Garden-Based Strategy in Teaching Senior High School Life Science

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Steffany L. Gatdula (MaEd) and Norrie E. Gayeta (PhD)
Department of Education - Tabangao Integrated School;
Batangas State University, Philippines
steffany.gatdula01@deped.gov.ph, cinderland08@gmail.com

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Abstract - *An effective teacher integrates numerous types of learning strategies based from the learning styles of the students. The researcher affirms that maximizing the available resources in school and strengthening the integration of Kolb's experiential learning theory are necessary in helping the students to easily understand the concepts especially when students' capacities and abilities are inclined more with skills rather than academics. This study determined the effectiveness of garden-based strategy in teaching senior high school Life Science and described the behaviors and attitudes of the students towards garden-based learning and developed garden-based learning activities.*

An experimental method was employed in conducting the study. The respondents were 60 Grade 11 Shielded Metal Arc Welding (SMAW) students of Tabangao Integrated School grouped as control and experimental using purposive sampling technique. Data sources included, pretest and posttest scores, class observation forms and survey questionnaire. Frequency, percentage, weighted mean, dependent t-test and Hake Factor test were the statistical tools applied.

Findings revealed that the integration of garden-based strategy (GBS) increased the level of performance of the students from average to high level in all life science lessons. In addition, a significant difference was noted between the performances of both groups specifically in perpetuation of life and how plants survived lessons. Also, the average normalized gains of the experimental group recorded medium gains in all lessons while the control group indicated low gains in some lessons. As to (GBS) allowed the students to improve their science academic performances while enhancing the life-long learning skills and positively shaped the attitude of the 21st century students.

Keywords: *bioenergetics, garden-based strategy, life science and science learning activities*

INTRODUCTION

In education, the end usually comes first before the beginning. It is important to picture the expected learning outcomes and possible applications of learning in the students' day to day activities before teaching and learning process occur. An effective teacher integrates numerous types of learning strategies based from the learning styles of the students. It is important for the teachers to realize that students learn in different ways. Some students are better visual learners while some are good in hands on activities. Further, some students' capacities and abilities are inclined more to skills rather than academics.

Also, an effective teacher also considers the learning environment and resources to enable the students to learn. However, limited resources sometimes equate to limited opportunities especially when some science laboratory experiments are not possible due to unobtainability of nearly resources as power supply and science laboratory. As highlighted by Bates [1] developing learning environment for students is probably the most creative part of teaching. Students may learn in wide variety of settings such as an outside-of-school locations and outdoor environments including how individuals interact with and treat one another as well as the ways in which teachers may organize student learning activities to facilitate learning.

Salient features of the K to 12 Program includes strengthening early childhood education, making the curriculum relevant to learners, ensuring integrated and seamless learning or spiral progression, building proficiency through language, gearing up for the future through senior high school (SHS) and nurturing the holistically developed Filipino. Its goal is to provide sufficient time for mastery of concepts and skills, develop lifelong learners and prepare graduates for tertiary education, middle-level skills development, employment and entrepreneurship. In order to achieve these goals, every student must be given an opportunity to receive quality education based on enhanced and decongested curriculum that is internationally recognized and comparable.

Senior high school is two years of specialized upper secondary education; students may choose a specialization based on aptitude, interests and school capacity. The choice of career track defines the content of the subjects a student will take in Grades 11 and 12. SHS subjects fall under either the core curriculum or specific tracks. Current content from some general education subjects are embedded in the SHS curriculum. Every graduate from the K to 12 programs will be equipped with the following skills: information, media and technology skills, learning and innovation skills, effective communication skills and life and career skills.

Part and parcel of the core curriculum under natural sciences are the earth and life science. This learning area is designed to provide a general background for the understanding of earth science and biology. Issues, concerns, and problems pertaining to natural hazards are also included. It also deals with the basic principles and processes in the study of biology. It covers life processes; an interaction at the cellular, organisms, population and ecosystem levels. Teaching natural sciences involves learning by doing. Educators know that a student learns more quickly and retains more information when the subject matter pertains to them personally. The act of doing makes learning extremely personal. Students don't learn by following rules, they learn by doing, and by falling over. The process of experiential learning involves both self-initiative and self-assessment, as well as hands on activity.

