Video Clip-Based Instruction and Performance Level of Junior High School Students in Science

[1]Datudido M. Tacbil., [2]Leizle B. Coronica, PhD

[1]Graduate Student, Master of Arts in Education major in Science Education, Notre Dame of Dadiangas University, General Santos City, Philippines

[2]Thesis Adviser and Faculty Member, College of Arts and Sciences, Notre Dame of Dadiangas University, General Santos City, Philippines

DOI: https://doi.org/10.51584/IJRIAS.2026.11080002

Received: 11 August 2026; Accepted: 17 August 2026; Published: 26 August 2026

ABSTRACT

This quasi-experimental study examined the performance of 80 Grade 10 students from two intact classes at Palimbang National High School during School Year 2025-2026. From five sections, two intact classes were selected by lottery; a second lottery assigned one class to video clip-based instruction ($n = 40$) and the other to lecture-based instruction ($n = 40$). Both groups completed the same 50-item test before and after two weeks of instruction on Boyle's Law, Charles' Law, and Carbohydrates. The experimental group's mean percentage score increased from 47.50 ($SD = 14.31$) to 85.15 ($SD = 7.96$), whereas the control group increased from 45.10 ($SD = 13.46$) to 68.40 ($SD = 17.00$). The baseline difference was not significant, Welch's $t\ (77.71) = 0.77$, $p = .442$, Cohen's $d = 0.17$. ANCOVA, with post-test score as the outcome and pre-test score as the covariate, showed a significant adjusted group effect, $F\ (1, 77) = 30.78$, $p < .001$, partial eta squared = .286. Adjusted post-test means were 85.07 for the experimental group and 68.48 for the control group, an adjusted difference of 16.60 percentage points, 95% CI [10.64, 22.55]. HC3 heteroscedasticity-robust analysis produced the same conclusion, $z = 5.46$, $p < .001$. Repeated use of the same test may have produced a testing effect. Within the limits of the two-class design, video-supported instruction was associated with higher adjusted post-test performance among the participating students in the selected Science topics.

Keywords: video clip-based instruction, Science performance, Grade 10 students, multimedia learning, instructional strategy.

INTRODUCTION

The Problem and Its Setting

Instructional media plays a significant role in enhancing the learning process, with educational videos emerging as one of the most effective and innovative tools in today's classrooms. The use of video clip-based instruction enables teachers to present both static and dynamic content more efficiently, while also incorporating animations that support deeper understanding. Moreover, video clip-based instruction provides engaging and interactive visual content that helps learners grasp complex and abstract concepts in a clearer and more meaningful way (Ismiyanti et al., 2023).

On a global level, science education encounters serious issues that weaken students' scientific understanding and long-term performance. Based on Organization for Economic Cooperation and Development's Programme for International Student Assessment 2022 findings, Cambodia is among low-performing Southeast Asian nations in science with the Philippines (OECD, 2022). Calam and Bacabac (2024) also emphasize in their systematic review that poor performance in Programme for International Student Assessment (PISA) is closely linked to weak teacher quality, insufficient training, and unequal availability of educational resources.

In today's rapidly changing educational landscape, the incorporation of technology, especially through video-based instruction, has become a vital element of contemporary teaching and learning. Studies show that video clip-based instruction can greatly enhance students' academic achievement. For example, YouTube videos are increasingly utilized by teachers as supplementary instructional tools that foster analytical skills, observation, and scientific problem-solving abilities in science learning among learners across different levels of understanding (Setyawati et al., 2025).

Consequently, the Philippine government enacted its most extensive educational reform, expanding the nation's basic education structure through Republic Act 10533, or the K-12 Basic Education Program. A primary goal of this initiative is to strengthen science education by delivering concepts and skills using a spiral progression approach (K to 12 Curriculum Guide). Nevertheless, the Philippines' science performance in the 2018 PISA (Programme for International Student Assessment) showed no substantial improvement, as reflected and confirmed by the most recent PISA 2022 assessment results (Acido & Caballes, 2024).

Accordingly, the Philippines, obtaining a score of 249, ranked lowest in science among the 58 countries that joined the 2019 TIMSS (Trends in International Mathematics and Science Study). Moreover, the findings indicated that 13% of Filipino learners were classified under the low benchmark, implying that students demonstrated minimal understanding of scientific concepts and limited knowledge of basic Science principles (Mullis et al., 2020).

Despite the Philippines' persistent efforts and strong acknowledgment of the value of science education, notable issues in students' science performance still emerge and impede overall advancement. Studies indicate that school infrastructure and the learning environment significantly influence academic outcomes, where overcrowded classrooms, insufficient laboratory resources, and poorly maintained facilities reduce students' capacity to concentrate and participate in active learning experiences.

Furthermore, these limitations emphasize the importance of providing a supportive environment that ensures access to appropriate materials and spaces, enabling learners to explore scientific concepts through hands-on activities and meaningful discussions (Malaya & Panganiban, 2021).

The increasing demands of science subjects highlight the necessity to investigate alternative instructional strategies that can improve and support students' comprehension and mastery of scientific concepts. Alternative ways of enhancing science instruction include inquiry-based learning, problem-based learning, hands-on activities, collaborative tasks, formative assessments, and the integration of multimedia or technology-supported materials. These approaches allow learners to investigate real-life problems, participate in meaningful discussions, receive timely feedback, and connect abstract Science concepts with observable experiences (Malaya & Panganiban, 2021; Agtarap et al., 2024; Saro, Tiempo, & Ytac, 2022). Anoling et al. (2024) emphasized the significance of integrating technology and experiential learning to address the needs of diverse students, and their findings indicate that traditional teaching methods commonly practiced by teachers may no longer be adequate in promoting deeper understanding and scientific literacy in today's educational context.

