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Research Article

Performance Assessment Task: A Point of Reference for Science Teachers - this Pandemic and Beyond

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ABSTRACT

The pursuit for quality education, including that in the basic education levels, for sustainable development is clearly described in the Education for Sustainable Development (ESD), one of the17 Sustainable Development Goals (SDGs) by the UN. Accordingly, to equip students, with knowledge, skills, attitudes, and values they'll need to face the difficulties along with sustainable development, there is a need to update some processes currently utilized in science teaching and learning. For this reason, alternative activities and assessment methods, like the use of performance task assessment is needed to improve both the quality of teaching and to provide a meaningful learning experience to students. The purpose of this study was to provide relevant information from extant literature and a sample performance task assessment to encourage Science teachers to utilize these information in their classes. To achieve this purpose, significant information about performance task assessment and an original performance task assessment were presented. The use of performance assessment task is one alternative method to develop critical thinking skills, and to provide an education that is truly relevant to every student in the light of today's challenges, like the pandemic. It could provide authentic and meaningful learning experience to students, and is very relevant in the context of coping with the challenges the science teachers have been facing. With the many pieces of evidence on its effectiveness and positive learning experience by students provided by literature, it is certain that the use of performance assessment task in Science classes cannot be overemphasized.

Keywords: *Performance task, Performance assessment, Science performance assessment task, Education for Sustainable Development (ESD), Length of time flowers open*

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Background

Education provides us knowledge in the Quality education, including that in the basic education levels from Kindergarten to Senior High School (K to 12) is a global thrust and commitment. Irrefutably, quality and relevant education is a requisite to the attainment of sustainable development in a highly globalized world, this 21st century and beyond.

In support of the pursuit for quality education and the goal of sustainable development, the UN General Assembly adopted in 2015 the "2030 Agenda for Sustainable Development Goals" (Education for Sustainable Development Goals Learning Objectives, UNESCO, 2017, p. 6). The "Quality Education-Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" has been one of the 17 Sustainable Development Goals (SDGs). As published in the aforementioned document, the "Education for Sustainable Development (ESD) is a key instrument to achieve the SDGs" (p.7).

Furthermore, the proponents of the publication on ESD have claimed that it is a holistic and transformational education that addresses learning content and outcomes, pedagogy and learning environment; and that it requires a shift from teaching and learning, asks for an action oriented, transformative pedagogy that supports self-directed learning, participation and collaboration, problem-orientation, inter- and transdisciplinarity and the linking of formal and informal learning. They argued that only such pedagogical approaches make possible the development of key competencies needed for promoting sustainable development (Education for Sustainable Development Goals Learning Objectives, UNESCO, 2017).

Accordingly, ESD should be considered as an integral part of quality education, inherent in the concept of lifelong learning in all institutions of learning from preschool to tertiary education, and even beyond. Education stakeholders should consider it their responsibility to deal intensively with matters of sustainable development and to foster the development of sustainability competencies, for "ESD provides an education that matters and is truly relevant to every learner in the light of today's challenges." (Education for Sustainable Development Goals Learning Objectives, UNESCO, 2017, p. 7).

One of the challenges that the education sector is facing this time is the occurrence and the adverse effects of COVID-19 pandemic. It has brought many changes in the lives and activities of people all over the world. The impact of the pandemic has affected many sectors and organizations, like education institutions, more specifically in the teaching and learning process.

At national and global levels, ensuring the welfare of millions of learners in basic education sector alone, because of the risk of COVID-19 infection, requires commitment amidst the health crisis. However as UNESCO reiterates its stand, "Education cannot wait. If learning stops, we will lose human capital." Thus, meeting the needs of the most vulnerable populations, like the basic education pupils/students, is essential to the achievement of SDG 4, the ESD (UNESCO, 2017, as cited in Guidelines on the Use of the Most Essential Learning Competencies [MELCS], n.d.).

Many significant changes and challenges have been recognized and solutions have been sought out in order to cope with the demands and needs of the education sector during this "new normal" or teaching and learning in changeable times.

One of the challenges brought about by the pandemic, like the adoption of distance learning modality in the teaching and learning process, has been utilized to ensure the continuity of quality learning, specifically to maintain achievement and develop new skills for all types of learners (United Nations Children's Fund, Asia and the Pacific, 2020). In relation to students' achievement, Rapanta, et al. (2020, as cited in Al-Sholi et al., 2021) published that "assessment is one main challenge in the transition process from face to face to distance learning during COVID-19 pandemic" (p. 14). In addition, the process of assessing students' learning should not only rely or focus on traditional measures of achievement, like formal examinations (e.g. true or false and multiple-choice tests) but should also use alternative learning task and assessment strategies, like the use of

performance tasks in the teaching of Science concepts, processes and skills.

Background of the Performance Assesssment Task

Although many teachers would agree that motivation and presentation of the main lessons are important parts of a science instruction, many others claim that classroom assessment is likewise an integral part of science teaching. According to Popham (2011, as cited in Rustaman, 2017) there is a strong relationship and alignment between science teaching and science testing or evaluation. Further, "assessment can be differentiated into 'assessment of learning', 'assessment for learning', and 'assessment as learning' based on the goal, whereas based on its function it can be differentiated into formative assessment and summative assessment" (p. 1).

