Research Article

Utilization of Authentic Assessments in General Chemistry 2: Its Correlation on Students' Learning Experience

Jonathan P. Mellona[1]*, Cristo Mark D. Ancheta[2]

[1]Schools Division Office of Pampanga, Pasig National High School, Candaba, 2013, Philippines
[2]Graduate School – Mathematics Education Department, Nueva Ecija University of Science and Technology, Cabanatuan City, 3100, Philippines

Corresponding author:
E-mail:
jonathanmellona.17@gmail.com

ABSTRACT

Assessment plays a significant role in enhancing the teaching and learning process, serving as a tool to gauge students' understanding and guide instructional improvement. However, traditional assessments in science education often emphasize rote memorization rather than conceptual understanding and real-world application. This study investigated the relationship between the utilization of authentic assessments in General Chemistry 2 and students' learning experience among Grade 12 STEM students at Pasig National High School, during the first semester, S.Y. 2025–2026. Utilizing a descriptive-correlational research design, data were collected from 80 randomly selected respondents through a structured questionnaire. Descriptive statistics revealed that authentic assessments are frequently used in their General Chemistry 2 class. Moreover, Grade 12 STEM students demonstrated a highly positive learning experience in terms of learning engagement, conceptual understanding and perceived real-life relevance. Meanwhile, inferential statistics using Pearson's correlation showed a significant relationship between utilization of authentic assessments in General Chemistry 2 and students' learning experience, with weak to moderate positive correlations (r values ranging from 0.254 to 0.657, $p<0.05$). These findings imply that as the utilization of authentic assessments in Chemistry class increases, the students' learning experiences also increases. Furthermore, it is recommended that science teachers continuously integrate and diversify authentic assessments to promote reflection, collaboration, and critical thinking. Additionally, teacher training programs should emphasize on designing rubrics and validating authentic assessment that align with the K–12 science curriculum competencies, thereby preparing learners for real-world problem-solving and lifelong learning.

Introduction

Assessment is an essential component in the teaching and learning process. It serves as a tool to monitor student understanding, identify areas for improvement and inform future lesson planning. To determine students' learning, teachers should utilize various assessments. Apparently, many teachers, particularly in science education, are still relying heavily on traditional assessments that primarily measure rote memorization rather than conceptual understanding and application. This often limits students' ability to connect scientific concepts to real-life situations. Likewise, as cited by Saher (2022), it restrains the assessment of higher-order thinking skills and other essential 21st-century competencies due to the nature of the item format.

Meanwhile, authentic assessments are used to determine the application of the students' understanding in a real-world context. Some of these are performance-based, product-based, portfolio and self/ peer assessments. As cited by Sokhanvar et al. (2021), these assessments gained recognition in higher education for the reason that they can improve students' learning and help them address pragmatic issues they might encounter in their professional life. Aside from assessing students' authentic performances or studies, authentic assessments also evaluate their ability such as persistence in solving complex problems, positive habits of mind, growth mindset, resilience and grit, and self-directed learning (Ozan, 2019).

The need for this kind of assessment is relevant in General Chemistry 2, a subject that covers complex and abstract topics such as chemical equilibrium and thermodynamics, where traditional assessments struggle to gauge students' ability to apply principles to practical, non-ideal scenarios. Authentic tasks help bridge this gap by making abstract concepts more accessible and relatable.

Although authentic assessment has been widely recognized in educational research as an effective approach for promoting meaningful learning, its actual utilization in science education remains limited and underexplored in the Philippine secondary context. As mentioned by Department of Education (2015), as aligned with the K-12 science curriculum, the teachers should emphasis on performance-based and learner-centered assessment approaches that promote critical thinking, collaboration, and application of knowledge to real-world contexts. Thus, this current study focuses on the utilization of authentic assessments in General Chemistry 2 and determines whether their implementation has a measurable effect on students' learning experiences in terms of their learning engagement, conceptual understanding and perceived real-life relevance.

Statement of the Problem

This study focused on determining the relationship between the utilization of authentic assessments in General Chemistry 2 and students' learning experience. Specifically, this study sought answers to the following questions.
1. How may the frequency of the utilization of authentic assessments in General Chemistry 2, as perceived by the students, be described in terms of:
    a. performance-based;
    b. project-based;
    c. portfolio; and
    d. self/ peer assessment?
2. How may the students' learning experience in General Chemistry 2 be described in terms of:
    a. learning engagement;
    b. conceptual understanding; and
    c. perceived real-life relevance?
3. Is there a significant relationship between the frequency of utilization of authentic assessments in General Chemistry 2 and students' learning experience?

