Annals of Studies in Science and Humanities, Vol. 2 No. 2 | December 2016
ISSN 2408-3623 | Online ISSN 2408-3631
www.journal.carsu.edu.ph

Performance–Based Learning Experiences and Achievement of Grade VII Freshmen in Elementary Algebra 1: Effective Inputs for the Enhancement of the K-12 Teaching Guide

Maris T. Lasco[1,2,*] *& Nelia S. Raganas*[1,#]
[1]College of Education, Caraga State University; Ampayon, Butuan City 8600, Philippines
[2]Mathematics Society of the Philippines-Caraga

ABSTRACT

This study sought to determine the performance-based learning experiences and achievement of Grade VII students in their Elementary Algebra 1(EA) subject. The students' performance and achievements were measured based on their learning experiences with respect to different determined domains. The frequency, percentage, arithmetic mean, correlation analysis and a partial correlation were used to analyze the data. The results conveyed that the students had a very satisfactory performance in their previous Mathematics and English subjects. However, their overall performance in EA is poor, except for their performance on the knowledge domain which is very satisfactory. The study further revealed that their performance in EA is highly correlated to oral recitation, group activity, board work and seatwork. The rest of the activities currently being employed did not show significant correlation. If their grades in Mathematics are held constant, only the group and board work activities have a high correlation. With these results, it is imperative to innovate and enhance the current Teaching Guide in EA for teachers.

Keywords: Elementary Algebra 1 (EA), Domains of learning, Learning Experiences, Performance-based

1 Introduction

Performance-based learning activities refer to tailor-fitted teaching techniques employed after a careful assessment of the students' performance to better aid learning. It provides a wide range of learning experiences in the classroom. Pedagogically, learners have increased engagement and motivation. This motivation, along with the use of learning strategies and self-regulation, is the key to the learners' achievement, emotions, and satisfaction (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011).

Performance-based learning concept in the education curriculum means an enhancement of the practices and the system that focuses on the students learning (Patrick & Sturgis, 2011). One concern about this system is the enhancement and innovations in learning Mathematics. Nowadays, the same scenario still exists in schools despite the many reforms in Mathematics teaching. The very recent reform in Philippine basic education is the implementation of the K-12 curriculum, which includes Math 7 or EA for Grade VII in Junior

*Corresponding Author
*E-mail: lascoomariss@gmail.com #nsraganas55@gmail.com

Cite this article: Lasco, M.T. & Raganas, N.S. (2016). Performance–based learning experiences and achievement of Grade VII Freshmen in Elementary Algebra 1: Effective inputs for the enhancement of the K-12 Teaching Guide. *Annals of studies in science and humanities 2*(2), 47-53.

High School. It was mentioned in the study of Nomi and Raudenbush (2014) that the National Mathematics Advisory Panel (2008) highlighted the significance of enhancing the mathematics topics in junior high school such as by teaching algebra. This topic is a very important foundation subject towards achieving enough understanding and analysis in Mathematics. It is from here that students will further their studies with higher Mathematics such as Geometry, Trigonometry, Logarithm, Statistics, and Probability.

Anent to this reform, the mathematics teachers are provided with the teaching guide for the grade 7 Mathematics. Notably observed is the fact that the teaching guide needs to be enhanced, to be more innovative and, at the same time, easy to relate to the learners' real-life experiences. The teaching guide and learner's guide are provided for all teachers and students as an aid in learning both for convenience and guide. These encouraged the researcher to investigate the performance-based learning experiences and achievements and its relation to the students' learning in EA.

2 Theoretical and Conceptual Framework

This study is anchored on the experiential learning theory of Kolb and Kolb (2005) with the work of the distinguished 20th century scholars like John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung, Paulo Freire and Carl Rogers. The idea conveys that the experience is the core role in the theory of the learners understanding and development. According to Dewey's experiential learning theory that knowledge is acquired from experiences and socialization, where the role of the teacher is to manage the ideas of the learners based on actual experiences (Grady, 2003). Thus, the understanding and performance domains of learning in the study that manifests in the performance of the participants connote that learning experiences in the classroom may affect such performances in Mathematics. According to Kolb (1984), there is a transformation of learning through experience whether its objective or subjective, thus the knowledge domain must thoroughly understandable. Grasping the lessons from different experiences and transforming these into learning lead to the acquisition of knowledge. This process involves the use of performance-based learning activities in the classroom. In the concrete experience stage, learning is emphasized through personal involvement with people in everyday situations. The domains of learning-- study, knowledge, process, understanding, and performance, depend on the learning experiences of the participants. In this stage, the learner would tend to rely more on feelings than on a systematic approach to problems and situations. While in a learning situation, the learner relies on the ability to be open-minded and adaptable to change. On the other hand, Bruner's constructivist theory (1960) conveyed that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions--relying on a cognitive structure to do so. A cognitive structure such as the schema and mental models provide meaning and organization to experiences and allow the individual to be independent and to go further from what is being learned. Moreover, Dewey's Experiential Learning Theory (1938) detailed the connections between our activities and what happens, in consequence, the cut and try experience is made explicit.

