

Recommendation

In the light of the findings of the study, the following recommendations were drawn.

1. Teachers should find time to have an enhance their teaching strategies for the benefit of the students by attending school learning action cell (SLAC) sessions and other in-service seminars.
2. School Administrators provide training and seminar for the teacher that promote critical and logical thinking .This will be of great help for the students to become more independent learners and acquire lifelong practical skills.
3. In the future studies, it is suggested that an investigation whether inquiry-based teaching has a similar effect when the students are group in large numbers.

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APPENDICES

Appendix A

Letter of Request for the Schools Division Superintendent of Bulacan



Republic of the Philippines
BULACAN AGRICULTURAL STATE COLLEGE
Pinaod, San Ildefonso, Bulacan



INSTITUTE OF EDUCATION, ARTS AND SCIENCES

January 18, 2017

ROMEO M. ALIP, Ph.D., CESO V
Schools Division Superintendent
Division of Bulacan
Malolos City



Sir:

The undersigned is presently working on her thesis entitled **"INQUIRY-BASED INSTRUCTION ON STUDENTS ENHANCED COMPETENCIES IN SCIENCE"** as a final requirement for the graduate degree of Master of Arts in Education major in Educational Management.

In this regard, she is requesting permission from your good office to allow her to conduct her study and administer questionnaires to the Grade 8 students of Calawitan High School, Calawitan, San Ildefonso, Bulacan. Rest assured that the responses and data gathered will be treated with confidentiality.

Thank you for your kind consideration to this request.

Very truly yours,


MARIF M. DOCTORA
Researcher

Noted:


ALICIA S.P. GOMEZ, Ed.D.
Adviser


OFELIA V. SILVERIO, Ph.D.
Dean, IEAS

Appendix B

Endorsement Letter from the Schools Division Superintendent of Bulacan



Republic of the Philippines
Department of Education
Region III
SCHOOLS DIVISION OFFICE OF BULACAN
Capitol Compound, City of Malolos



1st Endorsement
February 13, 2017



Respectfully returned to Ms. MARIFIE M. DOCTORA, Researcher from Bulacan Agricultural State College, San Ildefonso, Bulacan, granting approval of the request to conduct a study and administer questionnaires to the Grade 8 students of Calawitan High School, San Ildefonso, this division, in connection with the thesis entitled **"Inquiry-Based Instruction on Students' Enhanced Competencies in Science,"** subject to the compliance of the following:

1. Proper coordination with the school head should be made;
2. Teacher-learners contact hours should not be affected;
3. No government fund should be used for this study;
4. Data gathered should be treated with utmost confidentiality and should be used solely for research purposes; and
5. A copy of the study should be furnished this office for reference.

For guidance and compliance.


ROMEO M. ALIP, Ph.D., CESO V
Schools Division Superintendent



BUILDING UP FOR ULTIMATE LEARNERS' ADVANCEMENT THROUGH CAPABLE & ACTIVE NURTURING

Appendix C

Letter of Request for the School Principal



Republic of the Philippines
BULACAN AGRICULTURAL STATE COLLEGE
Pinaod, San Ildefonso, Bulacan



INSTITUTE OF EDUCATION, ARTS AND SCIENCES

January 18, 2017

The Principal
Calawitan High School
San Ildefonso, Bulacan

Madam:

The undersigned is presently working on her thesis entitled **"INQUIRY-BASED INSTRUCTION ON STUDENTS ENHANCED COMPETENCIES IN SCIENCE"** as a final requirement for the graduate degree of Master of Arts in Education major in Educational Management.

In this regard, she is requesting permission from your good office to allow her to conduct her study and administer experimental research using module to the Grade 8 students of Calawitan High School, Calawitan, San Ildefonso, Bulacan. Rest assured that the responses and data gathered will be treated with confidentiality.

Thank you for your kind consideration to this request.

Very truly yours,


MARIFIE M. DOCTORA
Researcher

Noted:


FRANCISCA T. SALVADOR
Principal I

APPENDIX D

Republic of the Philippines
BULACAN AGRICULTURAL STATE COLLEGE
Pinaod, San Ildefonso, Bulacan
INSTITUTE OF EDUCATION, ARTS AND SCIENCES

“INQUIRY BASED INSTRUCTION ON STUDENT’S ENHANCED
COMPETENCIES IN SCIENCE”
PRETEST/POSTTEST

Name: _____ Yr.& Section _____

School: _____

Multiple Choice: Write the letter of your answer on the blank before each number.

