

Effectiveness of Meme-Infused Didactics and Its Relationship in Improving Memory Retention of Grade 8 Chemistry Students Towards Learning Guide Development

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Abstract

This study examined the effectiveness of meme-infused didactics in enhancing the memory retention of Grade 8 chemistry students at Sto. Tomas City National High School during Academic Year 2025–2026. Anchored on Dual Coding Theory and Cognitive Load Theory, the study employed a descriptive-correlational research design involving 79 Grade 8 chemistry students selected through purposive sampling. Researcher-made pretest and posttest instruments and questionnaires, supported by adapted references and validated by experts, were used to measure academic performance, perceived effectiveness in terms of engagement, motivation, and learning enjoyment, and memory retention in terms of understanding of concepts, application of knowledge, and connecting concepts. Results showed that students' academic performance substantially improved after exposure to meme-infused didactics, with 68.4% reaching the Mastered level in the posttest and 81.1% reaching performance levels aligned with or approaching mastery. Meme-infused didactics was rated Very Effective overall, particularly in engagement, learning enjoyment, and motivation. Its influence on memory retention was Highly Influential overall, especially in application of knowledge and connecting concepts, while understanding of concepts was Moderately Influential. Statistical results confirmed a significant difference between pretest and posttest performance and significant relationships between perceived effectiveness and memory retention. The study concluded that meme-infused didactics can support chemistry learning by improving engagement, motivation, enjoyment, academic performance, and retention. It recommends the institutional use of a Meme-Infused Didactics learning guide, supported by accurate, culturally relevant, and evidence-based instructional design. The study aligns with SDG 4, Quality Education, by supporting improved science instruction and learning recovery, and SDG 9, Industry, Innovation and Infrastructure, through educational innovation using digital culture. Its sustainability impact lies in promoting a low-cost, learner-centered, and institutionally adaptable strategy for improving chemistry instruction and memory retention.

Keywords: Academic Performance; Application of Knowledge; Chemistry Instruction; Engagement; Learning Enjoyment; Memory Retention; Meme-Infused Didactics; Motivation; Periodic Table of Elements; Understanding of Concepts

1. Introduction

This study examines the effectiveness of meme-infused didactics in enhancing the memory retention of Grade 8 chemistry students. It responds to the dominance of digital media in learners' experiences and the need for instructional strategies that improve engagement, motivation, learning enjoyment, academic performance, and retention in science. Since chemistry involves abstract symbols, formulae, notations, and conceptual relationships, meme-infused didactics may offer a culturally relevant, low-cost, and learner-centered approach to support understanding, application, and connection of concepts.

1.1 Background of Meme-Infused Didactics in Enhancing Memory Retention of Grade 8 Chemistry Students

The twenty-first century is strongly shaped by digital media, where students increasingly interact with information through images, short videos, reels, and memes rather than extended text alone (Carlos & Delocado, 2024). This creates a challenge and opportunity for science educators to connect classroom instruction with learners' digital culture. Meme-infused didactics involves the purposeful use of memes in instructional materials to support learning objectives. When properly designed, memeification may strengthen engagement and improve memory retention through humor, imagery, and concise text (Tidy, 2024; Akin, 2025). This is relevant in chemistry, where abstract concepts, symbolic language, formulae, notations, and models often hinder learners' retention. Since concept retention indicates effective teaching and learning in chemistry, humor and imagery may serve as useful encoding supports (Zhou, 2025). Memes, as visual, humorous, and culturally rooted materials, may therefore support educational pedagogy (Tidy, 2024).