The respondents of the study were randomly selected from all Grade 7 students in Ampayon National High School. The diagram below shows the schematic diagram of the study.

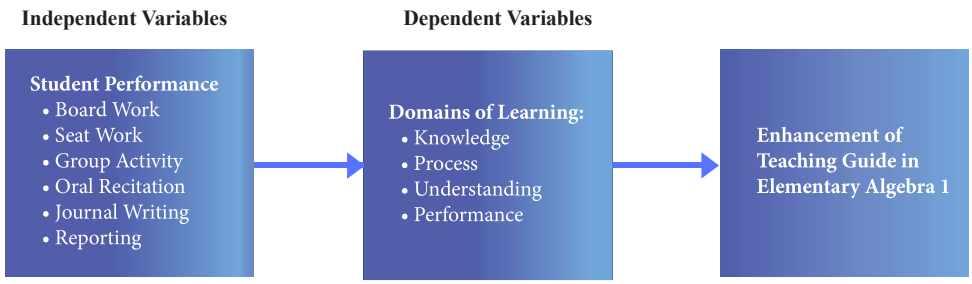

Fig. 1 Schematic Diagram of the Study

3 Methodology

Correlation analysis and partial correlation were used to test the hypotheses of the study. The population of the study involved the students in Grade 7 section Earth; this section was randomly selected from the four Grade 7 sections of Ampayon National High School. The rubrics used in assessing the activities were formulated by the researcher, her co-mathematics teachers, and experts in teaching EA. The criteria in the rubrics were formulated by considering the domains of learning. The domains of learning which are the knowledge, process, understanding, and performance were based on the K-12 Curriculum. The learning performance refers to the students' participation in the oral recitation, group activities and reporting activity during in the class. Meanwhile, achievement is the output, or score gained based on the performance of the students.

For the knowledge domain of learning, as defined by the Department of Education (2012), facts and information are the things that students need to acquire. The second domain of learning is the "process" which was defined as cognitive operations where students perform using facts and information for the purpose of constructing meanings and understanding. Effective cognitive learning in applying the word problems in Mathematics is manifested through the cognitive operations. The third is the "understanding" domain of learning, which according to the enduring big ideas principles and generalizations inherent to the discipline, may be assessed using the facets of understanding. The art of questioning by the teachers help the students to find meaning and understand the important ideas to gain effective transfer of learning (Wiggins & McTighe, 2005). The last domain of learning is the "product/performance" defined as the real-life application of understanding as evidenced by the students' performance of authentic tasks. The research instruments which were composed of the activity test questions and the second periodical examination questionnaire were validated by the researcher, Math teachers, and experts. The researcher made some modifications to the items to adjust the items to the students' level of experience.

As soon as the research proposal was approved, the researcher collaborated with two Math teachers who have been teaching EA in Grade 7 for almost five years. They are from another school in Butuan City Division. The Mathematics teachers, together with the researcher, evaluated and critiqued the rubrics to be used in evaluating the students' output.

The students' output was assessed by the researcher and the co-math teachers using the assessment tools. The seat work, quiz activity, board work and oral recitation activities of the students were scored based on how the students (1) used all appropriate information correctly, (2) applied appropriate procedure completely, and (3) if they clearly understood the problem, arrived at the correct solution and then made a general rule about the solution. In the reporting activity, the students earned perfect score if they can (1) speak clearly and effectively, (2) use appropriate mathematical terminology and symbols, and (3) integrate the topic into real-life situations. Moreover, in the journal-writing activity, students get a perfect score if they could (1) present accurate and insightful ideas, (2) provide depth and personal connections relevant to the topic, (3) understand clearly the topic, and (4) make a good journal with proper labels.

The researcher and the other two co-mathematics teachers rated the output of every learning activity of the students using the rubrics. The rating was decided unanimously by the researcher and co-mathematics teachers.

4 Results and Discussion

The personal profile of the students in terms of age shows that majority are aged 12 years old. The majority of the respondents obtained a very satisfactory level of performance in Math VI and English VI.