Hence, this study calls forth the researcher to determine the effectiveness of video clip-based instruction on the performance level of Grade 10 Junior High School students in Science at Palimbang National High School. By evaluating the effectiveness of video clip-based instruction, this study also aims to contribute in improving science instruction, inform policy and curriculum enhancement, and offer practical solutions that address persistent learning gaps.

LITERATURE REVIEW

This review synthesizes literature directly related to the selection, design, and classroom integration of instructional videos, the learning theories supporting their use, and empirical evidence concerning students' performance in Science.

Source of Video Clip-based Instruction

Learning through video media offers concise, engaging content that aids comprehension and skill development, allowing students to regulate their own learning pace, making it an effective strategy in modern education (Sukmawati et al., 2024). Among these platforms, YouTube is one of the most widely used applications for both adults and children (Magfirah, 2021). In educational contexts, YouTube serves as an interactive learning tool, making lessons more engaging beyond passive viewing. The rapid advancement of technology and information has directly influenced education and teaching practices (Wahyuni et al., 2024).

In addition to combining text, audio, and video, YouTube facilitates two-way communication, increasing student engagement (Ardiansyah et al., 2022). Supporting its use as a learning medium, YouTube provides authentic experiences, is easily accessible, and hosts a wide variety of videos that can motivate students (Yudha, 2021). Wulandari further highlights several advantages of integrating YouTube in learning: 1) providing access to teaching materials, 2) supporting discussions through video reviews, 3) assisting in foreign language acquisition, 4) enhancing memory retention of lessons, and 5) promoting the development of students' attitudes and personalities. Collectively, these features contribute to creating a conducive and enjoyable classroom environment that fosters effective learning. On the other hand, YouTube is widely accessible and serves as an effective platform for delivering curriculum-based video lessons created by teachers (Widiastuti & Hidayati, 2023).

Additionally, YouTube supports self-directed learning beyond the classroom, making it a valuable supplementary learning resource (Mohamed & Shoufan, 2022). As a teaching tool, YouTube provides audiovisual content that captures students' interest, encourages creativity, and supports deeper learning, thereby reinforcing its relevance and effectiveness in educational settings (Caratiquit, 2022; Sakkir et al., 2020). And also, study utilizes YouTube video lessons as supplementary learning materials for the students. YouTube is chosen as a platform since students love watching videos on it (Insorio & Macandog, 2022).

Nature of Video Clip-based Instruction

One pedagogical approach gaining attention for its innovative nature is the use of multimedia instructional materials. These resources combine various media types, including text, images, videos, audio, animations, and interactive elements, to support the teaching and learning process (Utami et al., 2023). Such instructional tools aim to improve the educational experience by providing learners with multiple avenues to understand the content (Bajahzar, 2024). Likewise, Luzano (2023) emphasized that video clip-based instruction serves as a means to evaluate learner academic performance and is highly effective for multi-modal learning, as it integrates dynamic and static visuals, written materials, sound, and audio, enabling learners to engage fully and retain information more effectively.

According to Ode and Alfredo (2023), when YouTube used as a source for video-based instruction, provides learners with an enhanced opportunity to engage with educational content through both audio and visual channels. This dual-mode presentation allows students to interpret and understand concepts more effectively, making the delivery of information clearer and more accessible. Additionally, using YouTube videos in instruction enables learners to control the pace of their learning, pause or replay sections for better comprehension, and revisit complex topics as needed. This flexibility supports diverse learning styles, reinforces retention, and encourages active engagement, ultimately contributing to a deeper understanding of the subject matter and improved academic outcomes.

As explained by Cognitive Load Theory, the human brain possesses a limited working memory capacity when processing new information. Instructional approaches that exceed this capacity may obstruct effective learning (Sweller, van Merriënboer, & Paas, 2019). Properly designed educational videos can reduce extraneous cognitive load by delivering complex content in an organized, multi-modal manner, integrating auditory narration with visual elements. This enables learners to process information at their own pace, with opportunities to pause, rewind, and revisit material when necessary, thereby maximizing cognitive resources for deeper comprehension. Additionally, Daniyati (2023), who argues that audio-visual media encourages students to become more active

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

participants in the learning process, as it allows them to observe real-life examples and direct demonstrations of the concepts being taught.

Moreover, Mayer's Cognitive Theory of Multimedia Learning, which suggests that students learn more effectively when instructional materials combine visual and auditory elements rather than relying solely on text or verbal explanations (Mayer, 2021). Video clips integrated images, animations, and narration that helped reduce cognitive load and enhanced understanding of abstract scientific concepts. This theory supported the idea that presenting Science lessons through multimedia enabled learners to actively process information, leading to better comprehension and retention.

Furthermore, Constructivist Learning Theory emphasized that learners actively constructed knowledge through experiences and interaction with learning materials (Piaget, 1972; Vygotsky, 1978). Accordingly, constructivism served as the foundation of video-based instruction (Tani et al., 2022). Video clip-based instruction provided meaningful learning experiences by presenting real-world scientific phenomena, and simulations, enabling students to connect prior knowledge with new concepts.