The use of assessment tools, such as oral and written tests, among others, is necessary and ever-present in class activities. When teachers give a test or different types of tests, it is usually because they have to make a decision and they want the results of the testing situation to help them make those very important instructional and promotional decisions. Many teaching and learning tests, like standardized tests are not designed to evaluate the individualized growth and development (of learners) taking place in the classroom…. But there are assessment tools that do!

Mackenzie (2020) published that "authentic assessments, unlike standardized tests, have a vital role. They can demonstrate growth over time in the students. Utilizing authentic assessments that play to students' strengths is an important area of consideration" (p. 6). In particular, Oberg (2010, as cited in Bland & Gareis, 2018) added that instead of contrived issues for the classroom environment, authentic performance assessment requires students to demonstrate understanding and skills in a real-life context.

Barber, King and Buchanan (2015, as cited in Bland & Gareis, 2018) reported that "performance assessments have future implications for students regardless of level, building foundation of problem-solving, self-directed learning, and constructive collaboration for future learning" (p. 62).

Performance assessment refers to "any assessment procedure that involves either the observation of behavior in the real world or a simulation of a real-life activity with raters to evaluate the performance" (Bachman, 2002; Norris, Brown, Hudson, & Yoshioka, 1998; Norris, Hudson, & Bonk, 2002; Weigle, 2002; as cited in Kim, 2004, p. 1). On performance evaluation focus, the performance-based assessment scoring should represent students' ability rather than the rater's prejudices and assumptions (Stiggins, 1987, as cited in Ernst & Glennie, 2017). Moreover, Darling-Hammond, Ancess, and Falk (1995, as cited in Johnsen & Johnson, 2007) reported that:

> Performance-based assessments provide the teacher and the students with not only more information about the important characteristics of the learning and performance goals, but also how near the students are to attaining these goals. In this way, the assessments may be used to help the student with strategies and skills needed to reach the goal (formative assessment) and in evaluating the quality of the final performance (summative assessment). The more clearly students understand the goals, the better able they be to assess their own progress and improve their performance. (pp. 16-17)

The ASCD (2011) published that "performance assessment involves the demonstration and application of knowledge, skills, and work habits through what is known as a performance task. It is important that the task be meaningful and engaging to students" (para. 2). To substantiate the aforementioned definition of a performance task, McTighe (2019) opined that it is "any learning activity or assessment that asks students to perform to demonstrate their knowledge, understanding and proficiency. Performance task yield a tangible product and/or performance that serve as evidence of learning" (Chap 1, para. 1).

Thus, performance tasks can be used to engage students to meaningful learning because of their authentic contexts and real-world challenges and when used as assessments, they enable teachers to measure students' deeper understanding of both simple and complex science processes (McTighe, 2019).

Designing a performance task could be considered as one of the challenging tasks by a teacher who would like to utilize the activity (the performance task) for students' meaningful learning experience within or beyond the four walls of the classrooms. Different sources and models, by their respective proponents, may suggest variations in design processes and steps in designing a particular performance assessment task.

One outline of the processes involve in designing the performance task had been published by Stoll and Schultz in 2019. The design process according to them have these steps: 1) Unpack the performance expectation, 2) Identify the rich and authentic phenomenon, 3) Develop prompts, 4) Create scoring rubric, and 5) Pilot, score, and revise. And, "the most important step" according to them along with understanding the aforementioned steps of the design process is for the teacher to collaborate and to get the support of other teachers in diverse fields. Collaboration is very important for teachers to overcome the challenges included in the development of the performance task.

Aligned with Stoll and Schultz's (2019) performance task design processes, McTighe (2019) published these Performance Task Review Criteria that should serve as targets for constructing and reviewing the performance task until its completion: 1) The task addresses targeted standard(s)/outcome(s); 2) The task calls for understanding the transfer, not simply recall or a formulaic response; 3) The task requires extended thinking---not just an answer; 4) The task establishes a meaningful, real-world context for application of knowledge and skills; 5) The task includes criteria/rubric(s) targeting distinct traits of understanding and successful performance; 6) The task directions for students are clear; 7) The task allows students to demonstrate their understanding, and 8) The task effectively integrates two or more subject areas and technology (Chap. 4).

The use of the performance task in the teaching of science lessons systematically documents what pupils know and can do based on activities they engage in on a daily basis in their classrooms, both real and virtual. In addition, and most importantly, it evaluates thinking skills such as analysis, synthesis, evaluation, and interpretation of facts, ideas, and — skills which standardized tests generally avoid.

In addition, it is flexible enough to allow teachers to evaluate each learner's progress using information obtained from ongoing class interactions with materials and peers (it permits an individualized approach to assessing abilities and performance) and provides valuable, in-depth information for parents, administrators, and other policymakers.