1.2 Related Literature on Meme-Infused Didactics, Student Satisfaction, and Memory Retention in Science Learning

Studies suggest that meme-infused and humor-based instruction may improve academic performance, satisfaction, and retention. Carlos & Delocado (2024) found that Grade 11 biology students taught with meme-infused materials obtained higher posttest scores than those taught through traditional instruction. Their findings also showed improved attitudes, confidence, and reduced anxiety, indicating links between academic gains and engagement, motivation, and enjoyment. Related studies support these findings. Erdoğan & Çakıroğlu (2021) found that humor improved attention, recall, and feedback interaction in online learning. Olalekan, Akinola, & Olasupo (2024) reported increased engagement, motivation, understanding, and enjoyment among students exposed to meme-based learning. Antón-Sancho, Nieto-Sobrino, Fernández-Arias, and Vergara-Rodríguez (2022) found that professors viewed memes and humor as helpful in maintaining attention, stimulating curiosity, and supporting recall. Teja & Dewandono (2023) also found that students favored meme-based materials, although supporting explanations were needed for clarity. Other studies show that memes may strengthen concept understanding and retention. Subbiramaniyan et al. (2022) found that meme creation simplified complex concepts, encouraged peer interaction, and helped retention. “Increasing Student Engagement Using ‘Meme Based’ Exercise Innovation” (Marketing Education Review, 2022) showed that meme-based assignments increased engagement, critical thinking, and interest. Sanchez-Mena et al. (2021) also emphasized that humor-enhanced digital content strengthens teacher–student interaction when aligned with instructional goals. However, effective use of memes requires careful design. Teja & Dewandono (2023) noted that memes may lack depth without explanations, while Antón-Sancho et al. (2022) identified concerns about cultural appropriateness, misunderstanding, and possible distraction. Thus, meme-infused didactics should remain content-aligned, clear, and instructionally guided.

1.3 Local, National, and Global Context of Chemistry Learning Recovery and Digital Pedagogy

In the Philippine context, science education continues to face learning gaps, limited resources, and the need for scalable instructional practices. The Basic Education Development Plan 2030 highlights science learning gaps worsened by school interruptions and unequal access to digital resources, a situation described as a “learning crisis” affecting content retention (PIDSPN, 2023). Science teachers often manage large classes with limited instructional materials while addressing learning losses and low motivation. Engagement, motivation, and learning enjoyment are strongly connected with interactive learning and active recall in context-based instruction (Demelash et al., 2024). However, large class sizes, insufficient learning materials, and limited facilities restrict hands-on science engagement and may weaken motivation and enjoyment (Polinar et al., 2025). National and global reports also emphasize evidence-based and responsive instruction. Department of Education (2022) highlighted the importance of learner performance data in addressing learning losses, while the Organization for Economic Co-operation and Development (2023) emphasized structured instructional support and progress monitoring. Department of Education (2023) likewise stressed focused remediation and strategic instructional delivery. Globally, digital and culturally responsive strategies can improve motivation by making learning more relatable (Rasheed, Kamsin, & Abdullah, 2020). Humor-integrated instruction can also increase intrinsic motivation and reduce learning anxiety. Memes support multimodal learning preferences by presenting complex content in manageable visual-linguistic forms, while humorous digital artifacts may help encode information into long-term memory (Gonulal, 2023).

1.4 Theoretical and Conceptual Basis of Meme-Infused Didactics and Memory Retention

This study is anchored on Dual Coding Theory and Cognitive Load Theory. Dual Coding Theory (Paivio, 1986; updated by Mayer, 2021) explains that learners remember better when information is processed through both verbal and visual channels. Since educational memes combine short text and imagery, they may help make chemistry concepts more vivid and memorable. Cognitive Load Theory (Sweller, 1988; van Merriënboer & Sweller, 2010) emphasizes that learners have limited working memory. Meme-infused didactics may reduce overload by presenting content through clear, humorous, and educational visuals. However, humor may also distract learners when it shifts attention away from the concept, making this balance important to investigate. Conceptually, the study follows an input-process-output model. The input includes students’ academic performance through pretest and posttest scores, satisfaction with meme-infused didactics in terms of engagement, motivation, and learning enjoyment, and perceived influence on memory retention in terms of understanding of concepts, application of knowledge, and connecting concepts. The process involves correlational analysis of academic performance, satisfaction, and memory retention. The output is a learning guide for using meme-infused didactics in chemistry instruction.

