INTRODUCTION

The word *science* probably brings to mind many different situations: a fat textbook, students collecting specimens in the seashores, synthesizing chemical formulas, performing dissections, among others. All these situations reflect some aspects of science but do not encompass the full meaning of science. Science is the study of phenomena and events in our environment through systematic observation and analysis (Wilson, 2008). Science education fosters the curiosity of students around the world and enhances scientific thinking. Also, through the research process, students will recognize the nature of science and develop scientific and process capabilities for scientific and technological development impact assessment (Education Bureau, 2017).

The objective of education, according to Albert Einstein, is to make individuals become self-conceived and acting. In this sense, the aim of science education will ultimately be to develop individuals who are able to understand and evaluate scientific information and make decisions that take adequately into, account several factors and to produce a sufficient number and diversity of future scientists, engineers and other science professionals who are skilled and motivated (Grandy & Duschl, 2005).

In the Philippines, the secondary science education curriculum has been reformed towards providing greater opportunities for students to realize that standards studied in class are relevant to daily life experiences (Tan, 2007). The revision of the curriculum made science education follow the spiral progression process. The process entails the learning of concepts from simple to complex in order for the learners to understand each topic thoroughly.

However, science education in the Philippines still fails to keep up with other science education programs of other countries, resulting to low science achievement among students. According to the feature article by The Manila Times (2014), the lack of scientific education reflects the poor quality of fundamental science and mathematical education seen in Filipino students ' low performance rates in tests. As reported by BusinessWorld (2019), the rate for the National Achievement Test (NAT) for Grade 6 is 40% in the SY 2016-2017. Compared to the 2015-2016 passing rate (41.5%), this is a slight decrease. On the other hand, the NAT rate for Grade 10 is 44.1% in SY 2016-2017 showing a slight drop from 44.7% in SY 2015-2016, but still it does not meet the 75% passing rate. Also, the Philippines ranked 34th out of 38 HS II countries and 43rd out of 46 countries in HS II Science. The country also took the last test in international surveys such as the 2003 Trends in the International Mathematics and Science Studies (TIMSS). Still, the Philippines ranked lowest among 10 countries. These low achievement levels are also documented in international assessments of science education (Bernardo, Limjap, Prudente & Roleda, 2008).

The data means that the science education in the Philippines is really in crisis. Thus, one of the solutions regarding this crisis is to enhance the educative process in terms of science concepts and teaching pedagogy.

The K to 12 Basic Education Program states that in developing learning-centered, developmentally adequate, inclusive learning for 21st century learners, the Department of Education shall adhere to the principles and standards. But in order that the teaching methodology and strategies comply with these standards, they must focus on the interaction between the teacher and students and among students too. Instead of knowing what they should learn, learners need to learn. With this demand in education, teachers also need to implement meaningful learning activities to develop the skills of the students.

A number of teaching methodologies and strategies have been developed and introduced to enhance the interaction of teacher and students and likewise students to students. One of which is the use of visual learning tools. Visuals can be a very powerful teaching tool. Teachers can use them to strategically engage, inspire and educate their students while creating a very fun and exciting experience for them (Lands, 2011).

A very good example of visual aid is presenting pictures. Pictures speak a thousand word, as they say. By simply presenting images to the students, teachers can let them wonder and explore. Pictures can also encourage students' own ideas to come out. It can also help them to develop their higher order of thinking skills particularly analyzing, synthesizing and evaluating what are presented to them.

Graphics organizers are also among the most efficient visual learning strategies that enhance learning and understanding of topic content throughout the curriculum. Graphic organizers guide the learners' thinking as they fill in the visual map or diagram. In a variety of formats dependent upon the task, graphic organizers help students learn by helping them to identify focus areas within a wide range of themes, such as a novel or an article. Thus, because they assist in building links and structural thinking, students often go to graphic designers to write projects. In addition, graphic organizers can be used as training instruments to help students manage their thinking and writing process. In the class, teachers can use graphic organizers to illustrate student knowledge of a topic or text section showing areas for improvement (Inspiration Software, 2018).

According to Ausubel's Meaningful Learning Theory, meaningful learning involves recognizing the linkages between concepts and the privilege of being passed on to long-term memory. The main element of meaningful learning is the integration of the new information into the old knowledge structure. He also believes that knowledge is hierarchically organized and that the new information can be meaningfully linked to what is known, attached or anchored. The theory Ausubel's had introduced are, in fact, advanced graphic organizers. These organizers are one of the most common visual linking tools used in the educative process (Dean, Hubbell, Pitler & Stone, 2012). However, there are a lot of other visual tools to represent linking between concepts that can be used by teachers. One of the visual tools used as an instructional tool considered in this study is the anchor charts.