Garden-based is an example of strategy that involves learning by doing. In this strategy, school garden serves as a living laboratory to explore the worlds of earth and life sciences. Stayer [2] cited garden-based learning strategy helps the student to increase grade point average, utilize new learning styles and develops their perspectives and ways of learning to incorporate critical 21st-century skills such as curiosity, flexibility, open-mindedness, informed skepticism, creativity and critical thinking. Teeming with possibilities, school garden strategy provides students with the opportunity to conduct experiments; view seasonal and land-form changes, take population surveys, and watch life cycles unfold before their eyes. Thus, schools and community gardens are living classrooms with great potential for learning.

There are many techniques, skills, strategies and practices to be an effective life science teacher. Being an effective teacher allows an environment that enables the students to learn more, solve problems, make decisions and create ideas. Effective teaching can stem from traditional to modern practices. Teachers must reevaluate how to reach and engage the students in learning. They need to retool the mode of strategies in this age of limited attention spans and increased emphasis on student engagement. Innovation in the mode of instruction is necessary to a successful teaching-learning process.

Using gardens as alternative settings to teach science veers away from the dry atmosphere of the classroom and jumps outside in the fresh air. Not only will students become part of the learning process, but they will gain appreciation for the skills they learn and enjoy the healthy foods they grow. Teaching science in the garden fosters teachers a wonderful opportunity to show the students biodiversity and life's uniqueness. In addition, a high voluntary participation rate is possible when teachers teach science through gardening. Paying attention and retaining information will not be a tedious endeavor. In addition, students engaged themselves in science activities because they enjoyed exploring the beauty of the environment and the richness of nature through collecting specimens needed in the experiments.

Science related activities are also vital in preparing the lesson plan. It serves as the major complement or supplement for the learning competencies needed by the students to meet. Life science activities specifically outdoor learning activities facilitate the development of various domains of mind and personality such as intellectual, emotional, social and aesthetic. To a greater extent, theoretical knowledge gets strengthened when relevant activities are organized related to the content taught to the learners. Since the mentioned activities are true and practical experiences, it also enhances the positive attitude of the students which is one of the facets of personality. Hence, a teacher who develops activities creatively and scientifically will surely develop a well-rounded student.

This study was guided by the constructivist theory of Jerome Bruner and experiential learning theory by David Kolb. The constructivist theories guided the mode of instruction expected to facilitate learning through garden-based strategy. Brashier [3] and Niaz [4], defined constructivism as a learning theory that focuses on individuals and relies on the idea that learners are actively involved in the learning process.

Constructivism aims to develop individuals with multiple viewpoints and advanced problem-solving skills and who are able to defend their thoughts and organize them.

On the other hand, experiential learning theory was utilized in the study as another basis for effective science education through outdoor learning activities since it emphasized learning through reflection on experience and knowledge construction by interacting with the environment. Fenwick [5] stated that educators' pedagogy when focused on learners' experience challenges well-established ways of thinking about education as a program. In addition, [6] Kaiser (2017) highlighted that engaging hands-on learning activities incorporated into subject matter are key components of experiential education in which environment-based education programs have been employed, emphasizing the lifelong learning skills, such as problem solving and critical thinking.

OBJECTIVES OF THE STUDY

This study determined the effectiveness of garden-based strategy in teaching senior high school life science. Specifically, this study sought answers to the following questions: what are the levels of performance in the pretest and posttest of the control and experimental groups in the following lessons: Introduction to Life Science, Bioenergetics, Perpetuation of Life, How Plants Survive and Interaction and Interdependence?; how do the levels of performance of students in the control and experimental groups compare?; are there significant differences?; how may behaviors and attitudes of students toward garden-based learning be described and based on the analysis, what garden-based activities may be prepared?

METHODS

Research Design

The experimental method of research was utilized in this study in determining the effectiveness of the integration of GBS in learning life science in senior high school students as against instruction not utilizing GBS. This method was used since it was deemed more appropriate as this study aimed to compare, analyze and interpret data.

Calmorin [7] noted that in the experimental method of research, the researcher manipulates and controls one or more independent variables for variation concomitant to the manipulation of dependent variables. Pretest-posttest design was used to measure the degree of change as a result of the treatment or intervention. This design involves the control group and the experimental group, which participants of whom were carefully selected through randomization procedures. Both groups were given pretest at the beginning of the quarter and posttest at the end of the quarter. The control group was isolated from all experimental influences.

The control group was taught by the teacher-researcher without GBS. The experimental group on the other hand used the garden-based strategy. The two sections handled by the teacher-researcher were used as the control and experimental groups.

