



Responding to the Challenges of Teaching Nomenclature of Compounds Through GENERATIVE ARTIFICIAL INTELLIGENCE INSTRUCTIONAL MATERIAL (GAIIM)

Jovela Peñañas

Southern Luzon State University

jipenañas@slsu.edu.ph

Abstract

Generative AI in education facilitates the creation of innovative materials, reshaping paradigms and promoting transformative shifts. This qualitative narrative study aimed to identify challenges encountered by senior high school chemistry teachers in Quezon Province in teaching the nomenclature of compounds and to develop and evaluate Generative Artificial Intelligence Instructional Material (GAIIM) to address the challenges. Nine chemistry teachers were purposively sampled and interviewed using a validated semi-structured questionnaire. For ethical considerations, informed consent was obtained, and alphanumeric codes were used. A 4-point Likert scale was utilized to assess the GAIIM's acceptability among 30 science teachers. Using Taguette, the qualitative data were analyzed, and it revealed that student diversity, lack of mastery, time constraints, and insufficient instructional materials are the challenges of teachers. In response, they adjust class schedules, provide diverse learning activities, and enhance discussions. The GAIIM was designed using Microsoft PowerPoint and Canva to address the identified problems and incorporate effective teaching-learning strategies relevant to the local context. Quantitative data analyzed using Jamovi indicated that the GAIIM is ideal, valid, and ready for classroom implementation. To enhance generalizability, it is recommended to increase the sample size, conduct experimental studies to assess GAIIM's effectiveness, and train teachers in creating GAIIM.

Keywords: Generative AI, Interactive Presentation, Nomenclature of Compounds, Educational Technology

Suggested citation:

Peñañas, J. (2025). Responding to the Challenges of Teaching Nomenclature of Compounds Through GENERATIVE ARTIFICIAL INTELLIGENCE INSTRUCTIONAL MATERIAL (GAIIM). *Studies in Interdisciplinary Horizons*. 1 (3),1-17. <https://doi.org/10.64358/jvbbrh57>



Introduction

Competency in naming compounds, otherwise known as nomenclature of compounds, is an essential competency that is needed to be mastered by the students in order to become more familiar with and knowledgeable in the world of chemistry. In molding this competency among students, science teachers are expected to develop the skill and knowledge among the students. However, despite the great lengths' science teachers would go for, students still struggle to comprehend and grasp the context behind the rules for naming compounds. Teaching chemistry alone is a complex process, specifically for science teachers. Adu-Gyamfi and Asaki (2023) revealed that there is a demand to examine the challenges of the teachers in teaching chemistry, particularly in teaching nomenclature of compounds since students' difficulties when it comes to nomenclature of compounds have already been studied. Idah and Eya (2018), found that oftentimes, students find it challenging to learn the nomenclature of compounds since it is one of the hard features of chemistry, this perception is vital as they are discouraged when they see their performances in chemistry to be low. Aside from the nature of the topic, students' attitude towards chemistry and the lack of available laboratory equipment were factors identified by Rebecca, Maxwell, and Abumchujwu (2021) to influence students' performance.

Science teachers, specifically Filipino teachers also encounter challenges as teaching chemistry is in a problematic state in terms of the content, pedagogy, and assessment they conduct inside the class due to several challenges they encounter, such as instruction-related factors, the competence of the teachers, and tools in assessment (Orbe, Espinosa, & Datukan, 2018). In line with this, Lakka, et al. (2023) mentioned that the absence of instructional aid contributes to teacher's effectiveness. Tilahun (2016) noted that teacher's lack of competence in the English language served as a factor in teaching chemistry which affects students' performance. Finally, Yalcin-Celik et al. (2017) found in his study that teachers have difficulty in teaching nomenclature of compound. However the study was not able to identify the main challenges of the teacher. The same is experienced by pre-service teachers in the study of Yaayin, Oppong, and Hanson (2022), it was found that challenges in teaching nomenclature of compounds start even way before the pre-service time of teachers as majority of these pre-service teachers present misunderstanding and somehow partial understanding of the concepts mentioned.

The problems identified in line with chemistry that are common among teachers and students can be resolved through effective teaching strategies. One of which is by employing interactive teaching with ICT. The combination of technology with content and pedagogy was proven effective in many studies. Students are engaged with interactive lectures and the majority of them respond to the teaching-learning process positively as they get to enjoy learning in such an environment, and this changes their perception towards the subjects. The study of Cipagauta et al. (2021) developed a proposed blog as a didactic strategy supported by ICT to promote learning for the basic concept of organic chemistry. Therefore, the goal is to create and verify an interactive chemistry course for lower secondary schools based on the characteristics of interactive ICT-connected education and more interesting presentation of the subject matter (Sadykov & Čtrnáctová, 2019). But before a teacher introduces and makes use of interactive teaching, teachers should be able to create strategies that will help and support effective implementation and communication of the interactive teaching; the

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

teachers themselves too must also be knowledgeable in the conduct of interactive materials available today before they involve students (Xhemajli, 2016).