- _____ 1. The highest category in the Linnaean system is _____.
 - a. class
 - b. phylum
 - c. kingdom
 - d. species
 - _____ 2. Muticellular organisms that can make their own food is belong to kingdom _____.
 - a. Animalia
 - b. Fungi
 - c. Protista
 - d. Plantae
 - _____ 3. The system of binomial nomenclature was developed by _____.
 - a. Charles Darwin
 - b. Carolus Linnaeus
 - c. Aristotle
 - d. Antoine van Leeuwenhoek
 - _____ 4. Carolus Linnaeus classified organisms based on similarities in _____.
 - a. Habits
 - b. Habitat
 - c. Size
 - d. Structure
 - _____ 5. A genus can be divided into _____.
 - a. Orders
 - b. Species
 - c. Phyla
 - d. Families
 - _____ 6. The branch of biology that deals with naming and classifying organisms is _____.
 - a. Evolution
 - b. Genetics
 - c. Taxonomy
 - d. Binomial Nomenclature
 - _____ 7. The scientific name for human is correctly written as _____.
 - a. *Homo sapiens*
 - b. homo sapiens
 - c. Homo Sapiens
 - d. *Homo Sapiens*
 - _____ 8. Two members of the same _____ would be most closely related.
 - a. class
 - b. order
 - c. family
 - d. genus
 - _____ 9. If an organism does not have its own means of locomotion and it produces new cells out of inorganic materials through the process of photosynthesis, it is _____.
 - a. an animal
 - b. a bacteria
 - c. a fungus
 - d. a plant
 - _____ 10. In which of the following phyla do animals have external skeletons as well as jointed bodies and limbs?
 - a. arthropoda
 - b. chordata
 - c. mollusca
 - d. Echinodermata
 - _____ 11. When the left and right sides of an animal body are mirror images of each other, it is referred to as being _____.
 - a. asymmetrical
 - b. bilaterlly symmetrical
 - c. radially symmetrical
 - d. none of the above
 - _____ 12. What features do all insects have?
 - a. Two pairs of legs, body divisions into four parts
 - b. Four pairs of legs, body divisions into two parts
 - c. Three pairs of legs, body divisions into three parts
 - d. Four pairs of legs, body division into three parts
 - _____ 13. All chordates have _____ at some time in their life cycles.
-

- a. Gill slits or pouches b. spinal cord protected by bones
c. Bones d. all of the above
- ____ 14. A group of related genera comprise the level called _____.
a. phylum c. family
b. class d. order
- ____ 15. Prokaryotic organisms make up the _____.
a. Archaeobacteria, eubacteria, and protists
b. Archaeobacteria, and protists
c. Protists and eubacteria,
d. Eubacteria and Archaeobacteria,
- ____ 16. Where will you likely find the methanogens?
a. In swamps c. Inside the cow's intestine
b. In marshes d. Near volcanic vents
- ____ 17. The soft bodied multicellular, eukaryotic organisms shaped like miniature
umbrellas, found in decomposing dead, moist leaves are actually members of
kingdom.
a. Plantae c. Protista
b. Fungi d. Animalia
- ____ 18. What structure does the amoeba use for movement?
a. cilia c. pseudopodia
b. flagella d. none of the above
- ____ 19. Which of the following describes the paramecium?
a. It moves by flagella c. It moves by pseudopodia
b. It moves by cilia d. It makes its own food
- ____ 20. What are cilia?
a. Cell walls of the prokaryotes c. Hairlike projections
b. Extensions of the cell surface d. Flagellated cells
- ____ 21. What are the black things on moldy bread called?
a. stalks c. hyphae
b. spores d. spore containers
- ____ 22. What fungi are associated with bread?
a. yeast and mushroom c. mushroom and bread mold
b. mushroom and bread mold d. yeast and bread mold
- ____ 23. Which of the following organisms does not have conducting vessels for food
and water ?
a. Sphagnum c. Azolla
b. Pinus d. Oryza
- ____ 24. To which group does the winged bean (sigarillyas) belong?
a. herb c. vine
b. shrub d. tree
- ____ 25. Which of the following is Not a perennial plant?
a. acacia c. santol
b. banana d. coconut
- ____ 26. What is the function of the stolon of Bermuda grass?
a. food storage c. reproduction
b. support d. water preservation
- ____ 27. Ferns reproduce by means of
a. seeds c. stems
b. spores d. roots
- ____ 28. Ferns, gymnosperms, and angiosperms are vascular plants because they
a. bear seeds c. have a specialized stems for storing food
b. develop from an embryo d. have a water and nutrient transport system
- For 29-39 Choose which animal does not belong to the group?
- ____ 29. Animals without backbones
a. lancelets c. sharks
b. jelly fishes d. insects
- ____ 30. Lays eggs with shells
-