1.5 Research Gaps and Rationale for Studying Meme-Infused Didactics in Grade 8 Chemistry

Although humor and memes have been studied in education, research on meme-infused didactics in the Philippine setting remains limited. Most studies were conducted in Western or higher education contexts and focused on attitudes toward meme use rather than academic performance outcomes. In the Philippines, meme-based learning studies are mostly anecdotal, observational, or limited to small-scale interventions in senior high school biology and language subjects (Carlos & Delocado, 2024). There is also limited evidence on meme-infused didactics in secondary chemistry, particularly among Grade 8 learners encountering chemistry concepts in depth. Prior studies often focus on short-term engagement or humor appreciation, with little attention to memory retention through understanding, application, and concept connection. Many

interventions also rely on perception surveys without objective learning measures such as pretest and posttest comparisons (Zhou, 2025). This study addresses these gaps by examining meme-infused didactics among Grade 8 chemistry students at Sto. Tomas City National High School during Academic Year 2025–2026. It focuses on the Periodic Table of Elements, particularly the competency on explaining its organization and how element properties vary across periods and groups. The study is further grounded in the previous Science Mean Percentage Score of 45.74% during Academic Year 2024–2025, indicating low mastery and the need for instructional intervention.

1.6 Alignment of Meme-Infused Didactics in Chemistry Learning with Relevant Sustainable Development Goals (SDGs)

The study aligns with SDG 4 – Quality Education because it aims to improve science learning, instructional quality, academic performance, and memory retention among Grade 8 chemistry students. By focusing on engagement, motivation, and learning enjoyment, the study supports learner-centered and inclusive classroom practices. It also connects with SDG 9 – Industry, Innovation and Infrastructure through its focus on educational innovation using digital culture and meme-based instructional materials. This alignment is limited to instructional innovation and does not extend beyond the study's educational focus.

1.7 Contribution of Meme-Infused Didactics to Educational, Digital, and Institutional Sustainability

The study contributes to educational sustainability by exploring a practical strategy for improving learning recovery, mastery, and science retention. In resource-limited classrooms, meme-infused didactics may help connect students' digital culture with academic learning without requiring costly materials. It also supports innovation and digital sustainability by examining how familiar digital forms can become purposeful learning tools. When content-aligned and supported by explanations, memes may promote meaningful engagement rather than entertainment alone. The proposed learning guide may help teachers use educational memes more responsibly and systematically. Institutionally, the findings may assist curriculum experts, school principals, and science educators in improving instructional design, teacher training, and classroom practice. For students, the study may support academic performance and metacognitive awareness. For future researchers, it provides a basis for further studies on meme-infused didactics, digital learning, and memory retention.

1.8 Purpose, Research Focus, and Proposed Learning Guide for Meme-Infused Didactics in Grade 8 Chemistry

The study aims to determine the effectiveness of meme-infused didactics in enhancing the memory retention of Grade 8 chemistry students from Sto. Tomas City National High School during Academic Year 2025–2026. It examines academic performance through pretest and posttest scores, students' perceived effectiveness of meme-infused didactics in terms of engagement, motivation, and learning enjoyment, and its influence on memory retention in terms of understanding of concepts, application of knowledge, and connecting concepts. The study also tests whether there is a significant difference between pretest and posttest performance and whether there is a significant relationship between students' perceived effectiveness of meme-infused didactics and its influence on memory retention. Based on the findings, the study proposes a learning guide for the proper use of meme-infused didactics in Grade 8 chemistry instruction.

2. Material and methods

2.1 Research Design

The study employed a descriptive-correlational research design to examine the effectiveness of meme-infused didactics in enhancing the memory retention of Grade 8 chemistry students. The descriptive design was used to identify students' levels of satisfaction, while the correlational approach was used to determine the relationships among the variables (Creswell & Creswell, 2018; Pandey & Pandey, 2021). This design allowed the researcher to assess students' engagement, motivation, and learning enjoyment, as well as the perceived influence of meme-infused didactics on understanding, application, and conceptual connections.

2.2 Locale of the Study

The study was conducted at Sto. Tomas City National High School in Sto. Tomas, Batangas during the Academic Year 2025–2026. The locale was selected because the respondents were Grade 8 chemistry students exposed to meme-infused didactics as part of the instructional process.

2.3 Respondents of the Study

The respondents of the study were Grade 8 chemistry students from three sections handled by the researcher at Sto. Tomas City National High School during the Academic Year 2025–2026. From a total population of 98 students, 79 respondents were included in the study. Students who transferred, withdrew, or failed to complete either the pretest or posttest were excluded from the final data analysis to ensure that the respondents represented an intact and authentic learning population.