One of the relevant approaches to science activity and assessment that has been gaining acceptance among basic education teachers is the performance assessment task. It is a learning activity and assessment procedure that requires students to apply knowledge and skills (by performing the authentic activity and assessment procedure---the performance assessment task) in a real-life situation and relevant context. In the ASCD article entitled "Designing Performance Assessment Tasks", Arter (n.d., as cited in Cohen, 1995), asserts that "performance assessment tasks should include carefully defined criteria. These are 'the basis on which we judge. Performance criteria specify what tasks are required of the student and how each element will be assessed." (p. 2).

The performance assessment task entitled "Performance Assessment Task on the Length of Time Flowers Open" is very relevant in the context of challenges (e.g. scientific interest, mental health issues and concerns like stress and depression) brought about by the pandemic to students and teachers, and the need for relevant online learning activities that can help create a positive mood and reduce stress.

Foster (2016) reported that scientists and researchers have long been fascinated by the multiplicity and relations of living things on Earth. Primarily, "flowering plants (angiosperms) have been of particular focus because

of their important economic and cultural roles with society, as well as their ubiquity and importance within natural ecosystems" (p. 65). In addition, Brodribb & Field (2010) and Magallon (2014, as cited in Foster, 2016) reported that angiosperms retain huge amounts of carbon from the atmosphere and serve as key food producers for a variety of animal species, with their spread and appearance influencing habitat structure around the world (Brodribb & Field, 2010; Magallon, 2014, as cited in Foster, 2016). And, according to the pollination interactions with insects, birds, and small animals, for example, have evolved major mutualistic ties with angiosperms (van der Niet & Johnson, 2012; & Rosas-Guerrero, et al., 2014, as cited in Foster, 2016).

In line with the well-being benefits of green industry products and services that serve to enhance the quality of life for consumers, specifically on persons' learning and mental health, Hall and Dickson (2011) asserted that "keeping plants in a child's learning environment enhances learning capabilities by helping them to focus and concentrate" (p. 99, para. 4), and "flowers generate happiness" (p. 99, para. 6). Particularly, people find natural aesthetic beauty (of flowers) comforting and having flowers in and around the house and workplace is a fantastic method to reduce tension and anxiety. More specifically, as stated in the factsheet by the International Association of Horticultural Producers (AIPH), (n.d.), "positive emotions help put life events in a broader perspective and so lessen the negative effects that may result from negative emotions. Positive emotions such as gratitude, hope, empathy, joy, love, pride, calmness, surprise and awe can all be associated with flowers" (para. 2).

Notably, on curriculum alignment requirements, the K to 12 Curriculum Guide for Science (Grade 3 to Grade 10) of the Philippines published in August 2016 that Science education aims to develop scientific literacy among the learners that will prepare them to be informed and participative citizens who are able to make judgements and decisions regarding applications of scientific knowledge that may have social, health, or environmental impacts. And, as a whole, the science curriculum is learner-centered and inquiry-based, emphasizing the use of evidence in constructing explanations. Concepts and skills in Life Sciences, Physics, Chemistry, and Earth sciences are presented with increasing levels of complexity from one grade level to another in spiral progression, thus paving the way to a deeper understanding of core concepts. The integration across science topics and other discipline will lead towards meaningful understanding of concepts and its applications in real-life situations (K to 12 Curriculum Guide for Science, Grade 3 to Grade 10, 2016).

The Performance Assessment Task on the Length of Time Flowers Open was developed by the Author/Researcher himself. It was checked by experts, and was included as one of the major outputs he developed during a National Training Course held at the premier university in the Philippines. The approved version was modified by him to be included in this publication. In the revision process, he was guided, among others, by the publications of Stoll and Schultz (2019) on "How to Design a Performance Task" (pp. 40-45), and McTighe's (2019) publication on "How Can Educators Design a Performance Task?" (Chap. 4), and many other relevant references listed in the References section of this paper.

Moreover, the Author developed the rubric based on Stoll and Schultz's (2019), McTighe's (2019), and Chun's (2010) suggestions/requirements in the development of the performance task (specifically the development of prompts, authentic performance, transparent evaluation and the criteria that target distinct traits of understanding) to guide
both the teachers and the students in performing the tasks and in assessing whether the task's goals and objectives have been achieved.

Most importantly, the provisions to adopt to the basic requirements of online learning modality, and also with the safety and health protocols during this COVID-19 pandemic were given utmost consideration in the revision process.

