



Performance-Based Assessment: Self-Efficacy, Decision-Making, and Problem-Solving Skills in Learning Science

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Abstract

Performance-based assessment is a purposive-oriented assessment activity in revealing student understanding of unwrapped concepts, skills, and big ideas. This study aimed to determine the effects of performance task assessment on the students' self-efficacy, problem-solving, and decision-making skills in learning science that used the quantitative and correlation methods of research. There were 35 Grade 9 students of the University of San Carlos, Basic Education Department – South Campus in science class as respondents of the study. The assessment was given after the engagement session of the instructional plan to be accomplished after the transfer task session and evaluated using specific rubrics. A modified Albert Bandura's Instrument was used to measure self-efficacy and Mind Tool: Essential Skill for Excellent Career questionnaires for the problem-solving and decision-making skills of the students in learning science. The study's findings indicated that the Performance Assessment developed students' self-efficacy in learning science and had a significant impact on how students think, feel, and behave in the process of learning. Moreover, the assessment conveyed positive influence in developing students' problem-solving and decision-making skills. This assessment encouraged students to apply the scientific processes in evaluating the identified options before deciding the problem's solution.

Introduction

As the Philippine education system was instituted, challenges or difficulties were always part of its function. In a modernized education system, joint problems are identified, such as accessing the fundamentals in education, quality primary education, deficiency of the public system, and underinvestment in education. In Philippine Education Sector Assessment Project (PESAP), the quality and standards of basic education have declined, which cause our country ranked low among the under-average participants in East Asia and the rest of the world.

The Philippine educational system designs and implements a new curriculum that prepares students as 21st learners and is believed to be the key to our nation's development. This K to 12 Program offers proficiency of concepts and skills, promotes lifelong learners, and produces graduates ready for college, intermediate skills development, employment, and entrepreneurship.

With the aims of the Philippine education in implementing this new curriculum, the focal objective of this research is to determine the effects of performance task assessment on students' self-efficacy, problem-solving skills, and decision-making skills in learning science. Performance-based assessment is a purposive-oriented assessment activity in revealing student understanding of unwrapped concepts, skills, and big ideas. This assessment type sharpens students' ability to incorporate understanding and skills across multiple standards, which is vital

for tertiary and career readiness. It is better to measure specific abilities of students like the application of the gained knowledge, research skills, and complex analysis, which cannot be adequately gauged with the conventional test type or the selected response items.

In learning, people acquire the knowledge, procure skills, establish work habits, and rehearse the application of the three objectives to actual situations. These are taken from the set of activities that educators prepared in their particular classes. The learners are given various assessments like formative, summative, integration activity, and application to real-life scenarios, but most often, they will gain the three-basic nature of learning. A performance task is introduced in the new curriculum as one of the four levels of assessment that could help students practice what is being transpired in a meeting.

Chun (2010) shared that like philosopher John Dewey defines education as a process or guide to face the facets of life in the actual setting. Dewey (1933) advanced the idea that students need to comprehend or practice the acquired knowledge to apprehend it certainly.

Some of the essential skills that students should improve in learning science are problem-solving, decision making, and critical thinking. These skills generally help students to become fully equipped with scientific ideas. Preparing the task for the students is part of the teacher's lesson planning and how far students can complete the task given with the application of the desired skills. In addition, Bandura (1998) stated that self-efficacy is incorporated in the study as a social cognitive theory and defined as "the exercise of human agency through people's capabilities to produce desired effects by their actions." Most teachers believed that students might include their ability to solve scientific problems in learning science, but when they try to battle the hurdle of the task, their affective domain will be affected that would include changes in their decision and their achievement. These results interpret the amount of understanding gained from what is being taught.

Performance task represents an approach in learning to acquire and integrate knowledge, skills, and work styles essential and exciting to students. This assessment consists of tasks or activities to be accomplished by the student and evaluated by the teacher or other evaluator based on the desired performance standards. This measures how the students utilize the knowledge rather than knowing how much they have learned. It also requires thinking skills, uses varied learning techniques and decisions, includes collaborative learning, and leads to positive attitudes and mental habits. Moreover, students are extensively engaged in creating different types of outputs, which results in meaningful learning for them since they are the ones who made it and carried it out.