Hypothesis

The hypothesis below was tested in this study.

1. There is no significant relationship between the frequency of utilization of authentic assessments in General Chemistry 2 and students' learning experience.

Methodology

This section presents the methods and techniques utilized in this study. This includes research design, sampling procedure, and data analysis scheme.

Research Design

This study utilized descriptive correlational research design. The collection of data was done through survey questionnaires, where the students perceived frequency of utilization of authentic assessments and their learning experience were obtained and measured. Consequently, the relationship between students perceived frequency of utilization of authentic assessments and their learning experience were assessed.

Sampling Procedure

The respondents of this include Grade 12 STEM students at Pasig National High School during the first semester, S.Y. 2025-2026. The researchers utilized Slovin's formula to determine the number of respondents. As stated by Anurgraheni et al. (2023), this formula is used to determine the appropriate sample size from a population. Based on the given population of 100 Grade 12 STEM students, the researchers utilized random sampling technique which determines 80 respondents using the formula with 0.05 margin of error.

Table 1. Respondents of the Study

Respondents	Number of Students	Sample Size
STEM 12 – Diamond	34	27
STEM 12 – Ruby	33	27
STEM 12 – Sapphire	33	26
Total	100	80

Research Instrument

The researchers utilized a researcher-made five-point scale survey questionnaire, for both variables, to determine the utilization of authentic assessments in General Chemistry 2 and learning experience among Grade 12 STEM students. This is composed of three parts. Part I focuses on the demographic profile of the respondents, Part II deals with their perceived frequency of utilization of authentic assessments in General Chemistry 2, and Part III deals with their learning experience.

Cronbach alpha, computed through Statistical Package for Social Science (SPSS), was utilized to determine the internal reliability of the research instrument. The result of reliability test yielded a coefficient of 0.94. As cited by Otibar et al. (2023), this value indicates good reliability, where Cronbach's alpha values of 0.7 or higher align with the generally accepted standard for reliability.

Data Analysis

To analyze the data collected, the researchers utilized both descriptive and inferential statistics. The following statistics were employed to ensure the accuracy and reliability of the analysis and interpretation of data:

Descriptive statistics including weighted means to describe the frequency of utilization of authentic assessments in General Chemistry such as performance-based, project-based, portfolio and self/ peer assessment. This is also used to describe the students' learning experience in terms of learning engagement, conceptual understanding and perceived real-life relevance.

Meanwhile, inferential statistics such as Pearson's correlation was utilized to determine the relationship between utilization of authentic assessments and students' learning experience. As mentioned by Mellona and Peria (2025), although the data gathered use five-point Likert-scale responses for both variables, composite scores were computed for each variable through summing responses across

multiple items leading them to be treated as interval scale. Moreover, to determine the strength of correlation between variables, the researchers utilized the correlation coefficient and strength of relationship outlined by Ahmad et al. (2019), which is presented in table 2.

Table 2. Correlation Coefficient and Strength of Relationship

Correlation Coefficient	Strength Relationship
±1	Perfect
$\pm0.7 < r < \pm1$	Strong
$\pm0.3 < r < \pm0.7$	Moderate
$0 < r < \pm0.3$	Weak
0	Zero

Results and Discussion

This chapter deals with the presentation, analysis and interpretation of the data collected and the results of the statistical treatment employed in the study. This focuses on determining the relationship between the utilization of authentic assessment in General Chemistry 2 and students' learning experience.

Frequency of Utilization of Authentic Assessments in General Chemistry 2

Authentic assessment enables the students to demonstrate their knowledge and skills in real-world tasks. This includes performance-based, project-based, portfolio and self/ peer assessment. The frequency of utilization of authentic assessments in General Chemistry 2, as perceived by the students, is presented in table 3.