Generative AI (GAI) utilizes the networks of deep learning to identify meaningful patterns and interrelationships across vast sets of data. This allows for original and innovative materials across a variety of sources, such as texts, images, music, and videos. GAI presents possibilities to reshape paradigms to advance innovative models to promote transformative shifts (Ahiara et al., 2023). Examples of GAI in education are the integration of web-based sources like Coursera, Khan Academy, and Duolingo in educational institutions.

As a forefront of educational technology and AI implementation in education, these digital resources are used for personalized learning, assessment and feedback, predictive analysis, virtual teaching assistants, and smart campus solutions (Glowatz & O'Brien, 2017). Active classroom and learning are the modern way of teaching and learning today. As showcased in the study of Munna and Kalam (2021), when they used an active pedagogical strategy in teaching, the students were able to have an improvement when it comes to their knowledge level, and it also allowed them to grasp the in-depth information about their topic. Aligned with the principles of active learning, modern teaching often incorporates interactive presentations to enhance classroom instruction. Yahya and Aegbaria (2022) found that these presentations significantly simplify the explanation and illustration of course materials, making the course more engaging and boosting student participation.

Interactive presentations benefit both teachers and students by facilitating material adoption and preventing misconceptions. Teachers receive immediate feedback, enhancing their teaching process. This strategy is well-received and appreciated by both students and educators (Bratic et al., 2020). When interactive presentations are applied in chemistry, students are able to better understand how chemical reactions occur at the macroscopic and molecular levels by using interactive presentations that incorporate 3D molecules, animations, and graphics. This could lead to the incorporation of visually appealing chemistry. Particularly in the molecules, which move continuously even though they would not react (Awad, 2022). However, the potential benefits of GAI in education come with concerns such as data privacy, equity issues, human interaction, bias, and ethical considerations. Hence, it is the teachers' role to effectively integrate GAI in education while upholding academic integrity.

The literature above shows the challenges in teaching chemistry as well as the opportunities that GAI offers to teachers, students, and the education field as a whole. To address the gap in research specific to enhancing teaching and learning of nomenclature of compounds through interactive presentation, this paper aimed to determine the challenges encountered by science teachers in teaching nomenclature of compounds among senior high school students in Quezon Province and create an interactive presentation that will help teachers address identified challenges by employing effective strategies. This study aims to benefit teachers and learners as it will improve the teaching-learning process and will promote the use of GAI in education, specifically as instructional material.

Objectives

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

This study focused on creating GAIIM to address the challenges in teaching nomenclature of compounds. Specifically, this aimed to:

1. Discover the challenges encountered by the teachers in teaching nomenclature of compounds.
2. Explore the strategies employed by the teachers to address the challenges they encounter.
3. Develop GAIIM integrated with the identified strategies to address the challenges.
4. Evaluate the level of acceptability of the GAIIM in terms of:
 - 4.1 accuracy;
 - 4.2 clarity;
 - 4.3 layout;
 - 4.4 originality; and
 - 4.5 learning activities

Theoretical Framework

To support this study, the self-determination theory by Deci and Ryan (1985), was used as an anchor to this study. This theory explains that when an individual feels more motivated in doing actions, in this case, teaching and solving challenges, nomenclature of compounds, when they foresee that their action will contribute to the desired outcome they have in mind (MSEd, 2022). With the GAIIM supported by this theory, it is expected that when it addressed the challenges being faced by the teachers when teaching nomenclature, they would be able to feel motivated and effectively teach nomenclature of compounds among their students.

With the evident struggle of teachers to teach nomenclature of compounds among their students because of the varying challenges and factors they face upon teaching, there is a need to determine what are these specific challenges they are facing and what appropriate measures can be taken in order to address these challenges, as the challenges being experienced by the teachers during teaching affect the quality of learning the students gain.

Because of this, the researchers created the GAIIM that was designed to address the challenges being faced by the teachers upon instruction. Through this, it can help to make the teachers feel that they are in control of their class, they are equipped with enough knowledge to teach the lesson to the class, and they are in one goal in class, that is, to learn the nomenclature effectively because of the various features this interactive presentation can provide to the teachers as a support. Upon learning more about what an interactive presentation is, the teachers can make use of it to enhance other topics to be learned by the students. It can also help them customize what they want to include inside the interactive presentation to better suit their preferences and strategies in teaching.