According to Brown (2001), there are three categories of significant interest for defining the characteristics of performance tests which include task specifications, task content, and criteria for scoring performances. It would be helpful if a teacher could design a well-defined task from the knowledge gained, and the judgment of the student's performance must be well described so that students have a guide on what and how to do it, and the evaluator must rate accordingly based on the identified measures.

Brown, Hudson, Norris, and Bonk (2002) noted that performance could add a personal aspect to assessment to the students, be integrated into and become a part of the curriculum and assess the learning process since it does not solely measure the cognitive aspect but at the same time the effective and the psychological domains in which shown in the course of completing the task.

The preparation of creating and performing the performance task should be taken enough time and consideration if our Philippine new educational curriculum aims to create lifelong learners,

critical thinkers, good communicators, creative, and competent enough to share or apply what they know and practice. Some studies support the usefulness of performance tasks in the teaching-learning system. A study done by Stahelin et al. (2006) demonstrated a positive outlook of a project-oriented goal in laboratory courses since it immensely improves students' scientific reasoning and understanding of the research process. In addition, students' development in a project-oriented assessment is also better related to skill-building and student-directed activities, even for students who have not tried.

Another skill to consider upon performing the tasks successfully that can lift students' achievement in science is self-efficacy. Albert Bandura defined self-efficacy as the perceived capabilities of an individual to establish and accomplish the courses of action required to complete a task. He theorized that self-efficacy could be determined if a task will be initiated, the effort will be expended, and the level of persistence to complete the task despite difficulties and unpleasant experiences.

The study of Loo and Choy (2013) found out that the mathematics self-efficacy of the polytechnic engineering students is affected by their academic achievements. The study showed that the four identified self-efficacy sources were significantly associated with the achievement scores and cumulative GPA in mathematics for the electronics-related engineering diplomas.

Another idea is that students' view on efficacy is different from an allied motivational concept because it has specific characteristics and similarities to performance tasks. In the study of Zimmerman (2000), self-efficacy has proven to be receptive to enhance the student's means of learning, predict achievement outcomes, and being assumed as a mediating variable in training studies. It also encourages the students to boost their interest, discover their capacity, and be socially responsible individuals through varied tasks.

Students are taught to use information and concepts in many schools and skills to show or do with what they know. The task makes schoolwork or outputs a functional training for life outside the four walls wherein problem-solving, and decision-making skills must be enhanced, essential in learning science concepts. It could allow students to use good strategies, converse, and solve problems. The other elements like time, exposure to curriculum, practices, speaking and listening, and challenges can help students become better problem solvers. Along with these activities of the students, decision-making comes in.

Dietrich (2010) described decision-making as a precarious trait about success and happy life; it is also the essence of all we do. Aside from self-efficacy, it is imperative to cultivate operative decision-making ability and scheme, including problem-solving strategies but not limited to brainstorming, cost analysis, written remediation plans, and choosing options (Wester, Christianson, Fouad, & Santiago-Rivera, 2010). The decision-making process can be multifaceted and unbearable; therefore, it is relevant for learners to learn how to apply it to everyday encounters and life-changing choices. One advanced model is based on objectives and planning. Several elements can affect decision-making and are noticeable when students organize their assigned tasks to perform.

There has been an enduring commitment in education to solve real problems, but students find it challenging to solve real problems from the lessons learned. Since all schools, both private and public, aimed to produce a functional Filipino citizen,

there must be meaningful and engaging tasks students must perform to develop their ability to think, change the way they see their role as students and prepare them for actual-world situations. As learners are exposed to this kind of activity, they will be well prepared for life

outside the classroom – a learner that is not hesitant to delve into the challenges of life because they have gained enough knowledge and trained how to be competent in a particular aspect of life being taught to them.

Korn (2010) explained that problem-solving is one of the identified 21st-century skills that a student has. He associated it with learning in art programs since it can nurture growth in organizing one's idea or imagination and reinforce their programs in this realm. With the hope of the educators in implementing the new curriculum in our country, this will be succeeding if all will work religiously and comprehensively to lift the students' performance, especially in science. This skill is not the sole need in science, but most educators designing different activities give high importance.