- a. bird
b. fish
c. platypus
d. snake
- _____ 31. Arthropods
a. houseflies
b. segmented worms
c. spiders
d. centipedes
- _____ 32. Placental mammals
a. kangaroos
b. monkeys
c. rats
d. whales
- _____ 33. Found in cnidarians
a. body cavity
b. stinging cells
c. jointed legs
d. tentacles
- _____ 34. Worms
a. ascaris
b. liver fluke
c. leech
d. millipede
- _____ 35. Found in echinoderms
a. tube feet
b. spines
c. notochord
d. radial symmetry
- _____ 36. Mollusks
a. clams
b. snails
c. squid
d. sea squirt
- _____ 37. Backbone
a. earthworms
b. insects
c. vertebrates
d. sponges
- _____ 38. Fish
a. shark
b. milkfish
c. sea horse
d. starfish
- _____ 39. What do you call a group of organisms that are of the same species and live in the same area?
a. habitat
b. population
c. community
d. ecosystem
- _____ 40. What term is applied to the role an organism plays in its habitat?
a. abiotic factor
b. ecological succession
c. biotic factor
d. niche
- _____ 41. Which ecosystem is most likely to be unstable?
a. One in which a new predator appears and flourishes
b. One with no social relationships between predator
c. One with virulent parasites
d. One with predators
- _____ 42. The best definition here of an ecological population is a group of _____.
a. Communities
b. Organisms living in the same area
c. Populations of the same species living in the same area
d. Interbreeding organisms of the same species
- _____ 43. Which shows the correct sequence of a food chain?
a. rice plant > field mouse > snake > grasshopper > bacteria > frog
b. bacteria > snake > grasshopper > rice plant > field mouse > frog
c. rice plant > grasshopper > frog > field mouse > snake > bacteria
d. grasshopper > rice plant > field mouse > frog > snake > bacteria
- _____ 44. Which of the following organisms receives the most amount of energy?
a. horse
b. pig
c. mushroom
d. grass
- _____ 45. Which is incorrectly paired?
a. Muro-ami: coral reefs destruction
b. Severe flooding: deforestation
c. Ozone depletion: CFC build-up
d. Fish kill: Carbon dioxide pollution
- _____ 46. Which of the following statement is true?
a. Most of the atmosphere is composed of oxygen gas.
b. Carbon dioxide is released by plants during photosynthesis
c. Leguminous plants are always the site of nitrogen fixation in the nitrogen cycle.
d. Excretion of organisms releases nitrogen which can readily use by plants.
-

- _____ 47. Which of the following organisms serve as the secondary consumer?
- a. Eagle
 - b. Grasshopper
 - c. Mouse
 - d. Corn
- _____ 48. Which of the following cycles focuses only in respiration?
- a. Oxygen cycle
 - b. Nitrogen cycle
 - c. Water cycle
 - d. Carbon cycle
- _____ 49. Which cycle follows a series of steps starting from evaporation followed by condensation, and finally, through precipitation?
- a. Oxygen cycle
 - b. Nitrogen cycle
 - c. Water cycle
 - d. Carbon cycle
- _____ 50. Gaseous composition of the atmosphere describes in what cycle?
- a. Oxygen cycle
 - b. Nitrogen cycle
 - c. Water cycle
 - d. Carbon cycle