2.4 Sample and Sampling Procedure

The sample size was determined using the Raosoft.com sample size calculator with a five percent margin of error, resulting in 79 respondents from the total population of 98 Grade 8 students. The study used purposive sampling because the respondents were intentionally selected based on their exposure to meme-infused didactics in chemistry instruction. This sampling technique was appropriate because the study aimed to measure students' satisfaction and the perceived influence of meme-infused didactics on memory retention based on their actual experience with the instructional materials.

2.5 Research Instrument

The study used researcher-made questionnaires and adapted references from established scales. The first instrument was a researcher-made pretest and posttest composed of multiple-choice items designed to measure students' academic performance and memory retention before and after exposure to meme-infused didactics. The test focused on the Grade 8 chemistry competency under the topic Periodic Table of Elements, specifically explaining how the periodic table is organized and how the properties of elements vary across periods and groups. The second part of the instrument measured students' perceived level of effectiveness of meme-infused didactics in terms of engagement, motivation, and learning enjoyment. The researcher-made questionnaire included Tagalog translation to ensure that the items were understandable to the respondents. It was developed using references such as the Student Engagement in Schools Questionnaire (Fredricks et al., 2004), Academic Motivation Scale (Vallerand et al., 1992), and Intrinsic Motivation Inventory (McAuley et al., 1989; Ryan & Deci, 2022). A four-point Likert scale was used to avoid uncertain responses, with interpretations ranging from very ineffective to very effective. The final part measured the extent of influence of meme-infused didactics on memory retention in terms of understanding of concepts, application of knowledge, and connecting concepts. This researcher-made questionnaire also included Tagalog translation and was developed using references such as the Multifactorial Memory Questionnaire (Troyer, 2018) and the Connecting Concepts Test in science education. A four-point Likert scale was used, with interpretations ranging from not influential at all to highly influential. To ensure validity, the instruments were reviewed by a panel of experts composed of experienced science teachers and research advisers with at least a Master of Arts degree. The validators assessed the clarity, relevance, and alignment of the items with the objectives of the study. Their suggestions were incorporated to refine the instruments. Reliability was established through pilot testing among students who were not part of the actual respondents. The responses were analyzed using Cronbach's alpha, with a coefficient of 0.70 or higher considered acceptable.

2.6 Data Gathering Procedure

After consultations with the research adviser, the proposed title was approved and evaluated by panel experts. The researcher gathered related information to conceptualize and refine the study. Suggestions and corrections from the panel experts were considered before the actual implementation. After the validation of the research instruments, the researcher submitted a permission letter to the school principal of Sto. Tomas City National High School to administer the questionnaires to the target respondents. Upon approval, pilot testing was conducted, followed by the implementation of meme-infused didactics among the respondents. The survey questionnaire was then distributed through a Google Form link. The researcher explained the nature, goals, and objectives of the study to the respondents and reminded them to complete the questionnaire. After all responses were retrieved, the data were tabulated, analyzed, and interpreted to generate findings and recommendations.

2.7 Data Analysis Techniques

The study used descriptive statistics, including frequency, percentage, mean, and standard deviation, to determine students' academic performance based on pretest and posttest scores, as well as their satisfaction levels and perceptions of the influence of meme-infused didactics on memory retention. The Pearson product-moment correlation coefficient was used to test the relationship between satisfaction indicators, such as engagement, motivation, and enjoyment, and memory retention indicators, such as understanding, application, and connecting concepts. This statistical tool was appropriate for interval-level data (Field, 2018). Data were analyzed using SPSS, with the level of significance set at $p < 0.05$.

2.8 Ethical Considerations

The study strictly followed ethical standards in educational research. Participation was voluntary, informed consent was secured, and the confidentiality of responses was maintained. Respondents were assured that their data would be used only for academic purposes and would not affect their grades or academic standing (American Psychological Association, 2022).

3. Results and Discussion

3.1 Academic Performance of Respondents

3.1.1 Pretest Scores

The pretest results showed that most respondents entered the instructional phase with only moderate prior knowledge. Among the 79 respondents, 46.8% were classified as Average, while 26.6% were Low and 6.3% were Very Low. Only 10.1% were Moving Towards Mastery, 8.9% were Closely Approximating Mastery, and 1.3% reached Mastered level.