4.1 Level of Students' Performance in the Learning Experiences

The Problem-based activities are the student's hands-on experiences with the concepts in mathematics. The level of the respondents' performance in learning experiences and achievement in EA in terms of the

activities such as board work, seat work, group activity, oral recitation, journal writing, and math reporting are presented in Table 1.

Table 1
Distribution of the Respondents According to Math VI Grade

Grade Ranges	Frequency	Percent	Descriptive Rating
91 and above	11	27	Outstanding
86 – 90	30	73	Very Satisfactory
81- 85	0	0	Satisfactory
76 - 80	0	0	Poor
75 and below	0	0	Needs Improvement
Total	41	100	

The data showed that the students reached a very satisfactory level in Math VI which is a preparation for Grade VII mathematics in the K-12 curriculum. This implies that the basic and past knowledge in elementary years were the very important foundation to build new learnings in the higher Mathematics.

Table 2
Distribution of the Respondents According to Grade VI English Grade

Grade Ranges	Frequency	Percent	Descriptive Rating
91 and above	15	37	Outstanding
86 – 90	26	63	Very Satisfactory
81- 85	0	0	Satisfactory
76 - 80	0	0	Poor
75 and below	0	0	Needs Improvement
Total	41	100	

Table 2 implies that most of the students have a very satisfactory performance in English VI which is required in learning grade VII Mathematics since the medium of instruction is English. This further implies that the respondents must have at least a very satisfactory reading and comprehension ability to learn and understand mathematics.

Table 3
Summary of the Student's Achievement in the Performance-Based Learning Experiences

Grade Ranges	Board work	Seat work	Group Activity	Oral Recitation	Journal Writing	Math Reporting	Descriptive Rating
91 and above	5	2	3	11	13	4	Outstanding
86 – 90	36	19	21	29	27	36	Very Satisfactory
81- 85	0	9	16	0	1	0	Satisfactory
76 – 80	0	6	0	0	0	1	Poor
75 and below	0	5	1	1	0	0	Needs Improvement
Total	41	41	41	41	41	41	

The results shown in Table 3 imply that the students were able to achieve very satisfactorily because of their learning experiences. The data on the students' performance in board work, seat work, group activity, oral recitation, journal writing, and math reporting activities showed that the majority achieved a very

satisfactory performance rating. Henceforth, most of the students were able to participate and comply with the activities during the teaching-learning process. Through such achievement from learning experiences in the school, the students were able to grasp the concepts needed to be understood from the topic.

The study of Hartshorn and Boren (1990) supports the results: the learners' experiences through active involvement in the class is the context of experiential education. The best way to learn is by experience. How students are supported to develop these domain-specific competencies brings attention to the importance of the purpose and function of the relationship of instruction to learning.

Table 4

Students' Performance in the Domains of Learning in Elementary Algebra I

Grade Ranges	Domains of Learning					Descriptive Rating
	Knowledge (15)	Process/ Skills (25)	Understanding (30)	Performance (30)	Total (100)	
91 and above	10	2	0	0	0	Outstanding
86 – 90	20	2	1	0	2	Very Satisfactory
81- 85	4	9	3	0	2	Satisfactory
76 – 80	4	13	14	3	20	Poor
75 and below	3	15	23	38	17	Needs Improvement
Total	41	41	41	41	41	

The result implied that the respondents obtained a very satisfactory level in the knowledge domain of learning in EA (Table 4). It can be gleaned also that the respondents were poor in the process, understanding and performance domains of learning. They were only good in the knowledge domain of learning in defining, identifying, naming and memorization; but did not master the topics to apply the concepts in the other domains of learning where it involves the problem-solving analysis skills. The respondents cannot give meaning and connection to discrete facts and skills. The respondents applied some inappropriate procedure and presented an incomplete answer for the given problem. As such, the process, understanding and performance domains of learnings were not performed well.

Table 5

Correlation Analysis between Learning Experiences and Performance in Elementary Algebra 1

Learning Experiences	r	Sig.	Decision	Interpretation
Oral Recitation	0.526**	0.001	Do not accept H_o	Significant
Group Activity	0.645**	0.000	Do not accept H_o	Significant
Board work	0.589**	0.000	Do not accept H_o	Significant
Seatwork	0.487**	0.001	Do not accept H_o	Significant

**significant at $\alpha = 0.01$

The finding reveals that only the oral recitation, group activity, board work and seatwork activities of the students were highly correlated to the performance in EA (Table 5). Henceforth, those who do well in any of these performance-based activities mentioned have a greater tendency to do well in the paper-and-paper test in EA. This entails the form of learning where the learner is actively engaged in a task (Harris, Graham, Mason, & Sadler, 2002).