Methodology

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Research Design

A qualitative approach was used in the quest of making the GAIIM to address the challenges experienced by teachers teaching nomenclature of compounds. Specifically narrative design, using this design allowed the researcher to explain variations in the responses as well as evaluate how differences in context may have influenced the outcomes (Creswell, 2018). Moreover, it was utilized as it fits the experience of teachers who are individual and social storytellers (Moen, 2006). The main outcome of this approach is providing narratives based on the collected data of the researchers that can be in the form of themes, conflicts, and challenges. In this case, the experiences and challenges of teachers were examined.

Furthermore, the use of this method was in line with the purpose of this study: identifying the challenges of the teachers in teaching chemistry and creating the GAIIM that will help to address such challenges. A semi-structured interview questionnaire was used to collect qualitative data. Categories emerged from interviewing the teachers. Meanwhile, a quantitative descriptive design was used to interpret the accumulated responses from the 4-point Likert checklist survey for the acceptability of the interactive presentation for addressing the challenges identified.

Participants

The participants of this study were the nine (9) chemistry teachers from different schools in Quezon Province teaching nomenclature of compounds among Grade 11 STEM students. They were purposefully chosen as they are the ones who experience teaching the topic and are the ones who experience the challenges that come along with it as mentioned during a preliminary interview. Moreover, thirty (30) high school science teachers from schools in Quezon Province and Laguna evaluated the acceptability of the GAIIM in addressing the challenges teachers encountered in the teaching of the nomenclature of compounds. They were purposefully chosen as they are also teaching chemistry and exploring innovative strategies in teaching.

Data Gathering and Analysis

Necessary documents were prepared, and approvals were sought prior to the conduct of the study. Informed consent was secured prior to the interview. The interview is face-to-face, where the teachers responded to the following questions:

- 1. What challenges did you encounter/still encountering in teaching nomenclature of compounds?*
- 3. What strategies are you employing to address the challenges in teaching the nomenclature of compounds?*



4. How do you perceive teaching nomenclature of compounds using an interactive presentation?

During the interview, the respondents responded with the language most comfortable for them. A recorder was used to ensure that all responses are collected. Moreover, the researchers used note-taking to emphasize key ideas. The qualitative data were transcribed and analyzed using Taguette, an open-source qualitative data analysis tool. The data were coded, categorized, and analyzed for common themes.

Data gathered were then used in designing the GAIIM through an interactive presentation. Canva and Microsoft PowerPoint presentations were utilized in developing the material. In Canva, the designs of the presentation are crafted. It is designed with a game-based interface having a school and classroom setting to get the attention of the students, as the study of Byusa et al. al. (2022) found that a game-based approach in educational settings helps students to develop a comprehensive understanding of the concepts in chemistry, and it also assists in driving the motivation of the students, having fun learning, and making sense out of the topic. The topics of the interactive presentation focused on the nomenclature of ionic and covalent compounds. This is based on the topic shared by the respondents pre-interview and during the interview as the topic that they teach among the STEM students when it comes to the nomenclature of compounds. The contents used in this study came from internet resources, particularly from Maribel and DeWitt from YouTube, who are established personalities on YouTube when it comes to teaching chemistry.

The main interactive presentation starts with a recall activity to test the pre-existing knowledge of the students. This is followed by the introduction of terminologies, then a proper discussion. In between the discussion proper is a formative assessment about each lesson discussed to allow teachers to easily identify whether the students fully understood the lesson or not.

The interactive presentation was then presented among the purposefully chosen respondents who evaluated its level of acceptability through a 4-point Likert scale with the following description (DR) and numerical value: strongly disagree (SD=1), disagree (D=2), agree (A=3), strongly agree (SA=4). After the data were gathered, it was tabulated, analyzed, and interpreted using Jamovi, an open statistical software.

Findings and Discussions

Qualitative Data Analysis and Discussion

This section shows the themes generated, the table containing sample responses, and codes, and the discussion based on the responses of the science teachers.

Table 1

Challenges Encountered by Teachers in Teaching Nomenclature of Compounds

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Themes	Codes	Sample Responses
Diversity of learners as a challenge in teaching nomenclature of compounds.	Large Class Size	"40-48"
	Unequal Learning Pface of Students	"Some students have experienced advance chemistry" "Some students did not have experienced advance chemistry"
Time constraint as a challenge in teaching nomenclature of compounds.	Less Lessons Taught	"Cannot be taught in 2-3 days" "Too much to discuss" "Too much to recall"
	Shortage of Time	"Other teachers consume your time" "Lack of Time"
Students' Mastery as a challenge in teaching nomenclature of compounds.	Lack of Mastery	"Unable to master skills" "Unreadiness for the topic"
	Slow Learners	"No prior knowledge" "Takes time to recall" "Slow to understand"
Provided by School Availability of IMs as a factor affecting teaching nomenclature of compounds.	Available Instructional Materials	Books Modules Internet
	Access of Teachers	Accessibility to the Internet for Resources Personal Instructional Tools

A large class size leads to a more diverse set of students. As the class size increases, the teachers find it hard to facilitate the classroom since all students possess their own behavior, interest, and level of learning pace. Since some students experienced advanced chemistry as a special program during their junior high school, it gives them a lot of advantage in understanding chemistry, particularly in nomenclature of compounds. But those students who were unable to experience this kind of special program, the majority of them struggled to understand the lesson. With this impact of class size on the learning pace of the students, the teachers find it challenging.