These results indicate that most learners had not yet mastered the competencies before the intervention and that significant learning gaps were present. The findings highlight the importance of using diagnostic assessment to guide instruction. Organization for Economic Co-operation and Development (2021) emphasized in its report entitled “The State of School Education” that diagnostic assessment is critical for identifying learning gaps and informing targeted interventions. Similarly, Department of Education (2022) stressed that evidence-based instructional planning grounded in learner performance data is essential in addressing learning losses and improving mastery levels among Filipino students.

3.1.2 Posttest Scores

The posttest results showed a substantial improvement in academic performance after the use of meme-infused didactics. Out of 79 respondents, 68.4% reached the Mastered level, 7.6% were Closely Approximating Mastery, 5.1% were Moving Towards Mastery, and 19.0% remained Average. No respondents were classified under Low or Very Low. Overall, 81.1% of respondents reached performance levels aligned with or approaching mastery. This improvement suggests that the instructional intervention helped address prior learning gaps and supported students’ conceptual understanding. Organization for Economic Co-operation and Development (2023) emphasized that structured instructional support and systematic monitoring of learner progress enhance academic outcomes, especially when interventions respond to diagnostic assessment results. Likewise, Department of Education (2023) underscored the importance of focused remediation and strategic instructional delivery in improving mastery levels and addressing learning gaps among Filipino learners.

3.2 Perceived Effectiveness of Meme-Infused Didactics in Chemistry

3.2.1 Engagement

The respondents perceived meme-infused didactics as Very Effective in promoting engagement, with an overall mean of 3.915 and a standard deviation of 0.1051. All engagement indicators were rated Very Effective, with mean scores ranging from 3.71 to 4.00. The highest ratings were given to the use of memes in prolonging attention span and helping students stay engaged during learning activities, both with a mean of 4.00. Active participation received the lowest mean of 3.71 but still remained within the Very Effective range. These findings indicate that meme-infused instruction effectively captured students’ attention, sustained interest, and promoted interaction in chemistry class. Humor-based and visually engaging materials may strengthen attentional focus and reduce cognitive fatigue. The findings also support the view that digital culture-integrated pedagogies foster behavioral, emotional, and cognitive engagement (Bond & Bedenlier, 2019). In addition, Sanchez-Mena et al. (2021) highlighted that humor-enhanced digital content strengthens teacher-student interaction and collaborative discourse when aligned with instructional objectives. However, Ansari et al. 2023 emphasized that digital humor yields stronger learning outcomes when embedded within pedagogically sound frameworks rather than used as standalone entertainment tools.

3.2.2 Motivation

The respondents rated meme-infused didactics as Very Effective in enhancing motivation, with an overall mean of 3.859 and a standard deviation of 0.1437. All indicators were interpreted as Very Effective, with scores ranging from 3.62 to 4.00. The highest mean of 4.00 showed that visual humor helped sustain motivation in chemistry learning tasks. High ratings were also obtained for enthusiasm, effort, interest, willingness to participate, and desire to continue learning chemistry. These results suggest that memes can strengthen students’ motivation by making chemistry lessons more relatable, enjoyable, and less intimidating. Akar (2023) affirms that humor-integrated instructional strategies positively influence intrinsic motivation by fostering enjoyment and reducing learning-related anxiety when students experience positive emotions during learning, their willingness to invest effort and persist in cognitively demanding tasks increases. The findings also align with Self-Determination Theory, which highlighted that instructional strategies really enhance enjoyment and relevance support intrinsic motivation (Ryan & Deci, 2022). Furthermore, culturally responsive digital content can enhance situational interest and sustained engagement (Bond & Bedenlier, 2019), while Ansari et al. (2023) emphasized that digital micro-content is effective in enhancing motivation when systematically embedded within broader instructional design frameworks rather than implemented alone.