APPENDIX E

PRETEST/POST-TEST
KEY TO CORRECTION

| Item No. | Correct Answer | Item No. | Correct Answer |
|----------|----------------|----------|----------------|
| 1. | C | 26. | B |
| 2. | D | 27. | B |
| 3. | B | 28. | D |
| 4. | D | 29. | A |
| 5. | B | 30. | A |
| 6. | C | 31. | B |
| 7. | A | 32. | D |
| 8. | A | 33. | B |
| 9. | D | 34. | A |
| 10. | A | 35. | B |
| 11. | B | 36. | D |
| 12. | C | 37. | C |
| 13. | A | 38. | B |
| 14. | C | 39. | B |
| 15. | D | 40. | D |
| 16. | D | 41. | A |
| 17. | B | 42. | B |
| 18. | C | 43. | C |
| 19. | B | 44. | A |
| 20. | C | 45. | B |
| 21. | B | 46. | A |
| 22. | D | 47. | C |
| 23. | B | 48. | A |
| 24. | C | 49. | C |
| 25. | B | 50. | B |

| APPENDIX D | | | | | |
|--|---------|----------|-------|---------|----------|
| “INQUIRY BASED INSTRUCTION ON STUDENT’S ENHANCED | | | | | |
| COMPETENCIES IN SCIENCE” | | | | | |
| PRETEST/POST-TEST RESULTS | | | | | |
| GRADE 8- YAKAL | | | | | |
| (50 Items) | | | | | |
| BOYS | | | GIRLS | | |
| NO. | PRETEST | POSTTEST | NO. | PRETEST | POSTTEST |
| 1 | 13 | 26 | 1 | 14 | 22 |
| 2 | 8 | 33 | 2 | 12 | 28 |
| 3 | 10 | 39 | 3 | 15 | 43 |
| 4 | 17 | 34 | 4 | 12 | 34 |
| 5 | 13 | 27 | 5 | 14 | 37 |
| 6 | 13 | 44 | 6 | 21 | 33 |
| 7 | 8 | 29 | 7 | 13 | 29 |
| 8 | 10 | 40 | 8 | 11 | 40 |
| 9 | 13 | 34 | 9 | 14 | 35 |
| 10 | 16 | 31 | 10 | 21 | 39 |
| 11 | 14 | 27 | 11 | 12 | 35 |
| 12 | 14 | 27 | 12 | 11 | 31 |
| 13 | 15 | 25 | 13 | 16 | 31 |
| 14 | 11 | 22 | 14 | 15 | 34 |
| 15 | 15 | 30 | 15 | 15 | 39 |
| 16 | 17 | 32 | 16 | 17 | 36 |
| 17 | 18 | 34 | | | |
| 18 | 15 | 40 | | | |
| 19 | 16 | 31 | | | |
| 20 | 15 | 22 | | | |
| 21 | 18 | 27 | | | |
| 22 | 17 | 23 | | | |
| 23 | 16 | 34 | | | |
| 24 | 21 | 31 | | | |
| 25 | 14 | 42 | | | |
| 26 | 11 | 17 | | | |
| 27 | 21 | 38 | | | |
| 28 | 12 | 35 | | | |
| 29 | 17 | 29 | | | |

“INQUIRY BASED INSTRUCTION ON STUDENT’S ENHANCED
COMPETENCIES IN SCIENCE”
PRETEST/POST-TEST RESULTS
GRADE 8- MOLAVE
(50 Items)

| BOYS | | | GIRLS | | |
|------|---------|----------|-------|---------|----------|
| NO. | PRETEST | POSTTEST | NO. | PRETEST | POSTTEST |
| 1 | 16 | 20 | 1 | 8 | 21 |
| 2 | 10 | 19 | 2 | 14 | 24 |
| 3 | 12 | 21 | 3 | 17 | 19 |
| 4 | 12 | 23 | 4 | 13 | 17 |
| 5 | 11 | 19 | 5 | 13 | 19 |
| 6 | 9 | 17 | 6 | 8 | 18 |
| 7 | 11 | 16 | 7 | 13 | 23 |
| 8 | 13 | 21 | 8 | 13 | 20 |
| 9 | 13 | 34 | 9 | 14 | 21 |
| 10 | 16 | 20 | 10 | 15 | 23 |
| 11 | 15 | 21 | 11 | 8 | 12 |
| 12 | 12 | 25 | 12 | 12 | 18 |
| 13 | 14 | 21 | 13 | 16 | 22 |
| 14 | 14 | 31 | 14 | 14 | 24 |
| 15 | 17 | 32 | 15 | 17 | 31 |
| 16 | 14 | 28 | 16 | 5 | 15 |
| 17 | 13 | 22 | 17 | 10 | 16 |
| 18 | 12 | 23 | | | |
| 19 | 17 | 25 | | | |
| 20 | 16 | 22 | | | |
| 21 | 13 | 32 | | | |
| 22 | 16 | 26 | | | |
| 23 | 14 | 24 | | | |