The Performance Assesssment Task

Performance Assessment Task on the Length of Time Flowers Open

By Ananias C. Sabijon, Jr., PhD in Education (major in Curriculum Development)

(Note: This is the copy to be distributed and discussed by the teacher to the students online (via Zoom, the Google Meet, or other video-communication service that is available to both the teacher and the students) before the students do the performance assessment task described on this learning activity material. Ideally, the assessment task is to be performed by group (with not more than 10 students for every learning group). However, considering the pandemic, the class teacher will decide whether this task will be performed by individual or by group of the students, to be followed by group leader output presentations, considering the following: 1) students' level of knowledge and skills, their context or place of residence (rural, urban, etc.), and 2) the level of COVID-19 pandemic infection rate in the area based on government resolutions and orders. Moreover, to highlight high level of critical thinking, creativity and independence, at the same time the parameters of the task, the teacher should share the code response and the rubric to the students prior to the performance tasks and assessment activities*).*

The Targeted Standard/S, the Audience, the Materials and the Task

The Targeted Standard/s*:* (Within 3-10 class days)

Content Standard: (for Grade 7 students in the Philippines): Scientific ways of acquiring knowledge and solving problems

Performance Standard: (for Grade 7 students in the Philippines): Perform in groups in guided investigations involving community-based problems using locally available materials

Standard Reference/Basis: Department of Education (DepEd). (n.d.). *K to 12 Most Essential Learning Competencies with Corresponding CG Codes.* https://commons.deped.gov.ph/K-to-12-MELCS-with-CG-Codes.pdf (p. 384).

The Audience: The peers (groupmates), or the course or subject teacher, and/or the whole class (composed of the teacher and all students)

The Materials:

For this task, the students should have these materials/equipment:

- 5 kinds of angiosperm or flower-bearing plants (with flowers) growing in the garden within the school campus, at the place near the students' homes, or in the public parks
- Zoom, Google Meet or other video-communication service tool common to the teacher and the students or the one officially prescribed by their school
- one notebook (at least 30 leaves) or 30 pieces of bond paper
- one pencil and one ball pen
- one ruler or foot rule
- one functional wrist or stopwatch
- one set of crayons or coloring pens
- one unit computer desktop (with optical scanner) or one laptop
- one smartphone (preferably with high resolution camera)
- list of the teacher and students' email addresses
- class group chat via Facebook messenger (optional)

The Task:

Read all directions carefully.

You will investigate how different kinds of flowers vary in the length of time they remain open each day.

This is what you should do:

- Plan an activity to find out how different kinds of flowers vary in the length of time they remain open each day. (Note: *Identify and use 5 kinds of flowers visible in one location* based on your own context (for example: within the school campus, at the place near your home, or in the public park).

1. Write your plan on a template you will create or develop. Your plan should answer the following:
   - Where will you perform the activity and what flowers (specifically the common and scientific names of plants with flowers) will be used?
   - How will the flowers be labeled?
   - What unit of time (seconds/minute/hour/others) will be used?
   - How many days/ trial will you make or perform to accomplish the objectives of the task?
   - How will you present your data in a bar graph for interpretation?
2. Perform the activity on the length of time flowers open. Make a record of all your measurements.
3. Construct a bar graph showing the organization and interpretation of your data. (If you made two or more trials or had observed the flowers for days, you should find the average of trials made). Include your discussion of the data shown in the graph.

The Objectives of The Task

The Objectives:

Investigate how different kinds of flowers vary in the length of time they remain open in each day or a week.

This task is intended to measure your (students') ability to:

- solve a science class problem;
- design a simple scientific investigation;
- carry out the investigation;
- construct a data table / a bar graph with systematically recorded data;
- summarize data and draw a conclusion;
- interpret data and/or develop a hypothesis to explain data;
- apply concept knowledge about the length of time flowers remain open and the importance of flower conservation;
- use the appropriate technology and online resources to answer and to supplement/enrich (only) the answers that are based on your (students') actual performance or "doing" of the tasks, and;
- submit all required performance assessment task outputs to the teacher online, using the computer, the scanner and/or the smartphone, and other available online technological tools and equipment as agreed during the first online class meeting in relation to this performance assessment task, in science, online class activity.

The Questions and the Coding Guide

Question 1

What are your plans?

Develop a template for your answer and write your plan on it. Then, you will describe the method/s you intend to follow, where will you perform the activity, how will you label the flowers and choose the unit of time you will use. Be guided by the code response provided to you.

Code Response:

5 - The plan is very comprehensive and it includes the place of study, the specific names (common and scientific) of flowers to be used, the unit of time to be used, and the number of trials to be made to accomplish the objectives and the steps on how to present the data in a bar graph.

4 - The plan includes the place of study, the names of the flowers to be used, the unit of time to be used, the number of trials to be made to accomplish the objectives; and/but the steps on how to present the data in a bar graph is omitted due to lack of information.

3 - The plan includes the place of study, the names of the flowers to be used, the unit of time to be used, the trial (once) to be made to accomplish the objectives; and/but the steps on how to present the data in a bar graph is omitted due to lack of information.

2 - The plan includes the place of study, the names of the flowers to be used, the unit of time to be used. Other pieces of information related to the described plan are not included.

1 - Other feasible plan (different from the described plan, but somewhat related to the attainment of the task).
0 - Nonresponse/No output was submitted to the teacher online.

Question 2

How did you perform the activity on the length of time flowers remain open? Describe briefly but /and completely how you performed the activity on the length of time flowers remain open. Sum up your data and descriptions on the template you will submit. Be guided by the code response provided to you.