Subjects of the Study

The participants of the study were the Grade 11 Shielded Metal Arc Welding (SMAW) senior high school students in Tabangao Integrated School enrolled in S.Y. 2018-2019. There were two sections of Grade 11 SMAW, with 30 students each section. The Grade 11 SMAW-Miller was the control group where photos, metacards and diagrams in learning life science were utilized while the Grade 11 SMAW-Lincolyn was the experimental group. The latter was exposed to the garden-based strategy in learning life science. A purposive sampling technique, specifically a total population sampling was utilized in this study in selecting the participants. This kind of sampling technique was commonly used to generate reviews of experiences within the population.

Pretest results revealed that there was no significant difference between the performances of the two groups of participants. To further strengthen the comparability of the two groups, participants' final grades in Grade 10 Science were subjected to statistical analysis. Statistical analysis showed that there was no significant difference between the experimental and the control group as indicated p values of 0.06 and 1.0 respectively. Pretest results were analyzed to establish the comparability of the two groups of participants.

Data Gathering Instruments

The major instrument used in this study was a self-constructed test, a self-made questionnaire and observer's rating scale. The books written by Baltazar and Leonor [8], Moncada [9] and Salandanan et al. (2016) served as the source of the pretest and posttest. The items were sourced from these references and were modified by the teacher-researcher and subjected to expert validation.

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Teacher-made test. The questions were based on the life science curriculum guide provided by the Department of Education. The test was used in the pre-test and posttest of the study.

Construction of the self-constructed test. Test items covered on the content standards including introduction to life science, bioenergetics, how plants survived, independence and interdependence, and perpetuation of life. The multiple choice test was modified based on the prepared table of specifications. The cognitive skills covered knowledge, comprehension, application and analysis based on Bloom's Taxonomy of objectives. The first draft of the test items was presented to the research adviser for corrections and suggestions. Corrections and modification as suggested by the research adviser were incorporated in the revised draft of the test. After series of revisions, it was then subjected to content validation.

Validation of self-constructed test. The final draft was presented for validation purposes among the teachers, school head in Tabangao Integrated School and other experts for comments and suggestions. Items were improved and subjected to a pilot test for further refinement and for determination of test items' reliability. After the content validation of the test, the 120-item test was pilot tested to ten Grade 12 students who had taken the life science. The data gathered were used for item analysis. The indices of difficulty and discrimination were computed for each item and the results are used for the final version.The final draft of the pretest which was composed of 100-item test was retested to a group of 10 Grade 12 CSS students. The results of the test were used to determine the coefficient of validity and reliability.

Administration of the self-constructed test. The test was produced and distributed to the participants. Pretest was given to the participants prior to instruction and posttest was given after four weeks. Both pretest and posttest were personally supervised by the researcher.

Questionnaire. The questionnaire was meant to obtain students' assessments and views on the use of garden-based strategy. The researcher reviewed books, theses, dissertations and some questionnaires to gain ideas on what could be used as bases of items of the instrument. The questionnaire consisted of fifteen items describing garden-based learning. After the administration of the posttest, participants were asked to rate each statement using the four-point Likert scale. The lowest rating was 1 (strongly disagree) and the highest was 4 (strongly agree).

Observer's rating scale. For this purpose, an observer rating scale was developed for this study. The profile of the observers is found in Appendix K. During the conduct of the study, observers were invited to the experimental class. This was used to ensure that garden-based strategy was integrated in the instruction. The observer rating scale had 10 items which basically describes how the teacher and students conduct themselves in the garden-based education.

Interview. The researcher also interviewed for the purpose of more valid responses from the participants to support and strengthen the responses in the questionnaire as to their behavior and attitudes toward GBS.

Data Gathering Procedure

After the approval of the adviser for the administration of tests, a letter of request noted by the adviser was prepared for approval from the principal of Tabangao Integrated School to conduct the study in the institution and to have the Grade 11 SMAW students as the participants of the study. Upon the approval of the request, all the students involved were oriented of the purpose of the study. Informed consent form was given to all participants to ensure that their participation was voluntary.

The two sections were grouped into control and experimental groups according to their final grades in Grade 10 science subject and pretest results analysis. Before the GBS mode of instruction and traditional instruction, the researcher planned lessons and prepared garden-based learning activities related to the selected lessons in life science; namely, introduction to life science, bioenergetics, perpetuation of life, how plants survived and interaction and interdependence.

The experimental group was exposed to garden-based strategy. Some exercises and quizzes were given to the experimental and control groups as forms of evaluation. The control group utilized the conventional method of instruction without GBS using only lecture, photos, metacards and diagrams as instructional materials. The pretest was administered to both control and experimental groups before subjecting them to instruction. Posttest was given after covering all the topics under study. After obtaining the pretest and posttest results, these were analyzed to determine the level of performance of the students. The researcher used four level descriptors: very high, high, average and low.