Table 3. Frequency of Utilization of Authentic Assessments in General Chemistry 2

Authentic Assessments	Weighted Mean	Verbal Interpretation
Performance-based	4.42	Always
Project-based	4.45	Always
Portfolio	4.01	Often
Self/Peer	4.38	Always
Overall Mean	4.32	Always

Legend: 4.21 – 5.00 (Always); 3.41 – 4.20 (Often); 2.61 – 3.40 (Sometimes); 1.81 – 2.60 (Rarely); 1.00 – 1.81 (Never)

Table 3 summarizes the results of the frequency of utilization of authentic assessments in General Chemistry 2. The date revealed that the utilization of authentic assessments has an overall mean of 4.32 and verbal interpretation of "Always". Among the four authentic assessments, project-based obtained the highest weighted mean of 4.45 with verbal interpretation of "Always". This indicates students frequently engaged in real-world tasks such as investigatory projects, design-based activities, model construction, and laboratory performance tasks.

The results imply that the General Chemistry 2 teacher consistently integrates authentic assessments in evaluating students' learning and performance in the subject. Specifically, the teacher consistently requires the students to work on projects that demonstrate the integration of chemistry knowledge with real-world situations.

This is aligned with Hurtado et al. (2023), stated that students supported project-based learning as it is a more effective way of learning than any other assessment methods.

Students' Learning Experience

Learning experience is crucial for students as it directly impacts their academic performance, personal growth and future career success. The assessments of students learning experience in terms of learning engagement, conceptual understanding and perceived real-life relevance are presented in tables 4 to 6.

Learning Engagement

Learning engagement involves active participation of the students, staying focused and feeling of personal connection to the learning process.

Table 4. Students' Learning Experience in terms of Learning Engagement

Item Statement	Weighted Mean	Verbal Interpretation
1. I find chemistry lessons more interesting when authentic assessments are used.	4.69	SA
2. I am more active in class when given authentic or practical tasks.	4.18	A
3. I enjoy participating in real-world problem-solving activities.	4.40	SA
4. I actively participate in group work during authentic assessment activities.	4.49	SA
5. I feel more involved in learning when the activities are hands-on.	4.53	SA
Overall Mean	4.46	SA

Legend: 4.21 – 5.00 [Strongly Agree (SA)]; 3.41 – 4.20 [Agree (A)]; 2.61 – 3.40 [Moderately Agree (MA)]; 1.81 – 2.60 [Disagree (D)]; 1.00 – 1.80 [Strongly Disagree (SD)]

Table 4 presents the assessment of students' learning experience in terms of learning engagement with an overall mean of 4.46 which possesses a verbal interpretation of "Strongly Agree". It can be noted that the item "I find chemistry lessons more interesting when authentic assessments are used" obtained the highest mean of 4.69 and a verbal description of "Strongly Agree".

This implies that students perceive authentic assessments as highly effective in making their learning experiences more meaningful, interactive and motivating. Moreover, these assessments significantly increase their interest in chemistry.

As mentioned by Nyinge et al. (2024), authentic assessment has been acknowledged to foster the active students' engagement and cultivate a sense of responsibility for learning, through which one can find a crucial link between higher education institutions and the skill demands of the employment sector.

Conceptual Understanding

Conceptual understanding is deep comprehension of scientific concepts which involves connecting new knowledge to existing understanding, analyzing the relationship between ideas and applying the knowledge in new and different situations.

Table 5. Students' Learning Experience in terms of Conceptual Understanding

Item Statement	Weighted Mean	Verbal Interpretation
1. I understand chemistry concepts better through authentic tasks.	4.25	SA
2. I can explain chemistry ideas more clearly after doing authentic activities.	4.16	A
3. I can connect chemistry lessons to real-world applications.	4.20	A
4. I remember chemistry concepts longer after completing authentic assessments.	4.19	A
5. I can solve chemistry problems better after engaging in authentic tasks.	4.10	A
Overall Mean	4.18	A

Legend: 4.21 – 5.00 [Strongly Agree (SA)]; 3.41 – 4.20 [Agree (A)]; 2.61 – 3.40 [Moderately Agree (MA)]; 1.81 – 2.60 [Disagree (D)]; 1.00 – 1.80 [Strongly Disagree (SD)]

Table 5 presents the assessment of students' learning experience in terms of conceptual understanding with an overall mean of 4.18 which possesses a verbal interpretation of "Agree". It can be noted that the item "I understand chemistry concepts better through authentic tasks" obtained the highest mean of 4.25 and a verbal description of "Strongly Agree". Although students generally agreed that authentic tasks improved their understanding, they still strongly agreed that they understood chemistry better through real-world activities.

This implies that students perceived authentic assessments as effective in deepening their understanding of chemistry concepts. This also suggests that these assessments help them grasp abstract chemical principles more effectively.