In addition, Dual Coding Theory remains relevant in contemporary instruction because recent studies continue to show that combining verbal and visual information can support learners' comprehension, retention, and academic performance. In science education, Mir, Fatima, and Fatima (2023) emphasized that dual coding strategies help improve students' retention of scientific concepts by presenting information through both visual and verbal representations. Similarly, Türel (2023) found that learners positively perceived the use of dual-coded materials, such as listening texts supported by keywords and contextual visuals, because these helped improve understanding and learning in digital environments. In a recent quasi-experimental study, Wooten and Cuevas (2024) also reported that dual-coding-based instructional strategies significantly benefited students' vocabulary learning and academic achievement. These findings support the use of video clip-based instruction in Science, as videos present spoken explanations, images, animations, and demonstrations that help learners process information through both verbal and visual channels.

Louaifi (2020) explained that engaging with videos involves several essential components, as presenters apply critical thinking skills such as inference and interpretation to effectively influence their audience. Videos can assist learners in enhancing their academic performance and may also support the development of stronger social and psychological abilities (Hsu et al., 2022). Kiat et al. (2020) examined the creation of interactive multimedia applications grounded in scientific approaches that support learners in improving their academic outcomes in primary education. Their findings indicated that the implementation of an interactive multimedia-based scientific approach has strong potential to enhance students' academic achievement.

Quality of Video Clip-based Instruction

Relevant study pointed the scoring criteria used to assess the reliability and quality of YouTube videos in the medical field, particularly those focusing on "ovarian cyst" content, were based on evaluating accuracy, clarity, and depth through the Discerning Consumers of Health Information (DISCERN) tool and the Global Quality Scale (GQS) evaluation models. This approach can be applied to video clip-based instruction to ensure that educational videos are reliable, well-organized, and comprehensive. By adopting such criteria, the quality of instructional videos can be enhanced, making them more effective in delivering content, supporting learners' understanding, and improving overall academic performance (Andan & Aydin, 2022).

As emphasized by Arakawa and Yakura (2021), audio is a crucial component in determining the overall quality of educational videos. Even when visuals are clear and appealing, poor audio quality can reduce students' interest and engagement. A key aspect of audio is speech, which involves three important elements: pitch, volume, and speed.

The pitch should be clear and audible to ensure that every utterance is easily understood. Likewise, maintaining an appropriate volume level is essential for clarity and listener comfort. The rate of speech should be well-paced, neither too slow nor too fast, to avoid confusion and allow students to follow the discussion effectively. Consistent pacing alsosupports note-taking and comprehension. Additionally, videos can be edited or reproduced to enhance delivery, such as emphasizing key points through volume adjustments or modifying speed for clearer explanations. However, as noted by Hidayat (2021), some videos still suffer from poor content quality, which may lead to unclear explanations and ineffective visual presentation, ultimately affecting learners' understanding.

The relevant study highlights that the evaluation findings indicating the learning video demonstrates a high level of quality, particularly in terms of creativity, which received the highest rating among all criteria. This suggests that the inclusion of visually appealing elements, engaging presentation styles, and effective multimedia integration successfully captured learners' attention and enhanced their overall viewing experience. Consistent with previous research (Haerawan et al., 2024), creative video design plays a significant role in increasing student engagement and improving academic performance. In essence, the more creatively designed the video is, the more it supports learners in maintaining focus and grasping the lesson content.

Furthermore, the video also achieved high ratings in language clarity and the use of captions, reflecting its accessibility and effectiveness as a learning tool. The presence of captions helped learners better follow and understand the material, particularly those who may find it challenging to rely solely on spoken explanations. This supports the findings of Hsieh (2023), which highlight that captions greatly enhance comprehension, especially among younger audiences. Overall, the use of clear language combined with well-integrated captions contributes significantly to the video's instructional quality and its ability to facilitate better understanding.

Integration of Video Clip-Based Instruction

Within this technology-driven setting, the integration of digital tools into the teaching-learning process offers educators valuable opportunities to enhance students' academic performance (Prestoza, 2024; Zakaria et al., 2022). Central to this is the creation of multimedia instructional resources, such as educational video lessons, which function as tools for learners to attain mastery of scientific concepts and skills. As technology increasingly shapes the education system, teachers need to innovate and design materials like video lessons to effectively respond to these evolving demands.

In recent years, video-based instruction has demonstrated considerable advantages for both educators and learners. Video lessons can be recorded, edited, and reused multiple times, providing teachers with the flexibility to optimize their classroom time for direct interaction and hands-on activities, thereby enhancing students' engagement and participation (Caratiquit & Pablo, 2021). Moreover, these instructional videos offer opportunities for students to review and revisit complex concepts at their own pace, supporting individualized learning and reinforcing understanding. This approach not only helps in addressing diverse learning needs but also allows teachers to integrate multimedia resources creatively, making lessons more interactive and appealing while fostering critical thinking and practical application of knowledge.

Several studies have demonstrated that video lessons serve as effective instructional tools. Bullo (2021) highlighted the significance of incorporating video lessons in the new normal, especially in science, as they have been found to be highly effective. Similarly, Prestoza & Banatao (2024) noted that video lessons assist in clearly explaining concepts, capturing students' attention, and supporting the learning process. Furthermore, video lessons have been proven to stimulate learners' interest, increase their motivation and support comprehension of key science ideas (Barut & Dursun, 2022). In addition, Tugirinshuti et al., (2022) and Amarulloh and Dzakiria, (2021) proposed that a Video-Based Multimedia instructional approach can serve as an effective long-term strategy in addressing Covid-19 and future disruptions while minimizing students' learning challenges.