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RESULTS AND DISCUSSION

Table 1 shows the life science performance level descriptors of the students based on the pretest and posttest results utilized by the researcher. Further, Tables 2, 3 and 4 posted the ranges of raw scores in different life science lessons and the corresponding achievement levels.

Table 1. Life Science Performance Level Descriptors

Achievement Level	Descriptors
Very High	A student at this achievement level has demonstrated mastery of life science content standards beyond high. Almost all items were answered correctly.
High	A student at this achievement level has demonstrated mastery of life science content standards and is well equipped with knowledge and skills for the next level of coursework in the subject area. Minimal errors can be found in the test items.
Average	A student at this achievement level has demonstrated only the fundamental knowledge and skills needed for the next level of coursework in the subject area. Possible confusion with the life science concepts results to low scores.
Low	A student at this achievement level failed to demonstrate the fundamental knowledge and skills needed for the next level of coursework in the subject area. Students get zero or lowest scores in this level.

Table 2. Raw Score Ranges for Introduction to Life Science Pretest and Posttest

Achievement Level	Raw-Score Range
Very High	9 – 10
High	6 – 8
Average	3 – 5
Low	0 – 2

Table 3. Raw Score Ranges for Interaction and Interdependence Pretest and Posttest

Achievement Level	Raw-Score Range
Very High	12 – 15
High	8 – 11
Average	4 – 7
Low	0 – 3

Table 4. Raw Score Ranges for Bioenergetics, Perpetuation of Life and How Plants Survived Pretest and Posttest

Achievement Level	Raw-Score Range
Very High	20 – 25
High	13 – 19
Average	6 -12
Low	0 – 5

Statistical Treatment of Data

Frequency and percentage were used to identify the level of performances in the pretest and posttest of the students. Weighted mean was used to further determine the level of performances in the pretest and posttest and the students' behavior and attitudes toward garden-based learning. Hake Factor (normalized gain, g) was used for analyzing the pretest and posttest to measure the effectiveness of garden-based strategy in teaching life science. Independent t-test was used to find the significant differences between the two groups of students.

RESULTS AND DISCUSSION

After tabulation, statistical tests, analysis and interpretation of the collected data, the study yielded the following findings.

1. Levels of Performances in the Pretest and Posttest of the Control and Experimental Groups in Life Science Lessons

1.1 Introduction to life science. The level of performances of the control and experimental groups in the pretest in introduction to life science were at the average level with composite mean values of 4.60 and 4.07, respectively. Twenty-one students (70.00) from the control group were at the average level; eight students at the high level (26.67) and one student at the low level (3.33) were noted. On the other hand, in the experimental group, 22 students (73.33) were at the average level, three (10.00) at the high level, four (13.33) appeared to be at low level with one (3.33) at the very high level. The average level has the highest percentage among the four levels of performances. The participants demonstrated only the fundamental knowledge and skills in the topics included in introduction to Life Science namely, the historical development of the concept of life, the origin of the first life forms, and the unifying themes in the study of life.

Apparently, after traditional method of teaching, the posttest results of the control group showed that there were 20 students (66.67) at the high level. A notable percentage (13.33) under very high level with a frequency of four was found. With the integration of GBS, posttest result of the experimental group revealed 23 students (76.67) at the high level, four students (13.33) were at very high level and only three students (10.00) remained at the average level. Thus, both groups improved from average to high level as reflected in the composite mean values of 6.73 and 7.30. Students understand more the unifying themes in the study of life since they were able to directly observe and trace the connections among living things and how they interact with one another and with their environment through various activities in the school garden. This affirms the concept of Stayer in utilizing the garden as living laboratory for the students.

1.2 Bioenergetics. The level of performances of the control and experimental groups prior to instruction was at the average level having composite mean values of 8.07 and 8.47. The obtained data of the control group implies that majority of the students were at the average level prior to instruction. Twenty-two students (73.33) were at the average level. Six students (20.00) were at low level and only two students (6.67) noted to be high. During the pretest of the experimental group, 23 students (76.67) were at the average, two students (6.67) were at high level and five students (16.67) were considered at low level.

The mean value of the control group after instruction increased to 12.03; which happened to be at the boundary of average and high level, yet still considered to be average. Though, it was noted that there were two students at very high level (6.67), 10 (33.33) were at high level and 18 (60.00) were at the average level. The result may remain at the average level because explaining how cells carry out functions, how photosynthetic organisms survive and how energy flow from the environment to the cells through photos and direct instructions may not be enough for the students to fully understand the lessons.