This is aligned with the study of Hains-Wesson and le Roux (2024), suggested that authentic assessment is designed to evaluate learners' understanding and capabilities in authentic, meaningful contexts mirroring real-life situations. Moreover, these assessments focus on the process and outcome of learning, necessitating higher-order thinking skills, including complex problem-solving and decision-making.

Perceived Real-Life Relevance
The relevance of the assessment to real-life situations involves the connection and application of acquired knowledge and skills to practical, careers and personal experiences.

Table 6. Students' Learning Experience in terms of Perceived Real-Life Relevance

Item Statement	Weighted Mean	Verbal Interpretation
1. I realize that chemistry is useful in my everyday life.	4.55	SA
2. I see how chemistry applies to real-life situations through authentic tasks.	4.58	SA
3. I can relate classroom lessons to what happens in my community.	4.38	SA
4. I understand the importance of learning chemistry because of real-world activities.	4.56	SA
5. I see chemistry as essential to solving real-life environmental and societal problems.	4.64	SA
Overall Mean	4.54	SA

Legend: 4.21 – 5.00 [Strongly Agree (SA)]; 3.41 – 4.20 [Agree (A)]; 2.61 – 3.40 [Moderately Agree (MA)]; 1.81 – 2.60 [Disagree (D)]; 1.00 – 1.80 [Strongly Disagree (SD)]

Table 6 presents the assessment of students' learning experience in terms of perceived real-life relevance with an overall mean of 4.54 which possesses a verbal interpretation of "Strongly Agree". It can be noted that the item "I see chemistry as essential to solving real-life environmental and societal problems" obtained the highest mean of 4.64 and a verbal description of "Strongly Agree".

This implies that students agreed that chemistry lessons delivered through authentic assessments as highly relevant and applicable to everyday life situations. In addition, students recognize the critical role of chemistry in addressing pressing global challenges.

This is highlighted by Hansen (2024), that authentic assessments represent a significant shift in educational practice, offering a more holistic and meaningful approach to evaluating student learning. These assessments prepare the students for the complexities of modern life and work by engaging them in real-world tasks that require critical thinking, creativity, and collaboration.

The Relationship between the Utilization of Authentic Assessments in General Chemistry 2 and Students' Learning Experience
Table 7 summarizes the results of the correlational analysis which was performed to determine significant relationship between the utilization of authentic assessments in General Chemistry 2 and Grade 12 STEM students' learning experience.

Table 7. Results of the Correlational Analysis Between the Utilization of Authentic Assessment in General Chemistry 2 and Students' Learning Experience

Authentic Assessments	Students' Learning Experience		
	Learning Engagement	Conceptual Understanding	Perceived Real-Life Relevance
Performance-based	0.604*M (0.000)	0.585*M (0.000)	0.510*M (0.000)
Project-based	0.622*M (0.000)	0.657*M (0.000)	0.505*M (0.000)
Portfolio	0.290*W (0.009)	0.254*W (0.023)	0.310*M (0.005)
Self/Peer	0.553*M (0.000)	0.527*M (0.000)	0.443*M (0.000)

Legend: * = significant (p≤0.05) Numbers in the upper entry are correlation values (r-values)
Numbers enclosed in parentheses are probability values (p-values)

Strength of Correlation:
	±1	Perfect (P)
	±0.7 < r < ±1	Strong (S)
	±0.3 < r < ±0.7	Moderate (M)
	0 < r < ±0.3	Weak (W)
	0	Zero (Z)

Table 7 revealed that significant relationship was found between the utilization of authentic assessments in General Chemistry 2 and students' learning experience. This significant relationship is manifested by the computed probability values that ranged from 0.000 to 0.023, which are less than 0.05 significance level. Moreover, correlation values ranging from 0.254 to 0.657 indicates weak to moderate positive correlation.

The strongest positive correlation was observed between project-based assessment and conceptual understanding (r=0.657, moderate), suggesting that projects are the most effective modality for deepening the students' grasp of abstract chemical concepts. Meanwhile, portfolio and conceptual understanding obtained the lowest positive correlation (r=0.254, weak), this may indicate that portfolios were used primarily as compilations rather than reflective tools, limiting their impact on conceptual mastery.

These findings imply that as the utilization of authentic assessments is more frequent in Chemistry class, students tend to exhibit higher learning experience such as higher engagement, deeper conceptual understanding and stronger perceptions of real-life relevance.