Time is a vital factor to be considered, especially in the field of teaching, as it affects the learning of the students. When the time to teach the topic is affected, it becomes a hindrance for difficult topics that need to be discussed, leading students to struggle further in learning and understanding the topics. Due to ineffective time allotment for teaching nomenclature of compounds, teachers struggle by minimizing the lessons they need to teach the students, as well as sacrificing their own time.

The students, specifically STEM students, have their own differences in terms of knowledge. Moreover, when it comes to their level of intelligence, retention ability from previous lessons, and prior knowledge during their time in junior high school, it contributes to the difficulties of the chemistry teachers teaching the nomenclature of compounds. It is because the students' knowledge serves as the basic foundation that helps the class to proceed to the next topic.

The availability of instructional materials in different schools is found to be abundant and is very accessible to teachers, especially when teaching the nomenclature of compounds. It poses no challenge for the teachers since they are able to use different materials for their

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

lessons that help students further develop their learning when it comes to the nomenclature of compounds. Given also the diversity of available materials, it is able to cater to the diverse intelligence each student has.

Wang and Calvano (2022) noted that large class sizes are associated with challenges in providing equitable and high-quality learning opportunities. On the other hand, Teig, Scherer, and Nilsen (2019) found that strong time constraints lead to less frequent use of inquiry-based Cognitive-Activation Strategies (CAS), hence teaching and learning is not maximized.

These findings are similar with the results of Ling and Mahmud (2023) as they outlined insufficient teaching time, lack of student mastery, and the lack of ICT infrastructure as the challenges encountered by teachers in Kuala Lumpur. This is supported by the study of Apiles (2025) in Baguio and Benguet, Philippines, as insufficient teaching time, lack of reading materials, diverse students' needs, and limited instructional support were the common issues teachers have to deal with. These studies show that several factors have to be considered and addressed as they significantly affect the teaching-learning process.

Table 2

Strategies in Dealing with Challenges in Teaching Nomenclature of Compounds

Themes	Codes	Sample Responses
A variety of teaching strategies are employed to address challenges in teaching nomenclature of compounds	Adjustment of Time	Making Own Schedule
	Enhancement of Discussion	Adjustment of Time
	Diverse Learning Activities	Back to Basic
		Enrichment
Intervention		
	Drills	Group Activity
		Activity Evaluation
		Diverse Activities
		Detailed Powerpoint

Despite the challenges encountered by teachers in teaching nomenclature of compounds, they are still expected to continue on teaching and make ways to address the challenges they encounter. Certain strategies teachers use are adjusting their time to fit all the lessons with the time prescribed, enhancing further the lesson by going back to basic or providing enrichment and interventions, and having diverse learning activities to cater to the diverse learners present within the classroom.

Kader and Eissa (2022) concluded in their study that effective time management strategies during instruction helps in improving academic time management and efficacy of students. Abulhul (2021) also found that using a variety of teaching strategies such short lectures, brainstorming, group reports, technology-based activities, and PowerPoint presentations are effective in meeting educational needs. Moreover, a study by Casinillo and Guarte (2018) in Leyte, Philippines outlined five effective teaching strategies used by 11 academic teachers. These are computer assisted lessons, peer tutoring, modeling and teaching demonstrations, oral recitation and reporting, and group activity.

Table 3

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Perceived Benefits of Teachers Teaching Nomenclature of Compounds in the Use of Interactive Presentation to Address their Challenges

Themes	Codes	Sample Responses
Perceived Benefits of Teachers Teaching Nomenclature of Compounds in the Use of Interactive Presentation to Address their Challenges	Increases Students' Knowledge	Helps in Retention Enhances further understanding
	Enhances Students' Learning Experience	Enable Hands-On Activities for Students Provides Simulations Provides Visuals

All of the teachers perceived that interactive presentation has the potential to address their identified challenges in teaching nomenclature of compounds. Teachers agreed with the idea that interactive presentation helps to increase students' knowledge by allowing them to increase their knowledge retention and understanding and further enhance their learning experience by providing hands-on activities, simulations, and visuals.