*Code Response***:**

5 - Response shows that the activity was performed systematically and completely. Data are recorded and are presented clearly.
4 - Response shows a less systematic way of performing the activity. Data are incomplete and are not presented clearly.
3 - Response shows a disorganized way of performing the activity. Data are inaccurate, incomplete, and are presented incorrectly.
2 - Response shows that an attempt was made. Data show that the activity is not finished.
1 - Response shows that an attempt was made, but is not congruent with the question or problem. Data presented are incorrect.
0 - Nonresponse/No output was submitted to the teacher online.

Question 3

How many days/weeks did you spend for the activity to determine the length of time flowers remain open each day? Why? Be guided by the code response provided to you.

Code Response:

5 - Response shows that the activity (which made use of science processes like observation and measurement) was performed for three days or more and is followed by the explanation on how and why the activity was undertaken that way. The response is complete, clear and includes correct science concepts on flowers (e.g. names of flowering plants) and on other related variables like the kinds of flowers/plants and the length of time they remain open.
4 - Response shows that the activity (which made use of science processes like observation and measurement) was performed for three days or more and is followed by the explanation on how and why the activity was undertaken that way. The response also includes correct science concepts on flowers (e. g. names of flowering plants)) and on other related variables like the kinds of flowers/plants and the length of time they remain open but is incomplete and unclear.
3 - Response shows that the activity (which made use of science processes like observation and measurement) was performed for less than three days and is followed by the explanation on how and why the activity was undertaken that way. The response also includes some correct science concepts, but the explanation part of the response/answer is incomplete and unclear.
2 - Response shows that the activity (which made use of science processes like observation and measurement) was performed for less than three days and is not followed by the explanation on how and why the activity was undertaken that way.
1 - Response shows no specific answer as to the number of seconds, minutes, hours or days or weeks the activity was conducted and is not followed by any explanation on how and why the activity was undertaken that way.
0 - Nonresponse/No output was submitted to the teacher online

Question 4

How will you present your data using a bar graph? What is your answer to the question, "what does the bar graph show?" Develop a template for your answer, then write your explanation and short interpretation of the graph

and some discussions on the template you created. Be guided by the code response provided to you.

Code Response:

5 - Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis and the interpretations and discussions are valid and correct.
4 - Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis but the interpretations and discussions are inadequate.
3 - Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis. Interpretations and discussions are incorrect.
2 - Response shows the correct way of constructing a bar graph. The graph does not show the proper variables on the *x* and the *y* axis. Interpretations and discussions are missing.
1 - Response shows an incorrect way of constructing a bar graph which does not show the proper variables on the *x* and the *y* axis. Interpretations and discussions are missing.
0 - Nonresponse/No output was submitted to the teacher online.

Question 5

According to your investigation, what factor(s) / variable(s) had affected the length of time flowers remain open each day? How did it/they affect the opening and closing of flowers? Write your answer/s and explanation/s on the template you created, then submit it to your teacher. Be guided by the code response provided to you.

*Code Response***:**

5 - Response shows more than 3 identified factors or variables. The explanation shows correct and in-depth understanding of science concepts and principles.
4 - Response shows 3 identified factors or variables. The explanation shows correct but not in-depth understanding of science concepts and principles.
3 - Response shows less than 3 identified factors or variables. The explanation/s about this/ these factor(s) or variable(s) is/are inadequate and minimal.
2 - Response shows less than 3 identified factors or variables. The explanation/s about this/ these factor(s) or variable(s) is/are incorrect.
1 - Response shows one (1) identified factor or variables. No explanation is included.
0 - Nonresponse/No output was submitted to the teacher online

Question 6

Other than using real (plant) flowers as specimen for study, how do people use flowers profitably in other ways? As science students, how can you help protect/ preserve flowers? Be guided by the code response provided to you.

Code Response:

5 - Response shows more than five profitable use of flowers other than using them as specimen . It also includes more than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation.
4 - Response shows more than five profitable use of flowers other than using them as specimen . It also includes less than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation.
3 - Response shows less than five profitable use of flowers other than using them as specimen . It also includes less than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation.
2 - Response shows less than five profitable use of flowers other than using them as specimen . It also includes less than five ways on how to conserve / protect flowers. Some ways on how to conserve / protect flowers is/are followed by incorrect or ambiguous (or unclear) explanation/s.

1 - Response shows less than five profitable use of flowers other than using them as specimen . It also includes less than five ways on how to conserve / protect flowers. The answers are not followed by an explanation.
0 - Nonresponse/No output was submitted to the teacher online.

Question 7

What science concepts and conclusions did you develop and make after doing the task/s? Be guided by the code response provided to you.

Code Response:
5 - Response shows more than five correct science concepts developed. More than five correct conclusions are also presented.
4 - Response shows more than five correct science concepts developed. However, less than five correct conclusions are presented.
3 - Response shows less than five correct science concepts developed. Also, less than five correct conclusions are presented.
2 - Response shows less than five science concepts and conclusions developed. Most of them (more than half of the total number of answers) are incorrect and ambiguous.
1 - Response is off task or unintelligible.
0 - Nonresponse/No output was submitted to the teacher online.