3.2.3 Learning Enjoyment

The respondents perceived meme-infused didactics as Very Effective in improving learning enjoyment, with an overall mean of 3.870 and a standard deviation of 0.1471. All indicators were rated Very Effective, with mean scores ranging from 3.65 to 4.00. The highest-rated indicator showed that visual humor reduced boredom during chemistry lessons. Students also highly rated memes for creating positive learning experiences, fostering creativity, making lessons enjoyable, and making classroom learning lively and engaging. These findings show that meme-infused instruction helped create a more positive, engaging, and psychologically comfortable chemistry learning environment. Humor-supported instruction reduces academic stress and promotes psychological comfort, thereby creating a more conducive learning climate (Akar, 2023). Emotionally supportive and interactive learning environments also enhance students’ sense of belonging and classroom satisfaction (Bond & Bedenlier, 2019). Moreover, Ansari et Al., (2023) emphasized that multimodal instructional materials improve knowledge retention and conceptual clarity in science education contexts. Although long-term memory improvement received the lowest mean of 3.65, it remained Very Effective, suggesting that memory retention

may still require sustained reinforcement. Ryan and Deci (2022) noted that supportive learning enjoyment that fulfill psychological needs contribute to deeper and more enduring learning outcomes when paired with autonomy-supportive teaching practices.

3.2.4 Overall Perceived Effectiveness

Overall, meme-infused didactics were rated Very Effective across engagement, motivation, and learning enjoyment, with a general mean of 3.881 and a standard deviation of 0.0784. Engagement ranked highest with a mean of 3.915, followed by Learning Enjoyment with 3.870, and Motivation with 3.859. The low standard deviations indicate that respondents generally agreed on the effectiveness of the strategy. These findings suggest that meme-infused didactics enhanced engagement, supported learning enjoyment, and improved motivation in chemistry instruction. Bakar & Shamsuddin (2022) found that integrating meme-infused into classroom instruction increased students' attention, participation, and conceptual understanding. Torok et al. (2004) reported that humor in instruction positively affects student engagement and classroom climate by reducing anxiety and creating a supportive learning enjoyment. Rasheed, Kamsin, & Abdullah (2020) also noted that digital and culturally responsive teaching strategies significantly improve students' academic motivation by making learning more relatable and meaningful.

3.3 Influence of Meme-Infused Didactics on Memory Retention

3.3.1 Understanding of Concepts

The respondents rated the influence of meme-infused didactics on understanding of concepts as Moderately Influential, with an overall mean of 3.23 and a standard deviation of 0.510. The highest-rated item showed that meme-infused lessons helped students remember chemistry concepts clearly, with a mean of 3.62. Memes also helped students recall lesson content during quizzes and tests, with a mean of 3.58. However, items related to immediate recall during discussions, continued reflection after class, and deeper understanding of terms and definitions were rated Moderately Influential. These findings suggest that memes are useful for reinforcing and recalling chemistry concepts, but deeper conceptual understanding may require additional instructional support. According to Mayer (2021), multimedia learning theory explains that combining visual and verbal elements enhances retention when properly designed. Bakar & Shamsuddin (2022) found that memes in science classrooms improved students' ability to remember key concepts, although deeper analytical understanding required teacher facilitation and structured discussion. Plump & LaRosa (2017) also reported that humor-enhanced instructional materials improve attention and short-term retention but must be aligned with clear learning objectives to support higher-order thinking.

3.3.2 Application of Knowledge

The respondents rated the influence of meme-infused didactics on application of knowledge as Highly Influential, with an overall mean of 3.75 and a standard deviation of 0.481. The highest mean of 3.90 showed that meme-infused teaching helped students apply lessons during experiments or hands-on activities. High ratings were also recorded for using learned concepts in class activities, connecting chemistry lessons to real-life situations, applying concepts to problem-solving tasks, using concepts in unfamiliar situations, and recalling correct steps in answering chemistry questions. These results indicate that meme-infused didactics supported knowledge transfer, practical application, and problem-solving in chemistry. According to Mayer (2021), multimedia learning enhances transfer of learnings when learners actively integrate verbal and visual representations. Plump & LaRosa (2017) highlighted that meme-based instructional strategies improved students' ability to connect theoretical content with practical examples when memes were aligned with learning objectives. Rasheed, Kamsin, & Abdullah (2020) reported that digitally mediated instructional approaches increase learners' motivation and can actively facilitate healthy engagement, which enhances knowledge application and problem-solving performance.