The related literature and study above support the findings of this study. Specifically diversity of learners (Wang & Calvano, 2022), time constraints (Teig, Scherer, & Nilsen, 2019; Ling & Mahmud, 2023; Apiles, 2025), mastery of content, and availability of instructional materials (Ling & Mahmud, 2023; Apiles, 2025). Moreover, the strategies used by the respondents were similar to effective strategies found in literature. Specifically time management, enhancement of discussion, and use of a variety of activities (Kader & Eissa, 2022; Abulhul, 2021; Casinillo & Guarte, 2018).

The challenges and strategies obtained from this study supported by a number of literature were used in developing the GAIIM.

Generative Artificial Intelligence Instructional Material (GAIIM)

Figure 1 shows the interface of the GAIIM and the QR Code to access the file. It is an interactive presentation that helps teachers in teaching lessons with the integration of technology. In this presentation, the students are also encouraged to participate more during the discussion of the lesson that enables them to further retain the information given and develop a more in-depth perspective about the topic being discussed.

Figure 1

Game-based interface of the interactive presentation sample slide



Figure 2

Features of the GAIM and the Challenges it Address

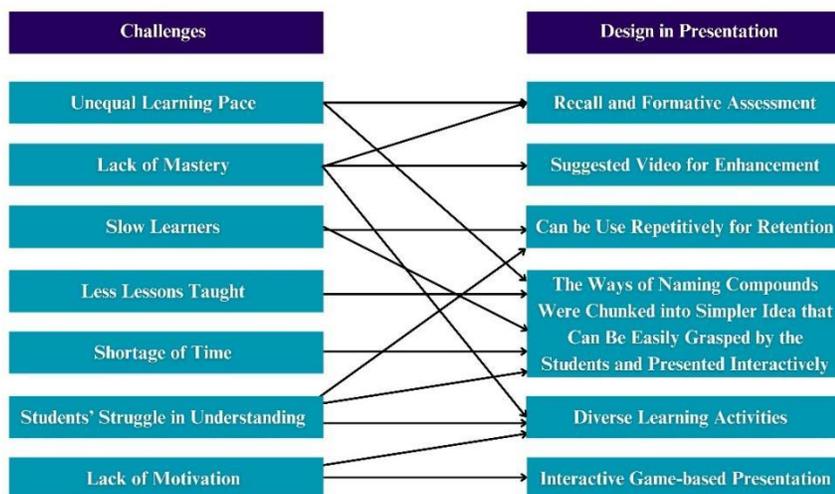


Figure 2 highlights the challenges identified by researchers for designing and content of the interactive presentation, which include unequal learning pace, slow learners, fewer lessons taught, time shortages, students' struggles with understanding, and lack of

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

motivation. Another challenge noted was large class sizes, but this was not addressed by the interactive presentation. According to Geverola et al. (2022), teachers face difficulties in teaching science topics and creating engaging lessons, but these challenges motivate them to improve their teaching methods. Successful teaching boosts their confidence and inspiration, aligning with self-determination theory. Similarly, Mat Salleh et al. (2022) found that chemistry teachers face challenges when providing differentiated instructions, such as addressing students' needs, lesson planning and delivery, limited support, and time constraints in teaching chemistry topics.

Teachers employ various strategies in teaching the nomenclature of compounds, such as adjusting their teaching time, going back to basics, providing enrichment activities, and creating diverse learning activities. The most effective strategies include student-centered activities and adjusting teaching methods to address both student and teacher-related issues. Bara and Xhomara (2020) found that student-centered teaching significantly benefits students.

In the interactive presentation, challenges like unequal learning pace and lack of mastery are addressed through diagnostic and formative assessments. Heeg, Hundertmark, and Schanze (2020) suggest that conceptual development in chemistry is supported by making students aware of their learning pace. Ozan and Kincal (2018) showed that formative assessments enhance students' knowledge and focus on learning goals. Video links are provided for additional recall of relevant topics.

Challenges such as slow learning pace, fewer lessons taught, time shortages, and students' struggles with understanding are addressed by simplifying and making the presentation interactive. Liu (2016) reported that interactive lectures with chunked lessons keep students engaged and ensure timely lesson completion. Lah, Saat, and Hassan (2014) found that chunking information reduces cognitive load and improves comprehension.

Table 8

Mean Table of Evaluation of the GAIIM in Addressing Challenges in Teaching Nomenclature of Compounds

Components	\bar{x} (overall)	DR
1. Accuracy of Content	4	SA
2. Clarity of Organization	4	SA
3. Layout	4	SA
4. Originality	4	SA
5. Learning Activities	4	SA

As a whole, the GAIIM through interactive presentation is accepted by the teachers in all of the components: accuracy of content, clarity of organization, layout, originality, and learning activities; with overall median of 4 and a description of strongly agree. This means that the teachers strongly agree that the GAIIM will aid them in addressing and managing the challenges in teaching nomenclature of compounds. This is supported by different literature and studies that show how the different aspects of the interactive presentation contribute to gaining solutions to the problems encountered by the teachers.