APPENDIX F



Republic of the Philippines
BULACAN AGRICULTURAL STATE COLLEGE
Pinaod, San Ildefonso, Bulacan



INSTITUTE OF EDUCATION, ARTS AND SCIENCES

“INQUIRY-BASED INSTRUCTION ON STUDENTS ENHANCED
COMPETENCIES IN SCIENCE”

Interview Guided Survey Question

What are the perception of the students on inquiry based teaching in science?

| Questions | Answers |
|--|---------|
| 1. What do you need to know in inquiry based learning approach? | |
| 2. What did you learn about the inquiry based learning approach? | |
| 3. How did you find the activity? | |
| 4. How did inquiry based learning approach enhance your learning in science? | |
| 5. Did you find inquiry based approach more effective than traditional approach? | |
| 6. Does inquiry-based approached increase your learning in science? | |
| 7. Does inquiry-based approached enhance the competency level in science? | |

APPENDIX G



Republic of the Philippines
BULACAN AGRICULTURAL STATE COLLEGE
 Pinaod, San Ildefonso, Bulacan



INSTITUTE OF EDUCATION, ARTS AND SCIENCES

Survey Questionnaire
 (for Students)

The undersigned is presently conducting a study entitled “Inquiry- Based Instruction On Students Enhanced Competencies In Science”.

In this connection, she asks for your cooperation in answering the questionnaires that have been prepared and attached to this letter. She assures you that all information that you will give will be treated confidentially.

Name: _____ Year and Section: _____

Below is a description of inquiry-based instruction with regards to content, method and assessment. On the columns provided for, please check (/) the frequency of description using the given scale.

5 Strongly Agree (SA) 3 Moderately Agree (MA) 1 Strongly Disagree (SA)
 4 Agree (A) 2 Slightly Agree (SD)

| A.Content | SA | A | MA | SA | SD |
|---|----|---|----|----|----|
| | 5 | 4 | 3 | 2 | 1 |
| 1.Present objectives that easily understand | | | | | |
| 2.Use effective techniques that improve learning of the students | | | | | |
| 3.Use different question such as what, where, when, why and how in guide question and in exploring the lesson | | | | | |
| 4.Consist of various ways of presenting the lesson such as concept map, graphic organizer, puzzle(word , picture loop a word and cryptogram) | | | | | |
| 5.Show organized content of the lesson that enhance the learners knowledge in science | | | | | |

| B.Methods | SA | A | MA | SA | SD |
|---|----|---|----|----|----|
| | 5 | 4 | 3 | 2 | 1 |
| 1.Provide different ways of exploring the lesson like games, puzzle, collage making, activities, reporting, role play and group work | | | | | |
| 2.Use (localized)materials that can be found inside the school ground | | | | | |
| 3.Show clear and step by step procedure of the activities. | | | | | |
| 4.Use instructional materials like manila paper, cartoline, localized materials, colored paper, charts, powerpoint presentation and video lesson. | | | | | |
| 5.Consists of detailed outline of the lesson | | | | | |

| | SA | A | MA | SA | SD |
|---|----|---|----|----|----|
| C.Assessment | 5 | 4 | 3 | 2 | 1 |
| 1.Help the learners increase their level of understanding | | | | | |
| 2.Provide different ways in assessing the learners | | | | | |
| 3.Increase the knowledge of the learners in science | | | | | |
| 4.Provide updated way of evaluating the learner | | | | | |
| 5.Show clear instruction in pretest and posttest | | | | | |

APPENDIX H

INQUIRY-BASED: DAILY LESSON PLAN

TOPIC/TITLE: BIODIVERSITY

Subtopic: Vertebrate: Fishes, Amphibians and Reptiles

GRADE LEVEL: GRADE 8

TIME ALLOTMENT: 1 Hour

Learning Competencies and objectives

At the end of the lesson, students should be able to:

1. Discuss the characteristics of vertebrates animals
2. Compare the organisms belong to Fishes, Amphibians and Reptiles
3. Explain the role of this organisms in the ecological balance

| | |
|---|--|
| ELICIT (5 min) | Materials |
| Classify the organisms into what kind of worm they belong: Pinoy Henyo: Games | Manila papEr Pentel pen |
| ENGAGE (10 min) | |
| Are you familiar with the organisms name LOLONG? In what group does this animals belong? | Power point presentation |
| EXPLORE (25 min) | |
| Group activity; Collage Making Group work : Let the student group into 5 Present the procedure and let each group make their own collage | Power point presentation Manila paper Pictures of different fishes, amphibians and reptiles |
| EXPLAIN (10 MIN) | |
| Key question 1. How does Fishes, Amphibians and Reptiles differ in their characteristics? 2. Explain the significance of your work 3. What kind of fishes, reptiles and amphibians can be found in our locality? | Presentation of each group Brainstorming |
| ELLABORATE (5 MIN) | Powerpoint presentation |
| EVALUATE (5 MIN) | |
| A. Give the role of the following organisms in maintaining the balance of nature(Snake, Frog, Shark) B. Identify the following organisms into what group they belong: (fishes, Amphibians and Reptiles) | Pad paper |

| | |
|--|----------------------|
| EXTEND (5 MIN) | |
| 1. What are the characteristics of mammals? 2. Differentiate the three classification of mammals 3. Give examples of mammals | Notebook Pictures |

Scilinks by Aquino Marites et al. P. 172

Learners Materials p.258-261

Inquiry Based Module 2 p.22-23

APPENDIX H

Sample : TRADITIONAL: DAILY LESSON PLAN

| | |
|--|--|
| A. Content Standards | The learners demonstrate an understanding of the species as being further classified into a hierarchical taxonomic system |
| B. Performance Standards | The learners should be able to report (e.g., through a travelogue) on the activities that community engage in to protect and conserve endangered and economically important species. |
| C. Learning Competencies/Objectives (Write the LC code for each) | The learners should be able to classify organisms using the hierarchical taxonomic system Code: (S8LT-IVh-20) |
| II. CONTENT | Vertebrates: Fishes, Amphibians And Reptiles |
| III. LEARNING RESOURCES | |
| A. References | |
| 1. Teacher's Guide Pages | p. 184 |
| 2. Learner's Materials pages | pp. 259-262 |
| 3. Textbook pages | |
| 4. Additional Materials from Learning Resource (LR) portal | |
| B. Other Learning Resources | |
| IV. PROCEDURES | |
| A. Reviewing previous lesson or presenting the new lesson | Recall the characteristics of invertebrates mammals. Give examples of each. |
| B. Establishing a purpose for the lesson | Classify the animals as vertebrates. |
| C. Presenting examples/ instances of the new lesson | Ask the students to give examples of vertebrate animals and classify them according to taxonomical class. |
| D. Discussing new concepts and practicing new skills #1 | Ask the students to give sample of vertebrate animals/aquatic species. |
| E. Discussing new concepts and practicing new skills #2 | Ask the learners to give animals that live in land that lay eggs with shells and have scales. |
| F. Developing mastery (Leads to Formative Assessment 3) | Ask the students to give sample animals that live in both land and water. |
| G. Finding practical applications of concepts and skills in daily living | |
| H. Making generalizations and | Fishes, Amphibians and Reptiles are some of the |

| | |
|---|---|
| abstractions about the lesson | taxonomical class of vertebrate animals. |
| I. Evaluating learning | Classify the vertebrate animals as fish, reptiles or amphibians according to taxonomical class. |
| J. Additional activities for application or remediation | Give examples of fishes found in the market |
| | |

APPENDIX I
DOCUMENTATION



Multimedia Presentation



Group presentation



Localized Materials



Group project Collage/Poster

APPENDIX J

RUBRICS FOR GRADING PROJECT
 COLLAGE (Kingdom Animalia)
 POSTER MAKING (Biodiversity)

| Criteria | Description | | | | Score |
|---------------------|---|--|---|---|-------|
| | 4 | 3 | 2 | 1 | |
| Accuracy of Content | The students shows deep understanding of how diversity of life exists | The student shows considerable understanding of how diversity of life exists | The student shows shallow understanding of how diversity of life exists | The student Shows limited understanding of how diversity of life exists | |

| Organization /Ideas | 3 | 2 | 1 | Score |
|---------------------|--|--|---|-------|
| | All elements in the product are logically presented and consistent. A very clear message is conveyed | Most elements in the product are logically presented and consistent. A clear message is conveyed | Some elements in the product are logically presented. The message is conveyed | |

| Mechanics (Poster-concept, creativity, color; Collage-concept, creativity) | 3 | 2 | 1 | Score |
|--|--|---|--|-------|
| | All mechanics are followed for the given product | Most of the mechanics were followed for the given product | Not all of the mechanics were followed | |
| TOTAL | | | | |