Anchor charts are charts that record the thinking or the creative knowledge of the students, most importantly the highlights of the lesson. These charts use graphics that depict the concepts of the lesson. These charts can also be a guide, a review chart and even be used as text mentors. These can also be utilized to improve the academic performance of students. According to Simmet (2016), anchor charts are effective in engaging students. It can also be one of the integration of arts in science that a teacher can use in the classroom. It is a visual tool which supports teaching making it possible for students to succeed in the class. Teachers also use their classroom management anchor charts for students to monitor their own behavior, so that their expectations and routines are softly recalled (Stewart, 2018). The use of these charts also develops a culture of literacy in the classroom where teachers and students make thinking visible by recording content, strategies, processes, hints and guidelines. (Tate, 2003)

In science education, anchor charts are very important because they promote devising or creating a new way of understanding science concepts by engaging the students to think of something creative or something unique to exemplify their understanding of a science concept. These can also be used in summarizing the science lesson in a unique way where the salient points are shown in the chart (Scholastic Teachers, 2016).

With that, this study is an attempt to evaluate the use of anchor charts as one of the tools during instruction and as an engagement activity in science lessons. The researchers sought to determine the effectiveness of anchor chart as instructional tool in improving the science academic performance of the junior high school students in biology subjects.

METHODOLOGY

This action research utilized a quasi- experimental design assigning one class as the experimental group and another class as the control group. The pretest and posttest scores were compared to determine the effectiveness of the said intervention between the two groups. This study is also a descriptive-comparative type of research because it describes and compares the students' academic performance through their biology mean scores after the intervention on both groups. This study was conducted at Nueva Vizcaya General Comprehensive High School (NVGCHS), specifically, on the two sections of Grade 8 science students that served as the control and experimental groups of the study. The researchers determined the strengths and weaknesses of the intervention by observation. A camera was used to take pictures and videos during the teaching- learning process. The mean scores of students in the pre-test and post-test of both control and experimental group were compared to determine if there is a significant difference after the intervention. For the academic performance in biology, the researchers used the raw scores to determine the levels of academic performance based on standards of the K to 12 curriculum, prescribed by DepEd Order No. 8, s.2015. The strengths and weaknesses were discussed in paragraph form with supporting examples of students' outputs.

Table 1

Basis for the Performance Levels of Students in the Achievement Test

Performance Level	Raw Score	Raw Score (%)
Did Not Meet Expectations	0-24	0 – 59.99
Fairly Satisfactory	25-27	60 – 67.99
Satisfactory	28-30	68 – 75.99
Very Satisfactory	31-33	76 – 83.99
Outstanding	34-40	84 – 100

Analysis of covariance(ANCOVA) was used in comparing the mean of raw scores on the post-test of the students in the experimental and control groups and to determine if a significant difference exists. Pre-test scores were used as a covariate to control possible effects of pre-existing level of performance of the students in the post-test results.

RESULTS

Section 1. Level of academic performance of students in the experimental and control groups

1. **Pre-test scores of students and level of academic performance**

Table 2 shows the mean scores of the two groups –experimental and control - before the intervention.

Table 2

Level of Academic Performance of Students Based on their Mean Pre-Test Scores.

Level of Performance	Experimental	Control

	f	%	f	%
Outstanding	0	0.0	0	0.0
Very Satisfactory	0	0.0	0	0.0
Satisfactory	0	0.0	1	2.9
Fairly Satisfactory	0	0.0	2	5.7
Did Not Meet Expectations	31	100.0	32	91.4
Total	31	100.0	35	100.0
Mean Score ± SD	18.74 ±2.93		18.80 ± 3.86	
Level	**Did Not Meet Expectations**		**Did Not Meet Expectations**	

Legend: 0-24 (Did not meet expectations), 25-27 (Fairly Satisfactory), 28-30 (Satisfactory), 31-33 (Very Satisfactory), 34-40 (Outstanding)

Table 2 shows the mean scores of the experimental and control groups before the intervention. In the experimental group, the mean score of 31 students was 18.74 classified under *did not meet expectations*. All students in the experimental group are under the same level.