The Rubric

Table 1. Rubric for Performance Assessment Task on the Length of Time Flowers Open

Performance Criteria Rating/ Score / Output Categories/ Elements	No response 0	Needs Improvement 1	Beginning 2	Acceptable 3	Proficient 4	Exception-al 5	Point/s
1. Plan Descriptions	Nonresponse/No output was submitted to the teacher online.	Other feasible plan (different from the described plan, but somewhat related to the attainment of the task).	The plan includes the place of study, the names of the flowers to be used, the unit of time to be used. Other pieces of information related to the described plan are not included.	The plan includes the place of study, the names of the flowers to be used, the unit of time to be used, the trial (once) to be made to accomplish the objectives; and/but the steps on how to present the data in a bar graph is	The plan includes the place of study, the names of the flowers to be used, the unit of time to be used, the number of trials to be made to accomplish the objectives; and/but the steps on how to present the data in a bar graph is	The plan is very comprehen-sive and it includes the place of study, the specific names (common and scientific) of flowers to be used, the unit of time to be used, and the number of trials to be made to accomplish	___ 5

Performance Criteria Rating/ Score / Output Categories/ Elements	No response	Needs Improvement	Beginning	Acceptable	Proficient	Exceptional	Point/s
	0	1	2	3	4	5	
				omitted due to lack of information.	omitted due to lack of information.	the objectives and the steps on how to present the data in a bar graph.	
2. Performance Descriptions	Nonresponse/No output was submitted to the teacher online.	Response shows that an attempt was made, but is not congruent with the question or problem. Data presented are incorrect.	Response shows that an attempt was made. Data show that the activity is not finished.	Response shows a disorganized way of performing the activity. Data are inaccurate and incomplete. Data are presented incorrectly.	Response shows a less systematic way of performing the activity. Data are accurate and/but incomplete and are not presented clearly.	Response shows that the activity was performed system-atically and completely. Data are recorded and are presented clearly.	___ 5
3. Time Allotment for the Activity	Nonresponse/No output was submitted to the teacher online.	Response shows no specific answer as to the number of seconds, minutes, hours or days or weeks the activity was conducted and is not followed by any explana-tion on how and why the activity was undertaken that way.	Response shows that the activity (which made use of science processes like observa-tion and measure-ment) was performed for less than three days and is not followed by the explanation on how and why the activity was undertaken that way.	Response shows that the activity (which made use of science processes like observation and measurement) was performed for less than three days and is followed by the explanation on how and why the activity was undertaken that way.	Response shows that the activity (which made use of science processes like also. observation and measurement) was performed for three days or more and is followed by the explanation on how and why the activity was undertaken that way.	Response shows that the activity (which made use of science processes like also. observation and measure-ment) was performed for three days or more and is followed by the explanation on how and why the activity was undertaken that way. The response is	___ 5

Performance Criteria Rating/ Score / Output Categories/ Elements	No response	Needs Improvement	Beginning	Acceptable	Proficient	Exception-al	Point/s
	0	1	2	3	4	5	
				The response also includes some correct science	The response also includes correct science	complete, clear and includes	
				concepts, but the explanation part of the response/ answer is incomplete and unclear	concepts on flowers (e. g. names of flowering plants) and on other related variables like the kinds of flowers/ plants and the length of time they remain open but is incomplete and unclear.	correct science concepts on flowers (e. g. names of flowering plants) and on other related variables like the kinds of flowers/ plants and the length of time they remain open	
4. Bar graph Descriptions	Nonresponse/No output was submitted to the teacher online.	Response shows an incorrect way of constructing a bar graph which does not show the proper variables on the *x* and the *y* axis. Interpretations and discussions are missing.	Response shows the correct way of construct-ing a bar graph. The graph does not show the proper variables on the *x* and the *y* axis. Interpreta-tions and discussions are missing.	Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis. Interpretations and discussions are incorrect	Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis but the interpreta-tions and discussions are inadequate	Response shows the correct way of constructing a bar graph. The graph shows the proper variables on the *x* and the *y* axis and the interpreta-tions and discussions are valid and correct	___ 5