For accuracy of the content, some of the challenges identified by the teachers when it comes to teaching nomenclature of compounds concern students' knowledge, as per Ukor (2018), teachers are only able to provide effective teaching when accurate materials are used to meet the instructional objectives inside the classroom. Although there is no direct evidence that the clarity of this material is effective in addressing the challenges of the teachers, Blaich, et al. (2016) showed in their study that when instruction is clear and organized, it creates a positive impact on the growth of learning of the students. Based on the identified challenges of teachers, one concern they have is the students' knowledge and learning capacity. The study of Sofyan, Tarigan, and Ganie (2023) cited the findings of Lin (2013), where it was found that when instructional material is designed in a digital manner and produced in multimedia by teachers, the teacher is able to make the layout of the instructional material more suited for the needs of the students and avoid a one-size-fits-all approach. In the study of Anacaya (2021), it was found that the use of presentation as innovative instructional material in teaching science reveals comparable statistical data from the pre-test and post-test conducted on the students. Originality in crafting the presentation is then considered that helps to suit the needs of the students as well as address the challenges being faced by teachers. Rossi, et. al. (2021) shared that engaging active learning activities in classroom instruction allows enhancement of students' performance in hard and soft skills in line with science inquiry. They also added that this helps the students have better critical thinking, motivation, and positive perception in line with science concepts, which are identified challenges of teachers in teaching nomenclature of compounds.

Conclusions and Recommendations

Teaching chemistry is challenging, this is primarily due to the low learning retention of the students and the personal struggles of the teachers. Teaching nomenclature of compounds is one of the topics under chemistry that teachers primarily struggle to teach. The challenges they often encounter revolve around students' diversity and mastery of content, time constraints, and availability of instructional materials. To address these they employ strategies such as managing time well, and using a variety of activities. GAIIM was

Publisher's Note: SIH stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

developed based on these findings to address the struggles of teachers. This interactive presentation presents various features that cater to the struggles and challenges encountered by teachers in teaching the nomenclature of compounds. Acceptability test shows that the teachers accepted the GAIIM to aid in addressing challenges in teaching nomenclature of compounds based on its accuracy, clarity, layout, originality, and learning activities. This implies that generative AI instructional materials may be used to address common problems that students and teacher encounter.

Although the study present a number of results it has certain limitations. One of the limitations of this study is the small sample size hence the challenges encountered by the science teachers may not be entirely captured. Moreover, it may also affect the generalizability of the findings to other settings. Future studies could increase the sample size and include participants from different regions to improve the generalizability of the findings of the study and the use of GAIIM. The effectiveness of GAIIM and the students' experience in using it may also be assessed by conducting an experimental study. It is also recommended to develop an interactive PowerPoint covering more science topics. For schools and administrators, it is encouraged to equip teachers in designing GAIIM to aid their teaching and the learning of their students.



References

- Abulhul, Z. (2021). Teaching strategies for enhancing student's learning. *Journal of Practical Studies in Education*, 2(3), 1-4. <https://doi.org/10.46809/jpse.v2i3.22>
- Adu-Gyamfi, K. & Asaki, I. A. (2022). Factors contributing to teachers' conceptual difficulties in teaching high school organic chemistry. *European Journal of Science and Mathematics Education*, 11(1), 49-67. <https://doi.org/10.30935/scimath/12433>
- Ahiara, W., Abioye, T., Chiagunye, T., & Olaleye, T. (2023). An Exploratory Data Analytics of Multivariate Observational Metrics on Generative AI. <https://tinyurl.com/22yb6uyz>
- Anacaya, R. (2021). Effectiveness of PowerPaper presentation as an innovative instructional material in teaching science 5 in the selected schools in Taytay, Rizal. *International Journal of Research Studies in Education*, 10(6). <https://doi.org/10.5861/ijrse.2021.649>.
- Apiles, V. F. (2025). Building reading classrooms: Insights from educational service contracting schools in the Philippines. *International Journal of Educational Management and Development Studies*, 4(2), 45-60. <https://doi.org/10.12345/ijemds.2025.0045>
- Awad, B. (2017). Attractive Educational Strategies in Teaching and Learning Chemistry. *Africal Journal of Chemical Education*, 7(3), 82-87. <https://tinyurl.com/3s879594>
- Bara, G., & Xhomara, N. (2020). The effect of student-centered teaching and problem-based learning on academic achievement in science. *Journal of Turkish Science Education*, 17(2), 180-198. <https://doi.org/10.36681/tused.2020.20>
- Blaich, C., Wise, K., Pascarella, E. T., & Roksa, J. (2016). Instructional Clarity and Organization: It's Not New or Fancy, But It Matters. *Change: The Magazine of Higher Learning*, 48(4), 6-13. <https://doi.org/10.1080/00091383.2016.1198142>.
- Bratic, B., Triglianios, V., Kurbalija, V., Pautasso, C., & Ivanovic, M. (2020). Role of interactive presentation platform ASQ in delivering web design course. *Smart Learning Environments*, 7. <https://doi.org/10.1186/s40561-020-00123-w>
- Byusa, E., Kampire, E., Mwesigye, A. R. (2022). Game-based learning approach on students' motivation and understanding of chemistry concepts: A systematic review of literature. *Heliyon*, 8(5), e09541. <https://doi.org/10.1016/j.heliyon.2022.e09541>.
- Casinillo, L. F., & Guarte, J. M. (2018). Evaluating the effectiveness of teaching strategies: The case of a national vocational school in Hilongos, Leyte. *Review of Socio-Economic Research and Development Studies*, 2(1), 65-80. <https://doi.org/10.46809/reserds.vsu.edu.ph.2018.01>