Of the 35 students in the control group, 32 or 91.4% of the students got scores of 24 and below and thus considered at the *did not meet expectations* level. Two (2) or 5.7% got scores between 25-27 thus considered as *fairly satisfactory* and one (1) or 2.9% got a score of 28-30 thus considered as *satisfactory*. Overall, the control group registered a mean score of 18.80 which means that the group was at the *did not meet expectations* level. This implies that the two groups have the same level of performance before the intervention, that is, they were unable to meet the expectations even if some of the topics were discussed in their lower years. For this reason, some of their answers in the pretest should have been based on their prior knowledge yet some may have just did a lot of guessing.

1. **Post-test scores of students and level of academic performance**

Table 3 shows the mean scores of the groups after the intervention.

Table 3

Level of Academic Performance of Students Based on their Mean Post-Test Scores after the intervention

Levels of Performance	**Experimental**		**Control**	
	f	**%**	**f**	**%**
Outstanding	0	0.0	0	0.0
Very Satisfactory	1	3.2	0	0.0
Satisfactory	4	12.9	1	2.9
Fairly Satisfactory	7	22.6	2	5.7
Did Not Meet Expectations	19	61.3	32	91.4
Total	31	100.0	35	100.0
Mean Score±SD	22.16±4.58		20.11±3.47	
Level	**Did Not Meet Expectations**		**Did Not Meet Expectations**	

Legend: 0-24 (Did not meet expectations), 25-27 (Fairly Satisfactory), 28-30 (Satisfactory), 31-33 (Very Satisfactory); 34-40 (Outstanding)

Table 3 shows the mean scores of the control group after the intervention. The mean score of the students was 20.11. Data shows that after the intervention, most (91.4%) of the students got 24 and below and thus considered to be at the *did not meet expectations* level. Some

(5.7%) of the students got 25-27 thus considered as *fairly satisfactory*. And 2.9% of the students got 28-30 thus considered as *satisfactory*.

Table 3 also shows the mean scores of the experimental group after the intervention. The mean score of the students was 22.16. Data shows that after the intervention, most (61.3%) of the students got 24 and below and thus considered to be at the *did not meet expectations* level. Some (22.6%) of the students got 25-27 thus considered as *fairly satisfactory*. The data also shows that almost thirteen percent (13%) of the students also got 28-30 thus considered as *satisfactory*. Only one is classified under *very satisfactory*.

It can be inferred that there was a change in terms of engagement and interaction as what has been found out by Simmet (2016) in her study *How anchor charts can engage in interactive read-aloud*. However, the academic performance of the students still did not meet the expectation. This was probably due to some factors. First, during the intervention, students had a problem with their attendance. There was a time, during the 5th day of intervention, when there were only 8 students in the class and the researchers had to wait for the other students to enter the class before starting the lesson. When asked where were their classmates, the students claimed that their classmates were still at lunch. As revealed by Fadelelmoula (2018) in his pilot study *Impact of Class Attendance on Student Performance,* attendance of the students has a positive impact on students' academic performance. In this study, this affected the level of academic performance of the students, that is, they were not able to meet academic expectations.

Section 2. Difference in science academic performance between control and experimental group after controlling pre-test scores

Table 4 shows the significant difference between the groups after controlling the pretest scores.

Table 4

Covariate of Academic Performance between Groups

GROUP	Mean	Std. Error	df	F	Sig.
Experimental	22.16	.665	1,63	5.162[b]	.027*
Control	20.11	.626			

a. Covariates appearing in the model are evaluated at the following values:
PRE TEST SCORE = 18.77. R Squared = .220 (Adjusted R Squared = .195)
*significant at .01

Table 4 presents the means of those taught with anchor chart (M=22.16, SE=.665) and those taught without (M=20.11, SE=.626). The table also shows the result of the test for significant difference on the academic performance of the experimental group and control group, F(1,63)= 5.162, p=.027. There is a difference found in the academic performance in science in which the mean difference of 2.05 is found significant.

Unfortunately, the level of academic performance of the students were still at its lowest level which is *did not meet the expectations*. However, based on the data, there was a significant positive effect on academic performance in science of students who received the intervention with the use of anchor chart. This implies that the anchor chart has a positive impact on the academic improvement of the students. Hence, with the aid of anchor charts, students are able to understand science concepts in a creative way.