The level of performance of the experimental group significantly increased to high level with a mean value of 14.10 after instruction. The posttest showed four students at very high level (13.33), 11 (36.67) proficient students, and 15 (50.00) were at the basic level. The result connotes a positive evaluation in the use of GBS in teaching bioenergetics since it is composed of topics related to plant biology like photosynthesis and how plants use energy from the environment where the integration of experiential learning in the garden leave remarkable concepts to the students similar with the idea of Kolb in incorporating experiential learning theory in science lessons.

1.3 Perpetuation of life. The pretest of the control group was at the average level with a mean value of 7.77 with the highest frequency of 25 students (83.33) at the average level and lowest frequency of three students (10.00) at low level. On the other hand, before exposing the experimental group to GBS, the pretest was similar with the weighted mean of 7.77 also at average level which was exactly similar to the control group. It was noted that 24 students (80.00) were at the average level and six students (20.00) appeared at low level.

Though an increase to 12.30 weighted mean was obtained after the conventional strategy, still the level of performance is average. One student (3.33) at very high level and majority of the students remained at the average level. However, the effectiveness of GBS directly reflects on the posttest result of the experimental group where it gained a weighted mean of 14.50, considered at high level, with frequency values of five (16.67) at very high level, 11 (36.67) at high level and 14 (46.67) at the average level. Some participants believed that the lack of using supplementary activities in dealing with perpetuation of life and plants reproduction limits the students' opportunity in enhancing their understanding of the concepts. An additional science learning activity may stimulate investigative and applied thinking skills of the students. This finding supports the notions of Brashier and Niaz where constructivism develops individuals with multiple viewpoints and advanced problem-solving skills.

1.4 How plants survived. The level of performance of the control group in the pretest in how plants survived lesson was at the average level with a mean value of 9.03. There were 20 students at the average level (66.67), six at high level (20.00), and four students at low level (13.33) recorded before the traditional method of instruction. Similar with the pretest result of the experimental group, the mean value of 7.37 also average. Only one student (3.33) was at the high level and most of the students were at the average level with a percentage of (63.33).

After instruction using conventional method of teaching the performance was improved to high level with a weighted mean of 12.90. This signifies that high percentage of the students understand the lesson with the use of metacards and photos during the lecture proper. Having a record of three students (10.00) who were at the very high level, with nine students at high level (30.00) during the posttest, supports that traditional method was also effective.

On the other hand, the experimental group noted a weighted mean value of 7.37 in the pretest and 15.40 in the posttest suggested that the integration of GBS has a good impact in the level of performance of the students. Also, seven out of 30 students (23.33) reached the very high level and 13 students at high level (43.33) after the experiment. A well-designed teaching strategy is necessary to address the needs of the students in improving the performance level.

1.5 Interaction and Interdependence. The level of performances of the control and experimental groups in the pretest in interaction and interdependence lessons was at the average level. The control group noted 21 students (70.00) out of 30 were at the average level, two students at high level (6.67) and seven students at low level (23.33) before the conventional instruction. The control group has a mean value of 4.80 while the experimental group noted a closed mean value of 5.30. Seventeen students (56.67) were at the average level, eight students at low level (26.67), four with high level (13.33) and one student at very high level (3.33).

The posttest result shows that the highest frequency of the students can be found at high level, noted frequency was 19 (63.33) and four students at the very high level (13.33). In addition, an increased in the mean value of 8.87 at the posttest was recorded for the control group while the experimental group noted a mean value of 9.77. After the experiment, 21 students (70.00) from the experimental group jumped to the high level, six (20.00) at the very high level with only three (10.00) recorded at the average level.

Apparently, the level of performances in the pretest of the experimental group on the selected life science lessons namely; introduction to life science (M=4.07) bioenergetics (M = 8.47), perpetuation of life (M=7.77), how plants survived (M=7.37) and interaction and interdependence (M =5.30); were all at the average level.

Furthermore, after the integration of garden-based strategy, postest revealed an increase in the level of performances of the students. The mean values on each lesson were noted as (M=7.30) introduction to life science, (M=14.10) bioenergetics, (M=14.50) perpetuation of life, (M= 15.40) how plants survived and (M=9.77) interaction and interdependence. Hence, all mean values after instruction were considered at the high level.