Peñaos, J (2025). Responding to the Challenges of Teaching Nomenclature of Compounds Through GENERATIVE ARTIFICIAL INTELLIGENCE INSTRUCTIONAL MATERIAL (GAIIM)

Cipagauta, M., Camacho, Y. N. S., and Camelo, A. C. (2021). The blog as a teaching strategy to strengthen the basic concepts of organic chemistry: Types of bond and functional groups. *EDUTECH REVIEW. International Education Technologies Review Revista Internacional de Tecnologías Educativas*, 8(1), 37-48. <https://doi.org/10.37467/gka-revedutech.v8.2932>.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. Fifth edition. Los Angeles: SAGE.

Gerevola, I. J. R., Mutya, R. C., Siason, L. M. B., & Bonotan, A. (2022). Challenges and struggles of public senior high school teachers during the new normal. *Journal of Research, Policy, & Practice of Teachers and Teacher Education*, 12(1), 49-69. <https://doi.org/10.37134/jrpptte.vol12.1.4.2022>.

Glowatz, M., & O'Brien, O. (2017). Academic Engagement and Technology: Revisiting the Technological, Pedagogical and Content Knowledge Framework (TPACK) in Higher Education (HE)--The Academics' Perspectives. *iafor Journal of Education*, 5, 133-159. <https://eric.ed.gov/?id=EJ1304460>

Heeg, J., Hundertmark, S., & Schanze, S. (2020). The interplay between individual reflection and collaborative learning – seven essential features for designing fruitful classroom practices that develop students' individual conceptions. *Chemistry Education Research and Practice*, 21, 765-788. <https://doi.org/10.1039/C9RP00175A>.

Idah, N. & Eya, N. M. (2018). Challenges Encountered by Chemistry Teachers in Teaching Practical Chemistry in Secondary Schools in Enugu East Local Government Area of Enugu State. *The Intuition*, 8(1): 331-342. <https://tinyurl.com/3db2sscb>

Kader, F. A. H., & Eissa, M. A. (2022). The effectiveness of time management strategies instruction on students' academic time management and academic self-efficacy. *Journal of Education and Learning*, 11(3), 123-135. <https://doi.org/10.12345/jel.2022.01123>

Lah, N. C., Saat, R. M., & Hassan, R. (2014). Cognitive Strategy in Learning Chemistry: How Chunking and Learning Get Together. *The Malaysian Online Journal of Educational Science*, 2(1), 9-16. <https://files.eric.ed.gov/fulltext/EJ1086202.pdf>.

Lakka, I., Zafeiropoulos, V., & Leisos, A. (2023). Online Virtual Reality-Based vs. Face-to-Face Physics Laboratory: A Case Study in Distance Learning Science Curriculum. *Education Sciences*, 13(11), 1083. <https://doi.org/10.3390/educsci13111083>.