This is supported by the study of Mulvahill (2018) that states that anchor charts reflect students' thinking or creative knowledge, with focus on lesson highlights. Simply put, these instructional aids are able to *anchor* the students' thinking ability. In different forms - a reference, a check-up chart for the students' work, and even as a mentor texts for spelling or for meanings – these charts are helpful. Made uniquely by the students, these charts reveal the learners' own interpretation about the lesson (Gryphon House, 2017).

Section 3. Strengths and Weaknesses of the Intervention

The intervention was done for 10 days. Within these days, the researchers made use of anchor charts as an instructional tool in teaching biology. The teacher and the students alternately made anchor charts for the discussion. Day by day, the submitted works of these students were getting more artistic and more creative. The willingness of the students to participate in class during the discussion and in the making of anchor charts was also observed. Collaborative learning was also a strength of anchor charts for it was done uniquely by group. How the students perceived the lesson was evident in the groups' work. Anchor charts help to strengthen class routine teaching. They also support students in how they work in a process such as problem solving and in interacting with peers. Finally, anchor charts help the students develop strategic behavior, such as what they can do when they discover a new concept they cannot understand (Gryphon House, 2017).

However, despite these strengths of using anchor charts, there were weaknesses that the researchers have encountered. One of which was the observation that the making anchor chart is time consuming. A good anchor chart necessitates ample time for the students to construct; unfortunately, this cannot be done within a class schedule considering that there are other parts of the learning session. Another weakness of anchor chart is that, not all of the science concepts need an aid of anchor charts. Some topics may be presented in some ways and other devices that can still help the students.

Samples of anchor charts made by the students in the experimental groups are as follows.

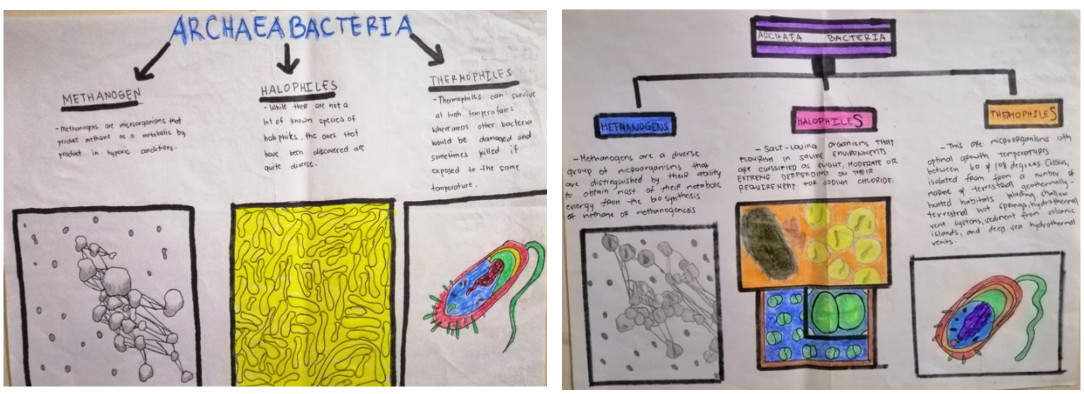

Figure 3. Archaebacteria Anchor Charts

The topic here was classification of archaebacteria. The students were tasked to identify the three classifications of archaebacteria, providing short description of each. With the aid of this anchor chart, the students were able to differentiate the three classifications which can enhance their understanding of the topic. Longer retention is expected since they have provided examples for each. By simply looking at the examples, they can easily remember which group does each belong.

Figure 4. Five Kingdoms of Living Things Anchor Charts

The topic here was the kingdom of the living things. The students' task was for them to create an anchor chart regarding the five kingdoms of living things. The students gave examples of each kingdom and described it according to the discussion. The task was assigned to check the retention of the students and to guide them in differentiating each kingdom according to its description at the same time providing some examples.