Finally, both control and experimental groups were at the average level of performances prior to instruction of the selected life science lessons. Both groups improved after the instruction, though it was also noted that the integration of GBS showed a higher level of performances compared to the conventional method of teaching specially in perpetuation of life and how plants survived lessons.

2. Difference on the Levels of Performances of the Control and Experimental Groups

Table 5. Levels of Performance in the Pretest and Posttest of the Control and Experimental Groups in Different Lessons

Lesson	Control Group				Experimental Group			
	Pretest		Posttest		Pretest		Posttest	
	X	PL	X	PL	X	PL	X	PL
Introduction to Life Science	4.60	A	4.63	H	4.07	A	7.30	H
Bioenergetics	8.07	A	12.03	A	8.47	A	14.10	H
Perpetuation of Life	7.77	A	12.30	A	7.77	A	14.50	H
How Plants Survived	9.03	A	12.90	H	7.37	A	15.40	H
Interaction and Interdependence	4.80	A	8.87	H	5.30	A	9.77	H

Legend: PL = Performance Level A = Average
H = High X=Mean

As indicated in the t-test with values ranging from 1.454 to 1.890 in introduction to life science, bioenergetics and interaction and interdependence lessons had no significant difference on the level of performances as reflected in the pretest and posttest of the students.

However, when it comes to perpetuation of life and how plants survived lessons, the result was clearly depicted that there were significant differences on the level of performances of the two groups. The computed t-values ranging from 2.29 to 2.271 and p – values ranging from 0.026 to 0.027 were smaller than the level of significance equal to 0.05.

Both conventional and garden-based strategy improved the level of academic performances of the control and experimental groups. The result of the average normalized gains of each lesson reflected an increased in the levels of performances of the students where majority indicated medium gains and few low gains in the control group while the experimental group recorded medium gains in all lessons.

3. Description on the Behaviors and Attitudes of Students Toward Garden- Based Learning

The integration of garden-based education in SHS Life Science not only allowed the students to improve the level of performances but also gave them an opportunity to enjoy the learning process as strongly agreed by most students with a weighted mean of 3.50. The students agreed that garden-based strategy helped them realized the importance of responsibility in taking care of the environment, gain insights, allowed them to develop positive attitude like perseverance and open-mindedness, enhanced life-long learning skills and increased their appreciation in learning Life Science lessons with a weighted mean ranging from 3.40 – 3.43. This supports the idea of Ruiz-Gallardo, GBS provided more positive interactions between educators and the students, strengthening their relationships and enhancing the level of respect students felt towards teachers as they work with each other in the garden. In addition, this finding is also similar with the concept of Kaiser, engaging hands-on learning activities incorporated into subject matter are key components of experiential education in which environment-based education programs have been employed, emphasizing the lifelong learning skills, such as problem solving and critical thinking.

4. Proposed Garden-based Learning Activities

The garden-based learning activities for Life Science developed by the researcher may aid in improving the students' engagement and academic performance in some topics in Life Science. These GBL activities are anchored on the content standards, performance standards and competencies for Life Science in the Department of Education's Senior High School Curriculum Guide. As such, these GBL activities can be utilized as individual or group performance tasks or as supplementary activities to reinforce and increase learning of Life Science concepts. Further, the GBL activities are highly attention-grabbing and engaging activities which subscribe to lively learning thereby empowering the students become active participants in their own learning while enjoying the process.

CONCLUSION

The levels of performance of the Senior High School students in Life Science are enhance better by their exposure to garden-based strategy. Garden-based strategy is more effective mode of instruction than the traditional method of teaching in increasing the levels of performance of the students in perpetuation of life and how plants survive lessons. Garden-based strategy gives the students enjoyment on outdoor learning activities and develops students' positive attitude like perseverance and open-mindedness. The proposed garden-based learning activities contain specific objectives, procedures and guide questions to enhance the students' academic performances in plant biology while developing lifelong learning skills.

RECOMMENDATION

The proposed garden-based learning activities may be adopted in teaching senior high school life science lessons specifically introduction to life science, bioenergetics, how plants survived, perpetuation of life, interaction and interdependence.

Enhancement of the school garden is necessary to have a more effective integration of garden-based learning in plant biology subject. Conduct of similar study with the academic track like Science and Technology, Engineering and Mathematics (STEM) and Accountancy and Business Management (ABM) as respondents aside from TVL students to measure the effectiveness of GBS in other group or category of learners.

Parallel study may be conducted to find out the effect of GBS on a larger area or population since Tabangao Integrated School has only few sections for Grade 11 students.

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