Use Short and Objective-Aligned Video Clips

The use of short-form video in educational contexts has grown considerably in recent years, especially in the areas of science communication and undergraduate instruction. Ranging from brief micro-lectures to dynamic scientific demonstrations, these short videos commonly shared on platforms like YouTube Shorts and TikTok have become flexible tools that can support teaching, improve learning outcomes, and increase student engagement across various scientific fields (Zeng et al., 2022).

According to Geyser (2022), short-form video has become one of the most widely used forms of social networking among today's youth, particularly for individuals between the ages of fifteen and nineteen, such as high school students. This type of content typically refers to videos that are three minutes long or less and is commonly featured on platforms like YouTube Shorts, TikTok, Instagram, and Facebook Reels. Its growing popularity can be attributed to its ability to capture and sustain viewers' attention quickly, offering engaging and easily digestible content within a limited time frame. Among these platforms, YouTube plays a particularly significant role, not only as a social networking site but also as an educational tool through its video clip–based instruction. With features like YouTube Shorts and traditional short videos, educators and content creators can present concise lessons, demonstrations, and explanations that align well with students' shorter attention spans.

Furthermore, shorter video durations emphasize the need to align content length with learners' attention spans to improve learning outcomes. Instead of lengthy instructional materials, concise videos help sustain focus and reduce cognitive overload, making learning more effective. Research in educational psychology further supports this by indicating that videos lasting around three to six minutes are optimal for maintaining attention and enhancing retention. This duration allows learners to process information in manageable segments, improving comprehension and recall. In video-based instructional settings, such as those utilizing YouTube, these brief clips can be organized into focused lessons, enabling students to engage more actively, revisit content when needed, and build understanding progressively (Wali, 2025).

Integrate Guided Viewing Questions

According to Noetel et al. (2021), integrating video content with interactive components such as guided discussions, collaborative tasks, and hands-on activities that can significantly improve students' engagement and learning outcomes. Rather than passively watching videos, learners become more actively involved when they are given opportunities to reflect, apply concepts, and interact with peers or instructors. This combination not only sustains attention but also promotes deeper understanding by encouraging critical thinking and real-world application of knowledge. As a result, video-based instruction becomes more effective when paired with interactive strategies that foster participation, reinforce concepts, and support meaningful learning experiences.

Apply Pause-and-Discuss Technique

Lin et al. (2022) found that learners achieve better understanding when they are guided on how and when to use video controls, such as pausing, especially when engaging with complex material. In this context, the Pause-and-Discuss technique can be effectively facilitated by the teacher, who takes an active role in playing the video and intentionally pausing at key moments to prompt questions, reflection, or discussion among learners. By structuring these pauses and directing students' attention to specific ideas or concepts, the teacher helps maximize the benefits of video-based instruction while fostering metacognitive awareness. This guided approach not only keeps students engaged but also supports deeper comprehension and more meaningful learning experiences.

Incorporate Formative Assessments

According to Agtarap et al. (2024), assessment strategies should be flexible to address the diverse needs and circumstances of learners. They emphasize that maintaining student engagement can be enhanced by incorporating varied tasks, such as group activities. This approach supports the use of videos as instructional tools by allowing students to demonstrate understanding through multiple formats, fostering active participation and deeper learning.

Provide Teacher Training on Multimedia Integration

Teacher readiness and competence continue to pose major challenges, as many educators struggle to implement multimedia tools especially video clip-based instruction effectively due to limited experience, insufficient training, and a lack of institutional support (Meštri´c et al., 2024; Chang & Kabilan, 2024; Ngongpah & Yetunde, 2025). This underscores the importance of enhancing teachers' preparedness through specialized training programs and ongoing support, enabling them to confidently and successfully incorporate video clip-based strategies into their teaching practices.

De Vera et al. (2021) highlight the urgent need for teacher education institutions to take an active role in preparing educators with the knowledge and competencies required to effectively integrate technology into their lesson planning. The study stresses that such integration is crucial in addressing the changing demands of contemporary education. In addition, the government plays a significant role in supporting teachers by providing the necessary resources to enhance instructional delivery. This support may include the establishment of ICT-equipped classrooms, the provision of technical assistance, access to laptops or other digital devices, and stable internet connectivity. These efforts collectively enable educators to implement technology-driven teaching strategies more effectively.

Ensure Technical Preparedness

The studies highlight that inadequate infrastructure and limited technical support remain significant obstacles to implementing video-based instruction effectively. Many educational institutions face challenges such as a shortage of essential audio-visual equipment, unreliable or slow internet connectivity, and insufficient access to trained technical personnel (Meštri´c et al., 2024; Bello et al., 2025). These limitations can hinder both teachers' ability to deliver multimedia lessons and students' capacity to engage fully with video content. Addressing these barriers requires investment in technological resources, improved internet infrastructure, and the provision of dedicated technical support staff to ensure that video clip-based instruction can be seamlessly integrated into the learning environment.

Significant Difference in the Performance After Exposure to Video-based Instruction

A relevant study by Zarco et al. (2026) found that many students initially performed at only a "satisfactory" level prior to the intervention. However, after the use of the instructional video, the majority achieved an "outstanding" level, suggesting that the video enhanced their ability to comprehend and retain the material. The improvement in physical performance was even more pronounced. At the outset, several learners demonstrated only "satisfactory" performance. Following practice supported by the video, all learners reached the "outstanding" level, indicating that they were able to accurately perform the targeted physical skills. Overall, these findings highlight the strong effectiveness of the instructional video in enhancing both cognitive understanding and skill acquisition. This aligns with the principles of multimedia learning theory, which posit that the integration of visual and auditory elements reduces cognitive load and enables learners to process and understand information more efficiently (Yu et al., 2024; Agbarakwe & Ossai-Chidi, 2025; van Nooijen et al., 2024).