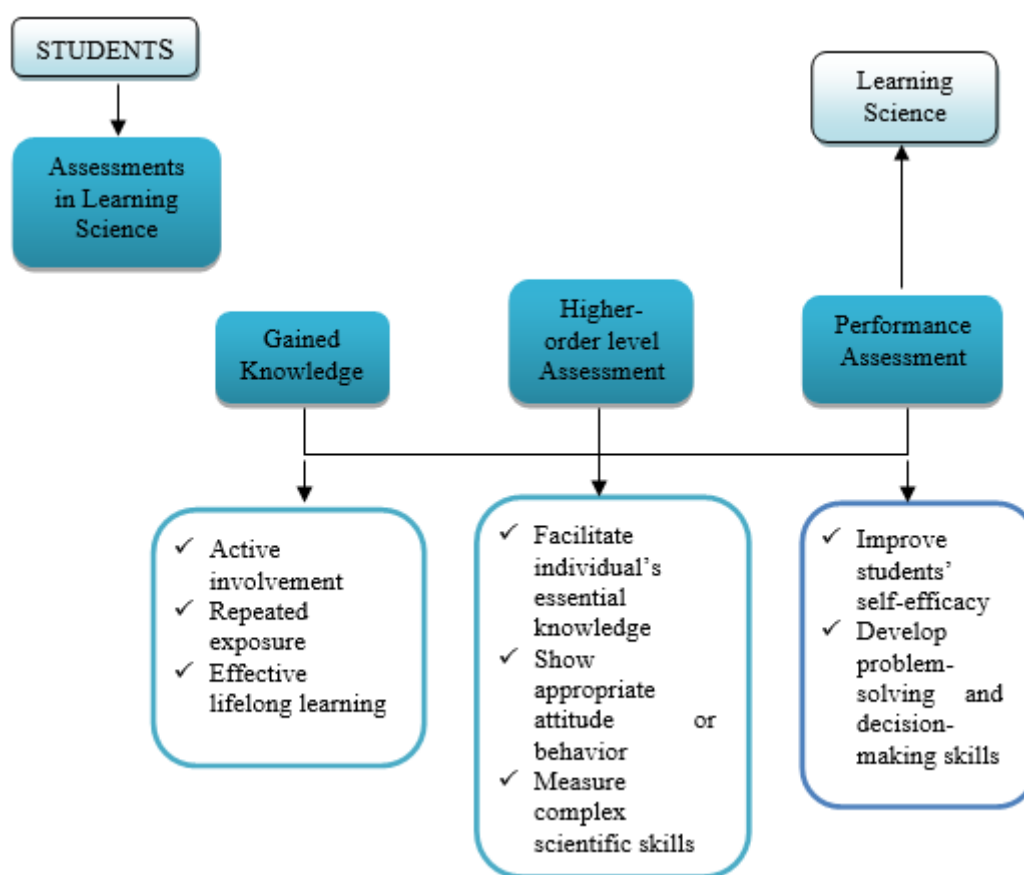


Figure 1. Conceptual Framework of the Study

Students are given varied assessments to increase their prior knowledge, formulate an understanding of the topic, correct the misconceptions of the lessons, prepare them to be equipped with ideas in performing the task outlined in a unit. The students will do these if they are actively involved either by individuals or by group activities. Repeated acquaintances to different kinds of exercise can develop the scientific processes and activities that apply to real-world or real-life problems, engaging them in uncovering the concepts necessary to solve. In the formulation of knowledge, students can easily relate other topics thus expansion of idea occur. The given task increases student's level of thinking and preparedness to do the tasks given. The performance task is an outcome in determining the students' learning in science that must measure the students' achievement, the application of knowledge gained and understanding, the improvement of problem-solving, decision-making, and critical-thinking skills, and improve their self-efficacy.

In a typical classroom setting, students often do their written activities such as laboratory write-up in science, an essay in English, a story outline in Social studies, and a problem set in Mathematics. Teachers almost exclusively lecture to get the target subject matter budget in a quarter due to the interruptions and other unexpected circumstances without engaging the brains of either. Students are supposed not to learn only the subjects' contents and improve their intellectual ability is the core of our mission.

The teachers know that what is being taught to the students is not equal to what is being learned. In addition, they determine that if the purpose of teaching is to ensure that students have gained knowledge and skills, it is sufficient to measure what was learned. Most teachers impart the knowledge in the classroom and assess learning (recorded or not) for their subject. Nevertheless, these are the only challenge of any subject or educator, and the assessment should track the development of the student from the entire teaching body's efforts. In many schools, all aimed to improve higher-order thinking skills and produced students who can globally compete with other learners from other places. Though we all know about this nature and must in education, only a few explicitly give an assessment that enables them to develop their critical way of thinking or what skills teachers all wanted for their students to possess.