3.3.3 Connecting Concepts

The respondents rated the influence of meme-infused didactics on connecting concepts as Highly Influential, with an overall mean of 3.691 and a standard deviation of 0.1834. All indicators were rated Highly Influential. The highest mean of 3.95 showed that memes helped students remember long-term connections between lessons taught on different days. Students also rated memes highly for organizing chemistry concepts, integrating ideas to draw conclusions, linking ideas across lessons, and relating chemistry to other science topics and subjects. These findings suggest that memes supported students' ability to organize and connect abstract chemistry concepts. Bebita & Sanguyo (2022) stated that memes in science education boost conceptual understanding because they serve as a form of "semiotic mediation," where humor acts as a catalyst for deeper engagement with difficult topics. Pardede (2021) also argues that the "affective filter" often prevents students from connecting new information to prior knowledge. By creating a low-stress environment, memes help learners relate chemistry to other subjects and connect ideas across lessons.

3.3.4 Overall Influence on Memory Retention

Overall, meme-infused didactics were rated Highly Influential in memory retention, with an overall mean of 3.62 and a standard deviation of 0.443. Application of Knowledge ranked first with a mean of 3.75, followed by Connecting Concepts with 3.691, while Understanding of Concepts ranked third with 3.23 and was interpreted as Moderately Influential. These

results show that meme-infused didactics were especially effective in helping students apply and connect chemistry concepts. The strong rating for application supports the view that memes provide contextual scaffolding for learning. Bebita & Sanguyo (2022) highlighted that memes serve as a form of "contextual scaffolding" because they place academic content within real-world or humorous scenarios. Pardede (2021) also noted that the visual-linguistic nature of memes suits modern learners' preference for multimodal information and reduces cognitive overload by presenting complex ideas in digestible and humorous forms. These findings suggest that meme-infused instruction can move students beyond basic comprehension toward application and higher-order thinking skills.

3.4 Significant Difference Between Pretest and Posttest Scores

The comparison between pretest and posttest scores showed a statistically significant difference in respondents' academic performance. The pretest mean rank was 7.50, while the posttest mean rank increased to 37.91. The computed Z-value was -7.454 with a p-value of <0.001. Since the p-value was below 0.05, the null hypothesis was rejected, confirming a significant improvement after the use of meme-infused didactics. This result indicates that meme-infused instruction led to measurable learning gains in chemistry. Tawafak et al. (2023) observed that digital visual aids, such as memes, create a "positive emotional climate" that supports memory encoding. Anas & Shaïd (2022) also emphasized that memes function as a form of "Micro-learning" by breaking down dense chemistry topics into bite-sized, humorous images, helping students process content without being overwhelmed by technical jargon. These findings support the use of meme-infused didactics as a viable strategy for improving science learning performance.

3.5 Relationship Between Perceived Effectiveness and Memory Retention

3.5.1 Relationship with Understanding of Concepts

The relationship between perceived effectiveness of meme-infused didactics and memory retention in terms of understanding of concepts was statistically significant. The overall Spearman's Rho value was 0.398 with a p-value of 0.011, leading to the rejection of the null hypothesis. Engagement had the strongest correlation with a Spearman's Rho value of 0.412 and a p-value of 0.008, followed by Motivation with 0.385 and a p-value of 0.015, and Learning Enjoyment with 0.331 and a p-value of 0.028. These findings show that as students perceived meme-infused didactics as more effective, their understanding-related memory retention also improved. Gonulal (2023) explained that humorous digital artifacts such as memes function as attention-gaining tools that prolong sensory engagement and increase the likelihood of encoding information into long-term memory. Lakshmi & Sreeya (2022) also argued that memes support generative learning because learners interpret humor using prior academic knowledge, which stimulates deeper cognitive elaboration.

3.5.2 Relationship with Application of Knowledge

The relationship between perceived effectiveness of meme-infused didactics and memory retention in terms of application of knowledge was also significant overall. The overall Spearman's Rho value was 0.326 with a p-value of 0.003, resulting in the rejection of the null hypothesis. However, Engagement showed no significant relationship with a p-value of 0.982, and Motivation was also not significant with a p-value of 0.297. Learning Enjoyment was the only specific indicator with a significant relationship, having a Spearman's Rho value of 0.272 and a p-value of 0.015. These results suggest that the application of knowledge may depend more on the quality of the learning environment and the way memes are integrated into instruction than on engagement or motivation alone. Kaya & Turan (2022) emphasized that while humor and memes initially spark interest, their value in knowledge application comes from the contextual cues they provide. Priyadarshini et al. (2023) also argued that application is strongly dependent on situated cognition, where relatable digital artifacts such as memes bridge abstract theory and practical problem-solving.