Building on the earlier findings, the results further emphasize the value of video-based learning materials. Consistent with the previous studies, instructional videos can significantly enhance student engagement and deepen understanding, even when dealing with complex topics. However, existing research also highlights that the effectiveness of videos is maximized when they are paired with opportunities for critical thinking and collaboration. In this context, instructional videos should not replace interactive discussions or group activities; rather, they should serve as complementary tools that enrich the learning process and promote deeper, more meaningful educational experiences (Gómez-Ortega et al., 2022; Onasanya et al., 2022; Millatina et al., 2022; Maulid & Sakti, 2022; Azizah et al., 2022; Hofifah & Sumiati, 2023).

Effectiveness of Video Clip-based Instruction

Another study revealed that the integration of video clip-based instruction is becoming more prevalent in high schools specifically in Thailand as digital technologies continue to advance. According to the standards set by the Organization for Economic Co-operation and Development (OECD), the assessment results indicated that Thai students achieved higher science scores when they were taught using video-based materials. According to Halder and Saha (2023), it is crucial to give serious consideration to enhancing the skills and capabilities of teachers and students in high schools in Thailand (Chang et al., 2020). Additionally, in a recent study, Noetel et al. (2021) conducted an extensive investigation to assess the effectiveness of instructional videos in higher education. They showed that instructional videos have the potential to enhance students' learning and offer significant educational advantages.

In today's constantly evolving world, videos offer a more engaging sensory experience compared to printed materials alone. Learners can both see and hear the concepts being presented, allowing their brains to process information similarly to real-life interactions. Educational videos have become a vital and effective method for delivering content in traditional, blended, and online classrooms. When teachers consider factors such as managing cognitive load, maximizing student engagement, and encouraging active learning through videos, the instructional effectiveness of videos increases. This study will contribute to the literature review and provide essential insights for each principle within the theoretical framework, offering practical strategies for teachers to utilize videos as instructional tools to enhance students' skills (Prestiadi, 2020). Likewise, prior research has demonstrated that technology can enhance learning outcomes, and studies indicate that video-based instruction, specifically, can be highly effective in teaching science (Velunta, 2021).

Accordingly, a study conducted by Sun and Zhang (2020) revealed that high school students perceived video-based instruction as highly beneficial because it allowed them to learn at their own pace, providing the flexibility to review and revisit challenging topics as needed. Students also reported that this approach offered more opportunities for active engagement compared to traditional classroom methods, encouraging participation, critical thinking, and collaboration. Moreover, learners noted that video-based lessons helped them better retain information and understand complex concepts by combining visual and auditory elements. The study further highlighted that this mode of instruction could accommodate diverse learning styles, support self-directed learning, and foster greater motivation and confidence among students, ultimately contributing to improved academic performance and a deeper grasp of subject matter.

Video-based and PowerPoint Instruction

In addition to video-based, PowerPoint instruction is another powerful multimedia tool that supports learning. PowerPoint instruction helps with simplifying complex information into manageable chunks by integrating structured text with images, graphs, and animations. This makes the information easier for learners to follow and comprehend (Glover, 2023). When used effectively, PowerPoint can also improve cognitive engagement by enabling teachers to incorporate interactive components like discussions, quizzes, and embedded videos. When prepared with specific learning objectives, PowerPoint can help with both theoretical and practical content mastery and retention (Ruado & Cortez, 2024).

Academic Performance

Academic performance pertains to the results of education, reflecting how effectively a student, teacher, or institution attains their learning objectives. Performance in Science is commonly evaluated through students' grades, examination scores, and competence in scientific inquiry (Mayer, 2020). It describes how learners approach their studies and manage or complete various tasks assigned by their instructors. It involves a process in which a student's achievement in school is assessed to compare their standing with peers in similar domains (Khan, 2023). Furthermore, Doblada and Caballes (2021) emphasized that academic performance is closely linked to the teaching strategies employed in improving learners' understanding.According to Ogegbo & Ramnarain (2022), performance refers to the level of achievement a student attains on a test when evaluated relative to other students. It is typically categorized along a continuum ranging from poor to average to good, based on assessment results used for evaluation or placement. Students' academic performance can be enhanced through the use of effective teaching strategies. Teaching strategy represents a structured approach aimed at improving the quality of students' learning experiences.

Academic performance in Science among Grade 10 learners has remained a significant concern in educational research, with studies highlighting the influence of individual, school-related, and external factors. For example, research by Casiño et al. (2020) in the Philippines revealed that students who maintained effective study habits and held positive attitudes toward Science tended to earn higher grades. Likewise, the study by Lopez and

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

Ramirez (2021) underscored the role of teacher competence and the quality of the classroom environment in promoting improved academic outcomes among Filipino high school students.

Science Education

According to Bello et al. (2023), science education plays a crucial role in equipping learners with the capacity to acquire knowledge through hands-on experimentation and active exploration. By emphasizing inquiry-based learning approaches, students are encouraged to ask questions, investigate phenomena, and construct their own understanding of scientific concepts rather than passively receiving information. This process not only deepens their comprehension but also fosters critical thinking, problem-solving skills, and scientific curiosity. Moreover, the study highlights the importance of well-prepared science teachers who possess the ability to effectively access and utilize a wide range of instructional resources. Such educators are better equipped to design meaningful and engaging learning experiences that mirror real-world scientific practices. As a result, they can create authentic classroom environments where students are actively involved in the learning process, making lessons more relevant and impactful. This combination of inquiry-driven instruction and resourceful teaching ultimately enhances the overall quality of students' learning journeys and promotes a more profound appreciation for science.