Performance Criteria Rating/ Score / Output Categories/ Elements	No response	Needs Improvement	Beginning	Acceptable	Proficient	Exception-al	Point/s
	0	1	2	3	4	5	
5. Factors and Variables Descriptions	Nonresponse/No output was submitted to the teacher online.	Response shows one (1) identified factor or variables. No explanation is included	Response shows less than 3 identified factors or variables. The explanation/s about this/ these factor(s) or variable(s) is/are incorrect.	Response shows less than 3 identified factors or variables. The explanation/s about this/ these factor(s) or variable(s) is/are inadequate and minimal	Response shows 3 identified factors or variables. The explanation shows correct but not in-depth understanding of science concepts and principles	Response shows more than 3 identified factors or variables. The explanation shows correct and in-depth understand-ing of science concepts and principles	5 ___
6. Plants Profitability and Ways of Caring for Them	Nonresponse/No output was submitted to the teacher online.	Response shows less than five profitable use of flowers other than using them as specimen. It also includes less than five ways on how to conserve / protect flowers. The answers are not followed by an explanation.	Response shows less than five profitable use of flowers other than using them as specimen. It also includes less than five ways on how to conserve / protect flowers. Some ways on how to conserve / protect flowers is/are followed by in-correct or ambiguous (or un-clear) explanation/s.	Response shows less than five profitable use of flowers other than using them as specimen. It also includes less than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation.	Response shows more than five profitable use of flowers other than using them as specimen. It also includes less than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation	Response shows more than five profitable use of flowers other than using them as specimen. It also includes more than five ways on how to conserve / protect flowers and each answer is followed by a correct explanation	___ 5
7. Science Concepts Learned and Conclusion/s	Nonresponse/No output was submitted	Response is off task or unintelligi-ble.	Response shows less than five sci-	Response shows less than five correct	Response shows more than	Response shows more than five	

Performance Criteria Rating/ Score / Output Categories/ Elements	No response	Needs Improvement	Beginning	Acceptable	Proficient	Exception-al	Point/s
	0	1	2	3	4	5	
	to the teacher online.		ence concepts and conclu-sions developed. Most of them (more than half of the total number of answers) are incorrect and ambiguous	science concepts developed. Also, less than five correct conclusions are presented.	five correct science concepts developed. However, less than five correct conclusions are presented.	correct science concepts developed. More than five correct conclusions are also presented.	___ 5
						TOTAL POINTS =	____ 35

Rating Legend:	Points	Descriptive
	30-35	Exceptional
	24-29	Proficient
	18-23	Acceptable
	12-17	Beginning
	0-11	Needs Improvement

Student's Points/Score: _____

Descriptive rating: _____

Group's Points/Score: _____

Rating

Conclusions and Suggestions

Extant literature substantiate the all-embracing reality that quality education is essential to the attainment of sustainable development in the local and global levels. And, that quality education is the major key instrument, considered a driver for the attainment of all SDGs, and that ESD equips everyone to make well-informed decisions that benefit environmental integrity, economic viability, and a just society for current and future generations. Furthermore, its goal is to equip people with the information, skills, attitudes, and values they'll need to face the difficulties of sustainable development (Sustainable Development Goals-Resources for Educators, UNESCO, 2021).

To attain the goal of sustainable development through education, it is necessary that some processes in science teaching and learning should be revisited, enriched and updated.

As supported by many related literature, especially researches on the features and positive effects and promises of performance assessment task in the teaching and learning of science concepts and principles---plus the sample performance assessment task included on this paper, the use of performance assessment task is indeed one of the better alternatives.

The learning activity provides more relevant, authentic and real-life-based methods of teaching and assessment of lessons and students' learnings. Also, it utilizes skills assessment tools and strategies for students to have meaningful, hands-on and performance or activity-based learning.

A performances task is any instructional activity or assessment that requires pupils to demonstrate their understanding, skill, or knowledge; and that the results of a performance task are a concrete product and/or performance that may be used as proof of learning. It is a performance assessment task because it is both a learning activity and assessment activity. Accordingly, it provides performance activities that can engage students in meaningful learning, with activities and challenges in authentic contexts and real-world settings; and it allows teachers to assess their students' comprehension of both simple and complex scientific processes (McTighe, 2019). Consequently, a performance task asks students to develop products or complete tasks to demonstrate mastery of specific skills, and can be used by teachers of different grade levels and disciplines to assess learning.

The "Performance Assessment Task on the Length of Time Flowers Open", is published as a prototype by the Author/Researcher for the reason that other than providing authentic learnings to students, it is very relevant in the context of coping with many challenges the education stakeholders are facing, like the use of online teaching-learning modality. More beneficially, it can also address some mental health issues, like reduction of the students' level of stress and depression brought about by the pandemic. Furthermore, the performance assessment task has been aligned with the processes in designing a performance task published by Stoll and Schultz (2019) and (McTighe, 2019). And, it also conforms to the features of a performance tasks published by Chun (2010), namely: 1) real-world scenario, 2) authentic, complex process, 3) higher-order thinking, 4) authentic performance, and 5) transparent evaluation criteria (p. 24).

Remarkably, it also conforms to McTighe's (2019) general characteristics of performance tasks, namely: 1) Performance tasks call for the application of knowledge and skills, not just recall or recognition; 2) Performance tasks are open-ended and typically do not yield a single, correct answer; 3) Performance tasks establish novel and authentic contexts for performance; 4) Performance tasks provide evidence of understanding via transfer; 5) Performance tasks are multi-faceted; 6) Performance tasks can integrate two or more subjects as well as 21st century skills; and 7) Performances on open ended tasks are evaluated with established criteria and rubrics (para. 4-10).