The findings in Table 6 implied that the students' learning performance and achievement in the group and board word activities were highly correlated with the performance in EA if Math Grade is controlled. In the group activity learning experience of the learner, it is supported by Kolb's theory (1984) that the

concrete experience stage of learning emphasizes personal involvement with people in everyday situations. In this stage, the learner would tend to rely more on feelings in cooperating towards its group mates than on a systematic approach to problems and situations.

Table 6

Partial Correlation between Learning Experiences and Performance in Elementary Algebra 1 Controlling for Math Grade

Control Variable			Performance in EA
Math Grade	Oral Recitation	Correlation	0.307
		Significance (2-tailed)	0.061
		Df	36
	Group Activity	Correlation	0.406*
		Significance (2-tailed)	0.012
		Df	36
	Seatwork	Correlation	0.029
		Significance (2-tailed)	0.864
		Df	36
	Board work	Correlation	0.477**
		Significance (2-tailed)	0.002
		Df	36

**significant at α = 0.01 *significant at α = 0.05

5 Conclusions and Recommendations

The findings of the study revealed that the performance-based learning in Mathematics of the students will depend also on the learning experiences, instructional materials and activities in school. The typical age is a factor that the students can use logical and coherent actions in thinking solving problems. However, the English and Mathematics performances must gain at least very satisfactory rating in the previous grade level will affect and tend to perform well to the next level. The learning experiences such as engaging to the activities in school such as board work, seat work; oral recitation, math reporting, journal writing, and oral recitation of the students will lead the students to easily grasp the concepts in mathematics which is needed to understand EA. But it was conveyed that only the oral recitation, group activity, board work and seatwork activities are highly correlated to the performance in EA.

The study further concluded that involving each student to do group activity with their peers and board work would help them perform better in learning mathematics. But it was found out that the overall performance in the Mathematics is poor except in the knowledge domain which is very satisfactory. Meanwhile, it is recommended for the teachers to develop more innovative, interactive and enjoyable activities. The positive environment and moderate usage of vernacular language shall be allowed in expressing the student's idea. Moreover, the journal writing activity and reporting activity are some of the assessments so that the students will practice the freedom of expression and develop analytical and creative thinking.

To promote the interest in learning more in EA, the mentors is recommended to design an activity in the class, so the students can participate in activities like group tasks and board work that express freely their ideas in Mathematics in their own way and be able to integrate what is being learned in real life situations. The further enhancement for the first, third and fourth quarter in the teaching guide is recommended to complete the enhancement activities of the current teaching guide in Mathematics 7.

Further study of this research in other public or private secondary schools in Caraga Region should be done by future researchers to verify the validity of its result.

6 References

Bruner, J. S. (1960). *The Process of education.* Cambridge, Mass.: Harvard University Press.

Department of Education (2012). Policy guidelines on the implementation of grades 1 to 10 of the K to 12 basic education curriculum (BEC) effective school year 2012-2013. *DepEd Order No. 31, s. 2012.*

Dewey, J. (1938) *Experience and education* (New York : MacMillan).

Grady, R. (2003). *An interpretation of dewey's experiential learning theory.* The Educational resources in Information Center. Retrieved from https://eric.ed.gov/?id=ED481922

Harris, K. R., Graham, S., Mason, L. H., & Saddler, B. (2002). Developing self-regulated writers. *Theory into practice, 41*(2), 110-115.

Hartshorn, R. and Boren, S. (1990). *Experiential Learning of Mathematics: Using Manipulatives.* ERIC Clearinghouse on Rural Education and Small Schools Charleston WV. Retrieved form https://files.eric.ed.gov/fulltext/ED321967.pdf

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of management learning & education, 4*(2), 193-212.

Kolb, D.A., (1984). *Experiential learning: experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall. Page 22.

National Mathematics Advisory Panel. (2008). *The Final report of the National Mathematics Advisory Panel.* Washington, DC, U.S. Department of Education.

Nomi, T., & Raudenbush, S. (2014). Algebra for all: the effect of algebra coursework and classroom peer academic composition on low-achieving students University of Chicago. *SREE Spring Publication.*

Patrick, S., & Sturgis, C. (2011). *Cracking the code: Synchronizing policy and practice for performance-based learning.* International Association for K-12 Online Learning.

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*(1), 36–48. Retrieved from https://doi.org/10.1016/j.cedpsych.2010.10.002

Wiggins, G., & McTighe, J. (2005). Understanding by Design. Alexandra, Virginia: Association for Supervision and Curriculum Development.