Saro et al. (2023) highlight the innovative strategies and instructional practices used by science teachers to motivate and guide learners in developing critical thinking skills. Their study emphasizes how educators integrate science concepts into engaging, realistic, and authentic activities, enabling students to actively participate and form meaningful connections with the lessons, thereby improving their understanding. Similarly, the Philippines, like many other countries, continues to face the challenge of reforming science education to meet the changing demands of its learners and society. Although national policies and curricular frameworks provide direction, it is the teachers who bring these guidelines into practice through their dedication and expertise.

Science teachers in the Philippines have demonstrated strong adaptability in modifying their instructional strategies to better engage students. To address the diverse learning needs present in the classroom, many educators have adopted innovative approaches. One notable example is the use of inquiry-based learning, where students are encouraged to investigate scientific concepts through their own exploration and questioning. This method not only nurtures curiosity but also empowers learners to take an active role in their educational journey. In addition, problem-based learning has become increasingly popular, as teachers present students with real-world situations that require the application of scientific knowledge and problem-solving skills. These learner-centered approaches support the goals of the curriculum by promoting critical thinking and fostering active participation among students (Saro, Tiempo, & Ytac, 2022). Moreover, the influence of science teachers in improving the quality of science education has become more apparent with the integration of technology in the classroom. Baring and Berame (2022) emphasize the impact of technological tools on students' academic performance in science. Their study focuses on the use of an interactive module designed to enrich the learning experience by incorporating technology into instruction. This technology-driven approach allows students to deepen their understanding of scientific concepts while actively engaging with digital tools. The findings suggest that teachers can adopt similar interactive strategies to effectively integrate technology into their teaching practices. By doing so, students are provided with opportunities to engage more actively in their learning, ultimately leading to a more dynamic, meaningful, and effective educational experience in science.

Performance in Science

The 2018 National Achievement Test (NAT) revealed a mean performance score of 44.59% in Science for secondary students, falling short of the government's target of 75% (Nidar & Lumanlan, 2021). In particular, the 2018 NAT results for Region 02, as reported in the 2019 Unnumbered Regional Memorandum of DepEd Region 02, indicated a 36.91% mean performance score in Science among Grade 10 students. The data further showed that no student achieved a "highly proficient" level, and only 0.41% were classified as "proficient," meaning nearly all examinees did not reach the expected proficiency level. Education Secretary Briones noted that these results reflect a broader trend of low performance among Filipino learners in the NAT. Research by

Munje and Jita (2020) suggests that this low achievement may be linked to limited student engagement and the inadequate integration of Information and Communication Technology (ICT) in the teaching and learning process.

Similarly, Nguyen et al. (2020) investigated student performance on National Achievement Tests across Asia and found that results in Science, Mathematics, and English were generally below average. These findings highlight ongoing challenges in academic attainment and point to the need for targeted improvements in educational practices. The study underscores the importance of effective managerial planning and program redesign in enhancing student outcomes, while also emphasizing the crucial role of strong leadership and institutional support in driving meaningful and sustainable educational improvements (Casildo, 2022).

The implementation of the K-12 curriculum in the Philippines has brought about a greater demand for instructional materials, particularly in public schools where resources are often limited. This shift has underscored the need to address the diverse learning needs of students, including varying learning styles, abilities, and engagement levels. To effectively support teaching and ensure that lessons are delivered efficiently within the constraints of classroom time, teachers are encouraged to design and develop their own instructional materials. According to DepEd Order No. 035, s. 2016, these teacher-created resources not only help accommodate the curriculum's requirements but also provide tailored learning experiences that can enhance student understanding, engagement, and overall academic performance. By creating context-specific materials, educators can better respond to the gaps revealed by assessments like the NAT and promote more effective learning outcomes.

Benefits and Advantages of Video-based Instruction

Video-supported instruction can make processes and phenomena visible, combine verbal and visual information, permit replay of difficult segments, and demonstrate procedures more efficiently than text alone (Olsson, 2020; Santos & Castro, 2021; Sukarini et al., 2021). These advantages are most educationally meaningful when videos are aligned with objectives and embedded in teacher-guided activities rather than used for passive viewing.

Previous research indicates that video-based learning can significantly enhance students' understanding, enrich the instructional content, and boost overall engagement in the learning process (Wong, 2020). It offers learners the flexibility to study at their own pace, enabling more efficient and personalized learning experiences (Dham, 2021). Moreover, incorporating video materials in the classroom supports both teaching and learning by helping students build foundational knowledge that is crucial for their future careers (Trail & Caukin, 2022; Wong, 2022). Video-based learning also encourages active participation, fostering greater interaction, motivation, and deeper engagement with the educational content (Galatsopoulou et al., 2022).

Similarly, Wibawa and Payadnya (2021) emphasized that video presentations enhance the learning experience by making it more engaging, enjoyable, and meaningful for students. Through the integration of visual and auditory elements, videos help capture learners' attention and support better understanding of the material. One of the key advantages of video-based learning is its accessibility and flexibility. Students can access instructional content anytime and anywhere, revisit complex topics by replaying unclear explanations, and learn at a pace that suits their individual needs. This promotes greater autonomy and allows learners to take a more active role in their own learning process.