More interestingly, the phenomenon on the opening and closing movements of flowers may seemingly involve simple science processes and concepts, like plants need sunlight or could be explained using science terms, like heliotropism, photoperiodism and other related terms (by the elementary school learners), but junior and senior high school science teachers could bring the level of discussion of the lessons (learned from the performance assessment task) to a higher level, like letting students in Junior and Senior High School do the discussion (with understanding) of the phenomenon similar to the one published by Doorn and van Meeteren (2003), that are as follows:

> In most species, flower opening is due to "local" elongation growth or to local ion accumulation that is not accompanied by growth. The elongation of petals, leading to opening, does not seem different from that in other plant parts, as it requires a source of energy and cell wall loosening and expansion. (p. 1809, para. 5)
>
> Moreover, the timing of opening is regulated by factors such as temperature, the quality and quantity of light, and the duration of both light and darkness. Flower closure, if it occurs, may be related to senescence or an active process. In the latter case, it is often regulated in a way similar to that of opening. (p. 1809, para. 6).

Likewise, Doorn and van Meeteren (2003) concluded that in many species, the coordination of activities that culminate in synchronized flower opening is quite complex. Flower opening and closure differ from most other growth processes due to the complicated control of internal and external variables. Although some of the interplay between numerous environmental and internal factors can be observed as a

phenotype (or observable characteristics or traits), little is understood about the cellular and molecular mechanisms that underpin it.

Conclusively, in line with the Education for Sustainable Development (ESD) goals of the UN, science teachers in the basic education levels should not be fixated to the traditional methods of lesson presentation and the use of standardized and other fixed-choice types of assessment in their teaching. To instill the importance of lifelong learning to students, and to provide an education that matters and is truly relevant to every learner in the light of today's challenges (like the challenge to develop critical thinking skills among students both in face-to-face or in-person and online modalities, the use of performance assessment task has been and is one of these alternative methods. It is recommended that the prototype "Performance Assessment Task on the Length of Time Flowers Open" may also be utilized by basic education science teachers (through proper protocols, among others) or will serve as a point of reference for them to develop their own performance assessment task, which could serve as the main learning task or an enrichment learning activity in science to achieve or accomplish some of the content and performance standards shown in Table 2 (DepEd. K to 12 Most Essential Learning Competencies with Corresponding CG Codes. https://commons.deped.gov.ph/K-to-12-MELCS-with-CG-Codes.pdf, pp. 376-397, n.d.), in particular and the ESD goals in general.

Table 2. Content and Performance Standards in which the Performance Assessment Task could be Utilized

Grade Level	**Content Standards** (The learners demonstrate understanding of …)	**Performance Standards** (The learners should be able to…)
Grade 3	Characteristics of living and non-living things (p. 376)	Illustrates the difference between living and non-living things (p. 376)
Grade 3	Basic needs of plants, animals and humans (p. 377)	List down activities which they can perform at home, in school, or in their neighborhood to keep the environment clean (p. 377)
Grade 3	Sources and uses of light, sound, heat and electricity (p. 377)	Apply the knowledge of the sources and uses of light, sound, heat and electricity (p. 377)
Grade 3	People, animals, plants, lakes, rivers, streams, hills, mountains, and other landforms and their importance (p. 377)	Express their concern about their surroundings though teacher-guided and self-directed activities (p. 377)
Grade 4	The sun as the main source of heat and light on Earth (p. 379)	Describe the changes in the position and length of shadows in the surroundings as the position of the sun changes (p. 379)
Grade 5	How plants reproduce (p. 381)	Create a hypothetical community to show how organisms interact and reproduce and survive (p. 381)
Grade 6	The interactions for survival among living and non-living things that take place in tropical rainforest, coral reefs, and mangrove swamps (p. 383)	Form discussion groups to tackle issues involving protection and conservation of ecosystems that serve as nurseries, breeding paces, and habitats for economically important plants and animals (p. 383)

Grade Level	Content Standards (The learners demonstrate understanding of …)	Performance Standards (The learners should be able to…)
Grade 8	The concept of species (p. 391)	Report (e.g. through a travelogue) on the activities that communities engage in to protect and conserve endangered and economically important species (p. 391)
Grade 9	How changes in the environment may affect species extinction (p. 392)	Make a multimedia presentation of a timeline of extinction of representative microorganisms, plants, and animals (p. 392)
Grade 10	The influence of biodiversity on the stability of ecosystems (p. 395)	Write an essay on the importance of adaptation as a mechanism for the survival of a species (p. 395)
Grade 11/12	Unifying themes in the study of life (p. 508)	Value life by taking good care of all beings, humans, plants, and animals (p. 508)

Most importantly, it is a given that creating something novel and innovative, like developing a new performance assessment task is not always easy. It (always) requires teachers' acceptance of the new paradigm, and investment of time and effort to develop the important task being dealt with. Notwithstanding, may this research article serves as a point of reference for some basic education science teachers who still need more examples to rise above the challenges related to the development of the performance assessment task, this time of pandemic and beyond…. With the many quality characteristics and pieces of evidence of learning outcomes provided by literature and the author's experiences on this learning and assessment activity, it is certain that the use of performance assessment task to teach many interdisciplinary science concepts and principles among basic education (K to 12) learners cannot be overemphasized

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