This is aligned with Sokhanvar et al. (2021), stated that authentic assessment can play a role in improving the learning experience of higher education students through enhancing their engagement in learning and improving their satisfaction as well as positively influencing their efforts to achieve educational goals. Moreover, these assessments equipped the students with significant skills for their future professional life.

Conclusion

Authentic assessments are frequently utilized in General Chemistry 2 such as performance-based, project-based, portfolio and self/peer assessments. Moreover, the Grade 12 STEM students exhibited a highly positive learning experience, in terms of learning engagement, conceptual understanding, and perceived relevance to real-life situations. Furthermore, a significant relationship was found between the frequency of utilization of authentic assessments and students' learning experience.

Recommendation

This study suggested that teachers may continuously integrate authentic assessments into classroom instructions, emphasizing real-world applications of the concepts to sustain engagement and deepen understanding. They may also diversify the use of portfolio and self/peer assessments to promote reflective

learning, collaboration and critical thinking among students. Moreover, school administrators may provide their teachers a professional development on designing rubrics and validating authentic assessments.

Acknowledgement

References

Ahmad, F. S., Velu, B. K. D. V., Zaidin, N. & Shariff, S. A. (2019). Entrepreneurship education for industrial professional: The influence of communication, teamwork, leadership and innovative soft skill on job performance. *International Journal of Recent Technology and Engineering*, *8*(3). https://doi.org/10.35940/ijrte.C1037.11 83S319

Anugraheni, T. D., Izzah, L., Hadi, M. S. (2023). Increasing the students' speaking ability through role-playing with Slovin's formula sample size. *Jurnal Studi Guru dan Pembelajaran,* *6*(3), 262-272. https://doi.org/10.30605/jsgp.6.3.2023. 2825

Department of Education. (2015). *DepEd Order No. 8, s. 2015: Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program.*

Hains-Wesson, R. & le Roux, S. (2024). Bridging teacher knowledge and practice: Exploring authentic assessment across educational levels. *Educational Sciences, 14*, 894.

https://doi.org/10.3390/educsci140808 94

Hansen, C. (2024). Authentic assessments: Developing tasks that more adequately prepare students for real-world problems. *Research Gate.* https://doi.org/ 10.13140/RG.2.2.10770.16329

Hurtado, J. A., Useche, A. C. & Masiero, B. S. (2023). Project-based learning: Authentic engineering assessment supported by model design. *International Journal of Engineering Pedagogy.* *13*(6), 17-32. https://doi.org/10.3991/ijep.v13i6.3853 9

Mellona, J. P. & Peria, J. N. T. (2025). Hanging green space: Assessing the relationship between students' horticultural involvement and environmental awareness. *International Journal of Multidisciplinary: Applied Business and Education Research*, *6*(5), 2272 – 2281. https://doi.org/10.11594/ijma-ber.06.05.14

Nyinge, B., Matete, R. & William, F. K. (2024). Exploring the Relationship between Authentic Assessment and Teaching Professional Competence Acquisition among Undergraduate Science Student-Teachers in Higher Education Institutions in Tanzania. *International Journal of Current Educational Studies,* *3*(1), 14-27. https://doi.org/10.46328/ijces.95

Otibar, J., Egargo, V., Calvara, C. M., Macion, K. M., Abrugar, S. J., Sanchez, S. Q., Danday, B. A. & Calzita, C. L. (2023). Social media exposure and grammar proficiency of junior high school students': A correlational study. *International Journal of Multidisciplinary: Applied Business and Education Research*, *4*(9), 3104-3115. https://doi.org/ 10.11594/ijma-ber.04.09.04

Ozan, C. (2019). Authentic assessment increased academic achievement and attitude towards the educational measurement of prospective teachers. *International Journal of Evaluation and Research in Education.* *8*(2), 299-312. https://doi.org/10.11591/ijere.v8i2.185 64

Saher, A., Ali, A., Amani, D. & Najwan, F. (2022). Traditional versus authentic assessments in higher education. *Pegem Journal of Education and Instruction, 12*(1), 283-291. https://doi.org/10.47750/pegegog.12.01.29

Sokhanvar, Z., Salehi, K. & Sokhanvar, F. (2021). Advantages of authentic assessment for improving the learning experience and employability skills of higher education students: A systematic literature review. *Studies in Educational Evaluation, 70*, 101030. https://doi.org/10.1016/j.stueduc.2021.101030