Moreover, video presentations can also function as an effective alternative tool for assessing students' skills. When paired with timely and constructive feedback, this approach enables learners to recognize their strengths and areas for improvement, ultimately helping them perform better in future tasks (Indriani, 2020).

The integration of video clip–based instruction in class discussions has been emphasized as one of the most effective ways to engage learners and involve them actively in the teaching-learning process. Unlike traditional lecture-based methods, where students may lose focus or become bored, incorporating video clips into lessons allows students to observe movements, behaviors, processes, and demonstrations related to the topic being taught.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

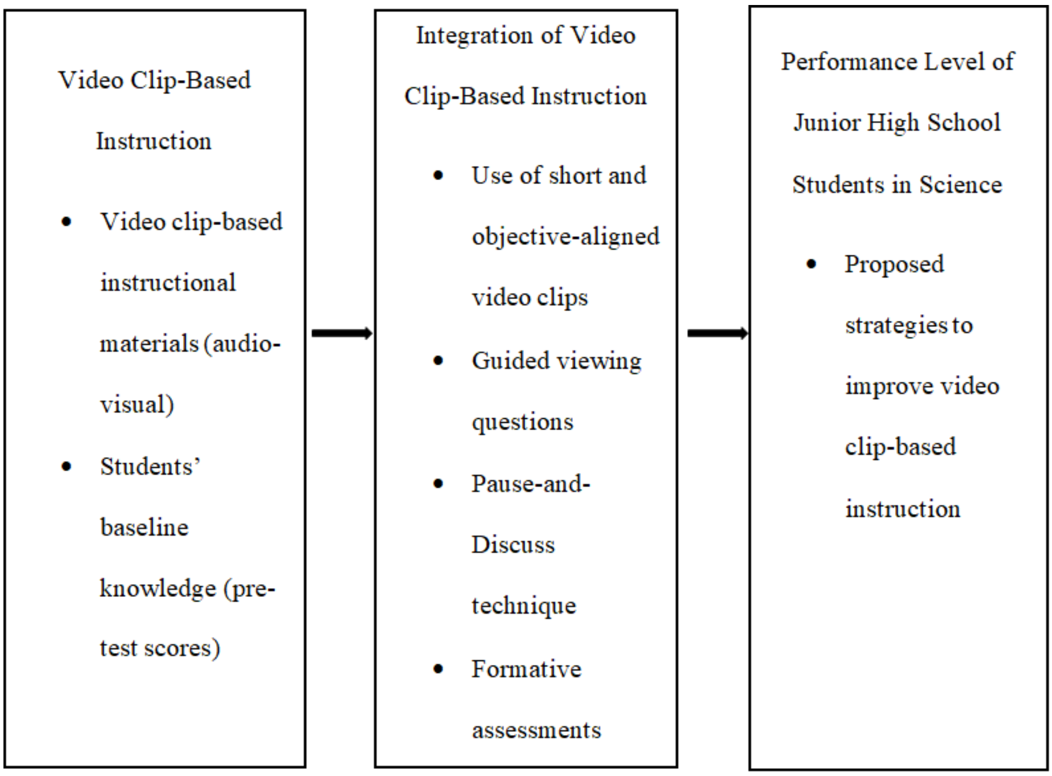
Furthermore, video clip-based instruction promotes student engagement and participation by allowing learners to interact with and reflect on the content. It enhances retention, interest, concentration, knowledge development, and critical thinking skills. Research indicates that the majority of students enjoy watching video clips during class discussions, particularly short videos. However, teachers should carefully select videos that are relevant, accurate, legally accessed, and ethically used to maximize learning outcomes.

Conceptual Framework

This study was anchored on the Input-Process-Output (IPO) model, which provided a structured framework for determining the effectiveness of video clip–based instruction on the performance level of Grade 10 Junior High School students in Science. The input of the study consisted of video clip–based instructional materials with audio-visual presentations, along with learner-related factors such as baseline knowledge, which was measured through pre-test scores prior to the implementation of the video-based instruction. These inputs served as the foundation for how students engaged with the instructional content.

The process involved the integration of video clip–based instruction in the classroom through the use of short, objective-aligned video clips, guided viewing questions, the Pause-and-Discuss technique, and formative assessments. Guided by the Cognitive Theory of Multimedia Learning and Constructivist Learning Theory, this process enabled students to actively engage with science concepts and construct meaningful understanding. The output of the study was the propose strategies to improve video clip-based instruction. The IPO model illustrated how carefully designed instructional inputs, implemented through structured and interactive teaching processes, contributed to improved student performance outcomes.

Figure 1 Conceptual Framework



Statement of the Problem

This study determined the effectiveness of video clip-based instruction on the performance level of Grade 10 students in Science at Palimbang National High School.

Specifically, it answered the following questions:

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

1. What video clip-based instruction may be integrated in science education in terms of:

1.1 source;

1.2 nature; and

1.3 quality?

2. What is the pre-test performance of the experimental and control groups?

3. What is the post-test performance of the experimental and control groups?

4. Is there a significant difference between the pre-test and post-test performance of experimental and control groups?

5. Based on the findings, what strategies can be proposed to improve video clip-based instruction?

Hypothesis

H_O**:** There is no significant difference between the pre-test and post-test performance of experimental and control groups.