3.5.3 Relationship with Connecting Concepts

The relationship between perceived effectiveness of meme-infused didactics and memory retention in terms of connecting concepts was statistically significant. The overall Spearman's Rho value was 0.425 with a p-value of 0.001, leading to the rejection of the null hypothesis. All variables were significant: Learning Enjoyment had a Spearman's Rho value of 0.450 and a p-value of 0.003, Motivation had 0.412 and a p-value of 0.008, and Engagement had 0.382 and a p-value of 0.012. These findings indicate that engagement, motivation, and learning enjoyment work together to help students retain connections among chemistry concepts. Drouin et al. (2022) stated that memes can act as relatability bridges that help students map abstract information onto existing mental schemas. Arias-Badia and Matamala (2023) also emphasized that shared digital instructional tools, such as memes, promote social engagement and collective motivation, helping students retain interconnected scientific ideas more effectively.

3.6 Proposed Learning Guide Based on the Results

Based on the findings, a learning guide titled "Meme-Infused Didactics (MID) as Aiducational Strategy" was crafted to provide a structured framework for implementing meme-infused didactics as an instructional strategy. The framework was grounded in the observed increase in mastery level from 1.3% in the pretest to 68.4% in the posttest. Its core pillars were Engagement, Learning Enjoyment, and Motivation, all of which were interpreted as Very Effective. The guide also emphasized strategic implementation, curriculum and meme design, performance benchmarking, and standardized visual

and content standards. The proposed guide positions meme-infused didactics as a scalable instructional model rather than a simple classroom supplement. It recommends the use of relatable and humorous memes to introduce abstract definitions and complex ideas, support knowledge application, and connect related concepts through thematic meme series. It also highlights the need for continuous monitoring using Z-values, p-values, and correlation coefficients to ensure that implementation remains evidence-based. Overall, the expected impact includes increased engagement, stronger knowledge retention, improved problem-solving skills, higher mastery rates, and sustainable adoption of meme-infused didactics in instruction.

4. Conclusion & Recommendations

The study concluded that the respondents initially demonstrated a moderate level of mastery in the pretest, but their academic performance substantially improved after the integration of meme-infused didactics in chemistry instruction, with the majority reaching the mastery level in the posttest. Meme-infused didactics was found very effective in terms of engagement, motivation, and learning enjoyment. Its influence on memory retention was moderately influential in understanding of concepts and highly influential in application of knowledge and connecting concepts. The findings also confirmed a significant difference between pretest and posttest performance and a significant relationship between students' satisfaction with meme-infused didactics and its influence on memory retention. Thus, the proposed Meme-Infused Didactics educational strategy serves as a learning guide grounded in cognitive, motivational, and empirical aspects.

Based on the findings, educational institutions are encouraged to integrate Meme-Infused Didactics into chemistry instruction to help bridge students' baseline understanding and academic mastery. Educators should prioritize engagement when designing meme-based materials and use meme-based visuals particularly for complex relational topics, practical applications, and lessons requiring stronger memory retention. Schools should also adopt a consistent pretest and posttest framework to monitor instructional effectiveness, while curriculum developers should ensure that meme content remains academically accurate and culturally relevant. The proposed Meme-Infused Didactics learning guide may be institutionalized to standardize and sustain implementation, while further large-scale and longitudinal studies may examine its long-term impact on mastery, higher-order thinking skills, and cross-disciplinary memory retention.

The study is limited to the use of meme-infused didactics in chemistry instruction and its influence on students' academic performance, satisfaction, and memory retention. Since the recommendation calls for further large-scale and longitudinal studies, the findings may need additional validation across wider educational contexts, longer implementation periods, and other science disciplines. Future investigations may also consider moderating variables such as teacher proficiency and learner characteristics to strengthen the consistency, quality, and evidence-based integration of meme-infused didactics across different learning settings.

Compliance with ethical standards

The study strictly followed ethical standards in educational research. Participation was voluntary, informed consent was secured, and the confidentiality of respondents' information and responses was maintained. Respondents were assured that their data would be used solely for academic purposes and would not affect their grades or academic standing.

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