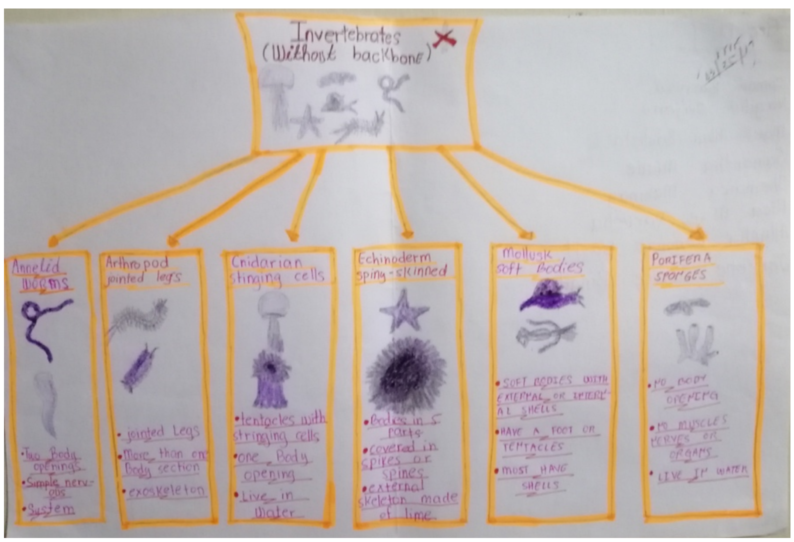

Figure 5. Invertebrates Anchor Chart

Another kingdom of animalia is the invertebrates which were discussed for this learning session. The figure shows the classification of the invertebrates wherein students created an anchor chart to draw examples and provide description of each classification. The examples helped the students identify where classification each belongs contributing to longer retention and easily identification of each organism.

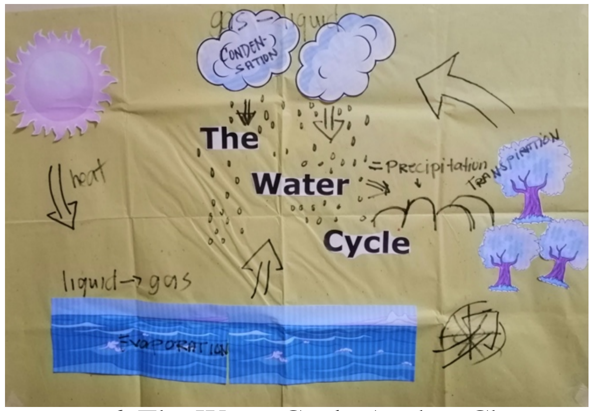

Figure 6. The Water Cycle Anchor Chart

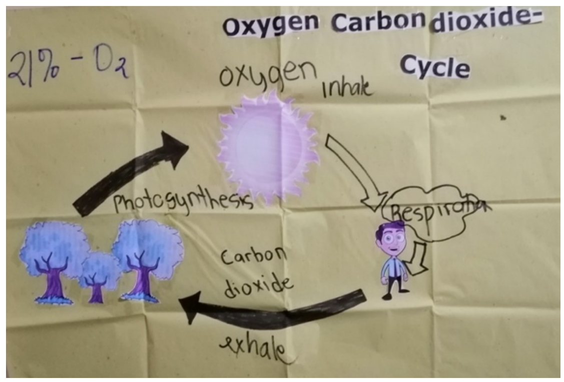

Figure 7. The Oxygen Carbon Dioxide Cycle Anchor Chart

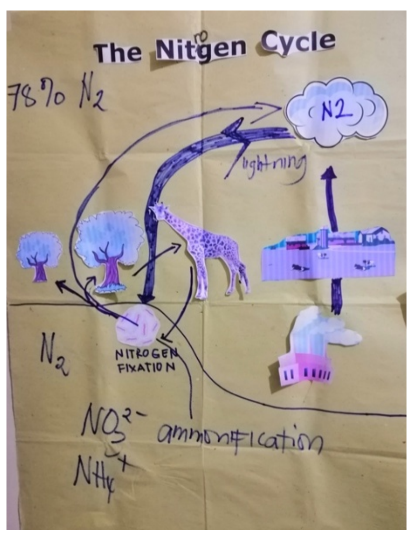

Figure 8. The Nitrogen Cycle Anchor Chart

The students were grouped into three to read and report on the three Nutrient Cycles (Water Cycle, Oxygen-Carbon Dioxide Cycle and the Nitrogen Cycle). Creating anchor charts to present their reports helped them analyze the cycle easily. During their presentation, their classmates were able to connect the relationship between each cycle immediately because diagrams were provided. Students were also able to identify the application and the importance of not altering each cycle.

CONCLUSIONS

Based on the findings, the following conclusions can be made:

1. Academic performance in biology is at the lowest level; that is, it did not meet expectations.
2. The use of anchor charts as an instructional tool effectively engages the students for maximum participation during discussion and group activities.
3. The use of anchor charts as an instructional tool has developed the students' creativity skills as observed.

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