According to Chun (2010), it is an unfilled activity to judge student gained-knowledge without offering means to modify teaching according to insufficiencies remarked from the assessment. Moreover, when schools measure students' understanding, usually standardized tests are administered by external agencies, and faculty noticed that the results are incoherent from classroom learning goals and practice. With this, teaching and assessment must be linked or established well by the teachers.

He suggested having an alignment of the assessment with the students' learning objectives so that the faculty's teaching plans directly onto what is being measured. He added that to attain the alignment is to find a connection between pedagogical practice and assessment tools for an institution to instill and evaluate in the same way. These two factors must become adjacent.

In a National Achievement Tests, it highlights that Science and Mathematics continue to be the most challenging field of study in primary education in the Philippines. The results show that the fourth-year students acquired the mean percentage score (MPS) of 48.90 in the 2012 NAT. Though evidence of fewer MPS improvements with the previous years' 2005 and 2006, the National Education Testing and Research Center finds it elusive to reach the goal of 75% (Philippine Basic Education, July 20, 2013). In addition, it was found out that those countries with high achievement scores in the Trends International Mathematics and Science Study (TIMSS) have fewer topics in their science syllabi. Philippines did not participate in the TIMSS since 2007, for it constantly ranked among the lowest for the past years.

The finding explains that factors that accounted for the low performance of the Filipino students include the lack of support for scientific culture reflected in the school curriculum, the flawed teaching-learning process, inadequate instructional materials, and lack of teacher training. Another point is the lack of engaging textbooks for references and readings, science equipment needed in conducting scientific investigations, and hands-on activities among Filipino learners that can lift their interest to appreciate science or motivate them to learn as the means are engaging to them. These results reflect the immediate action on Science performance in local settings. The majority of the school finds means to improve students' scientific views and integrates the affective aspect of them to show interest in the subject for better understanding.

Espinosa et al. (2013) explained that critical-thinking skill is one of the most relevant skills for students to develop in science learning. This skill requires students to use the gained knowledge in any situation and in unraveling problems. It is an analytical approach characterized by creative conceptualization, application, synthesis, and evaluation of facts collected from the observations and practices. They concluded that it is based on collective intellectual ideals that transcend the subject matter like clarity, accuracy, precision, or consistency. They defined critical thinking as self-guided thinking, which reasonably explains at the highest level of quality. It is also one of the parameters in this study that would prove the importance of developing different scientific processes and skills.

Kaya et al. (2012) mentioned that teachers' efforts in developing students' scientific process skills could promote student's scientific literacy is highly encouraged and honored. In order to obtain this, the students must be exposed to more activities or tasks that prepare them for real-life scenarios, and once they are into it, the more they gain positive behavior in science classes. Pajares, Britner, & Valiante (2012) had a similar finding of the performance approach that gave a positive outcome.

Wisconsin Education Association Council or WEAC (1996) describes performance tasks as an exercise that wants students to show their mastery of specific skills and competencies measured by doing or making something. Moreover, the Association for Supervision and Curriculum Development or ASCD restated that performance-based learning characterizes a set of schemes in acquiring and applying knowledge, skills, and work habits by doing performance tasks vital and engaging to students. Perhaps in this manner, educators can help students improve their science scores and interest.

The study aimed to determine the effects of performance-based assessment on the self-efficacy, decision-making, and problem-solving skills in learning science among the Grade 9 students of the University of San Carlos – Basic Education Department. The study sought to determine (1) if there is a change in student's self-efficacy before and after giving the performance task assessment; (2) the relationship of the students' performance task assessment in decision-making and problem-solving skills in learning science

Methods

The study used a non-experimental quantitative design, specifically a descriptive correlation design, to determine the relationship of performance-based assessment on self-efficacy, decision-making, and problem-solving skills in learning science.

The study was conducted in the University of San Carlos – Basic Education Department – South Campus in Cebu City, Philippines. The school is located at J. Alcantara Street, Cebu City, and catered to academic activities that develop students' scientific skills and lifelong learning. It is a private sectarian school managed by the Society of the Divine Word (SVD) priests. The population of the study was all Grade 9 students. The thirty-five (35) students were chosen through a random sampling method.