Ling, A. N. B., & Mahmud, M. S. (2023). Challenges of teachers when teaching sentence-based mathematics problem-solving skills. *Frontiers in Psychology*, 14, <https://doi.org/10.3389/fpsyg.2022.1074202>

Peñaajas, J (2025). Responding to the Challenges of Teaching Nomenclature of Compounds Through GENERATIVE ARTIFICIAL INTELLIGENCE INSTRUCTIONAL MATERIAL (GAIIM)

Liu, D. (2016, September 19). Teaching@Sydney. <https://educational-innovation.sydney.edu.au/teaching@sydney/chunking-class-lessons-learnt-observing-lecturers/>

Mat Salleh, M. F., Rauf, R.A.A., Saat, R. M., & Ismail, M. H. (2022). Malaysian Chemistry Teachers' Challenges to Practice Differentiated Instruction in Classroom. *Malaysian Online Journal of Educational Sciences*, 10(2), 59-69. <https://ajba.um.edu.my/index.php/MOJES/article/view/36065/14436>

MSEd, K. C. (2024, July 18). *Self-Determination Theory in Psychology*. Verywell Mind. <https://www.verywellmind.com/what-is-self-determination-theory-2795387>

Munna, A. F. & Kalam, M. A. (2021). Impact of Active Learning Strategy on the Student Engagement. *GNOSI: An Interdisciplinary Journal of Human Theory and Praxis*, 4(2), 96-114. <https://files.eric.ed.gov/fulltext/ED614302.pdf>.

Orbe, J. R., Espinosa, A. A., & Datukan, J. T. (2018). Teaching Chemistry in a Spiral Progression Approach: Lessons from Science Teachers in the Philippines. *Australian Journal of Teacher Education*, 43(4). <http://ro.ecu.edu.au/ajte/vol43/iss4/2>

Ozan, C. & Kincal, R. Y. (2018). The Effects of Formative Assessment on Academic Achievement, Attitudes toward the Lesson, and Self-Regulation Skills. *Educational Sciences: Theory & Practice*, 18(1), 85-118. <https://doi.org/10.12738/estp.2018.1.0216>.

Rebecca, C. E., Obikezie, M. C., & Abumchukwi, A. A. (2021). Challenge of Effective Teaching of Chemistry in the Secondary Schools in Enugu State. *International Journal of Research*, 8(10).

Rossi, I. V., de Lima, J. D., Sabatke, B., Nunes, M. A. F., Ramirez, G. E., & Ramirez, M. I. (2021). *Biochem Mol Biol Educ*, 49(6): 888-903. <https://doi.org/10.1002/bmb.21574>.

Sadykov, T. & Ctrnactova, H. (2019). Application interactive methods and technologies of teaching chemistry. *Chemistry Teacher International*. <https://doi.org/10.1515/cti-2018-0031>.

Sofyan, R., Tarigan, B., & Ganie, R. (2023). Need analysis for digital instructional materials of the Translation Theory Course in Indonesia. *Studies in English Language and Education*, 10(1), 369-387. <https://doi.org/10.24815/siele.v10i1.25636>.

Teig, N., Scherer, R., & Nilsen, T. (2019). I know I can, but do I have the time? The role of teachers' self-efficacy and perceived time constraints in implementing cognitive-activation strategies in science. *Frontiers in Psychology*, 10, Article 1697. <https://doi.org/10.3389/fpsyg.2019.01697>

Peñañas, J (2025). Responding to the Challenges of Teaching Nomenclature of Compounds Through GENERATIVE ARTIFICIAL INTELLIGENCE INSTRUCTIONAL MATERIAL (GAIIM)

Tilahun, K. (2016, July 29). Common difficulties experienced by grade 12 students in learning chemistry in Ebinat Preparatory School. *African Journal of Chemical Education*, 6(2). <https://www.ajol.info/index.php/ajce/article/view/140984>.

Ukor, D. (2018). Effective Lesson Delivery: The Impact of Instructional Materials. A Guide to Teaching Practice, Federal University, Dutsin Ma, 252-263. <https://tinyurl.com/mryzv88k>

Wang, L., & Calvano, L. (2022). Class size, student behaviors and educational outcomes. *Organization Management Journal*, 19(4), 126-142. DOI 10.1108/OMJ-01-2021-1139

Xhemajli, A. (2016). The role of the teacher in interactive teaching. *International Journal of Cognitive Research in Science Engineering and Education*, 4(1), 31-37. <https://doi.org/10.5937/IJCRSEE1601031X>.

Yaayin, B., Opong, E., & Hanson, R. (2022). Enhancing Pre-Service Teachers' Understanding and Attitudes Toward Naming and Reactions of Organic Compounds Using Jigsaw Approach. *European Journal of Open Education and E-learning Studies*, 7(2), 105-123. <https://doi.org/10.46827/ejoe.v7i2.4442>.

Yahya, A. H. & Aegbaria, S. (2022). Using Interactive Presentations to Promote Mathematical Discourse. *SSRN*. <https://doi.org/10.2139/ssrn.4096301>.

Yalcin-Celik, A., Kadayifci, H., Uner, S., & Turan-Oluk, N. (2017). Challenges faced by pre-service chemistry teachers teaching in a laboratory and their solution proposals. *European Journal of Teacher Education*, 40(2), 210-230.