The instruments used in the study were a modified Albert Bandura's (1977) instrument to measure self-efficacy and Mind Tool: Essential Skill for Excellent Career questionnaires for the problem-solving and decision-making skills of the students in learning science. The student's self-efficacy is measured using a t-test was used and spearman's rho to determine the relationship of the student's performance task and problem-solving and decision-making skills. The interval scale of 4.21-5.00 (highly positive), 3.41-4.20 (positive), 2.61-3.40 (Somewhat positive), 1.81-2.60 (negative), and 1.00-1.80 (highly negative) were used to interpret the

correlation between performance-based assessment and the skills of problem-solving and decision-making.

The researchers wrote a transmittal letter to the principal for approval in conducting the study. A consent letter was also given and explained to the respondents to understand the purpose of the involvement. The respondents were given ample time to answer the modified survey questionnaires, and discreet confidentiality of their responses was observed. The results were gathered, tallied, and analyzed. They were all reminded and informed that results would be treated with the utmost confidentiality

Results and Discussion

Table 1 presents the data collected in the survey results of the students' scientific processes skills and attitude and samples of students' ratings in their performance task assessment.

Table 1. Difference of the Students' Self-Efficacy in Learning Science Before and After the Performance Task

	Mean	Mean Diff	SD	df	t	p
Self-efficacy						
After	75.71	15.71	5.91	34	2.86	0.002
Before	60.00					

n = 35; significant at p-value <.05(2-tailed test)

The results showed a difference of 15.71 before and after the students' performance task assessment. This outcome presented an improvement, $t(34) = 2.86$, $p < (.05)$, in the students' self-efficacy in scientific learning. Therefore, there was a change and a significant difference in the mean gain of the students. The result implies that students can evaluate their experiences and thought processes in the study of Dewey (1933) and Bandura (1977). It is true to the study of Pajares, Britner, & Valiante (2002) that students' perceived self-efficacy is correlated with their academic performance and achievement.

On the other hand, Table 2 presents the mean average results of the measured skills' decision-making and problem-solving concerning the performance task assessment in learning science.

Table 2. Students' Decision-Making and Problem-Solving Skills on Performance Task Assessment in Learning Science

Measured Skills	Mean	Description
Decision-making	3.22	Somewhat Positive
Problem-solving	3.27	Somewhat positive

n = 35

The decision-making ($\bar{x} = 3.22$) and problem-solving skills ($\bar{x} = 3.27$) of the students were both somewhat positive. This finding means that both skills were ambivalent toward students' scientific skills in performing the performance task assessment.

It explains that decision-making and problem-solving skills of the students are taking into account the value of knowledge bears and the experiences resulted in the study of Yasar, 1988; Erbil; et al. [18] and making students gain skills of decision-making and problem-solving helped gained a habit of scientific thinking and learning.

Table 3 presents the correlated difference between the students' performance task assessment, decision-making, and problem-solving skills of learning science students.

Table 3. The Correlated difference between the Students' Performance Task Assessment and Decision – making and Problem – Solving Skill in Science Learning

Skills/Performance Task Assessment	Mean	SDd	Computed r	r	p
Decision-making	11.9	8.1	0.25	2.776	0.325
Performance Task	11.0	1.6			
Problem-solving	16.5	2.7	- 0.29		
Performance Task	11.0	1.6			

n = 35; Critical value of r at $\alpha=0.05$ with df(n-2); Critical value at $\alpha=0.05$

These results emphasized that the students' performance task assessment had no significant difference in decision-making and problem-solving skills. This finding may explain in the study of Kaya, V. H., Bahceci, D., & Altuk, Y. G. (2012) that scientific process skills such decision – making and problem-solving skills may not develop quickly. It will take up to a year as possible since this is one of the main goals in science education

Conclusion

Performance Task assessments develop students' self-efficacy in learning science. It has a significant impact on how students think, feel and behave in learning science. Moreover, students' decision-making and problem-solving skills bear a positive influence in developing scientific processes. In the light of the initial findings and conclusions, the researchers recommended that the science teachers apply varied performance task assessments at every end of the unit to increase students' understanding of the different scientific concepts. Since the Department of Education designed/implemented the new curriculum, public schools should formulate an authentic performance task in all subjects and levels to develop students' knowledge, behavior, and skills, precisely the students' critical thinking skills in science

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