Scope and Delimitation

This study examined video clip-based instruction among 80 Grade 10 students from two intact classes at one public high school in Palimbang, Sultan Kudarat, during School Year 2025-2026. One selected class received video-supported lessons and the other received lecture-based lessons on three fourth-quarter Science topics: Boyle's Law, Charles' Law, and Carbohydrates. The intervention lasted two weeks, and the clips, obtained from cited YouTube sources with appropriate permission or licensing, generally lasted two to three minutes. Outcomes were limited to scores on the researcher-developed 50-item test. Because only one intact class represented each condition, the findings may reflect class-level influences and should not be generalized beyond the participating Grade 10 students, school context, intervention period, and selected Science topics. The same test was administered before and after instruction; therefore, familiarity with the items may have contributed to post-test gains. Other instructional approaches and materials were outside the scope of the study.

Significance of the Study

Generally, the result of this study will be significant to the following:

DepEd officials. It provides evidence on the effectiveness of video clip-based instruction in enhancing learners' academic performance in science. It can guide teacher training and professional development, and support resource allocation for digital learning materials.

School Division Superintendents. It provides insights into the effectiveness of video clip-based instruction in improving learners' academic performance and guide division-level decisions on curriculum implementation, teacher training programs, and the integration of technology in classrooms. It can also help superintendents identify best practices that can be replicated across schools within the division, ensuring consistent quality of instruction and enhancing overall student learning outcomes.

School principals. It helps them to support teachers in integrating video clip-based instruction, monitor teaching practices, and foster a technology-rich learning environment which is significant in improving student engagement, enhance lesson delivery, and ultimately contribute to better academic performance across the school.

Curriculum Planners. It provides them empirical evidence on the effectiveness of video clip-based instruction in improving the performance level of junior high school students in Science. The results can serve as a basis for integrating video-based instructional materials into the Science curriculum.

Science Department Heads. It provides them to use the findings of the study just to guide and support the teachers in integrating video clip-based instruction, plan collaborative activities, and monitor instructional practices in the department. This can lead to improved lesson quality, enhanced student understanding of abstract concepts, and overall better academic performance in science subjects.

Science Teachers. It will be a great help for them to recognize the effectiveness of video clip-based instruction in teaching science on the academic performance of the students. It will also serve as guide to improve lesson delivery, enhance student understanding of complex topics, and design activities that support active learning.

Students. This research helps them address their gap in learning science preferably Gas laws and Biomolecules lessons by providing them the integration of video clip-based instruction to increase participation in the teaching learning process and improve overall academic performance.

Stakeholders/Parents. It provides insights into instructional strategies that can enhance their children’s learning experience in science. Understanding the use and effectiveness of video clip-based instruction can help parents support their children’s learning at home, encourage active engagement with lessons, and monitor academic progress.

Researcher. It provides an opportunity to gain practical experience in designing, implementing, and evaluating instructional strategies. It also contributes to the researcher’s professional growth and development in educational research and pedagogy.

Future Researchers. This study provides a foundation for future research on the use of multimedia resources in education. It can guide further studies on video-based learning, instructional strategies, and technology integration in classrooms, helping to expand knowledge on effective teaching methods and their impact on student learning outcomes.

METHODOLOGY

This chapter presents the methods which encompasses the research design, selection of respondents, research instruments, data gathering procedure, data analysis, and the ethical considerations.

Research Design

The study used a quasi-experimental pre-test-post-test control-group design with two intact Grade 10 classes. The class, rather than the individual learner, was the unit of selection and assignment. From the school’s five Grade 10 sections, two intact sections were selected by lottery. A second lottery assigned one selected section to the experimental condition and the other to the control condition. Both groups completed a pre-test on Boyle’s Law, Charles’ Law, and Carbohydrates. The experimental class received video clip-based instruction, whereas the control class received lecture-based instruction. Both classes were taught by the same teacher using aligned lesson objectives and completed the same post-test after the two-week intervention. Because only one class represented each condition, class-level characteristics cannot be separated completely from the instructional condition. Accordingly, random assignment of the two classes reduced selection bias at the section level but did not provide the internal validity of an individually randomized trial.

The design permits comparison of change across the two participating classes, but findings are interpreted as evidence of association rather than definitive causation.

Selection of Respondents

The participants were 80 Grade 10 students enrolled during School Year 2025-2026. The school had five Grade 10 sections of approximately 40 learners each. All five section names were written on identical slips, mixed in a container, and two section names were drawn without replacement. Thus, intact sections, not individual students, were the sampling units. All enrolled students in the two selected sections were included, yielding 40 participants per class.

The two selected section names were then returned to identical slips and drawn again to assign the instructional conditions. The first section drawn was assigned to the experimental condition and the remaining section to the control condition. This procedure constituted random assignment at the section level only. It did not randomly distribute individual learners across groups.

The use of two intact classes was practical and helped reduce subjective assignment; however, with only one class per condition, unmeasured class-level differences may remain. This limitation was considered when interpreting the results and restricting the scope of the conclusions.

Research Instruments

The researcher developed a questionnaire to determine what video clip-based instruction may be integrated in Science education in terms of source, nature, and quality. The instrument assessed video clips in terms of their source, nature, and quality, focusing on credibility, instructional characteristics, and technical effectiveness. Also, the researcher used video clip analysis tool that served as a self-evaluation procedure for selecting appropriate instructional video clips. The video clips were adopted from credible educational YouTube channels and were not produced by the researcher. The tool was used to assess each video clip is based on criteria such as acceptability, relevance, and appropriateness. Only video clips that met the established criteria were selected for use in the video clip-based instruction, ensuring that the adopted materials were suitable and aligned with objectives of the Science curriculum.

A content validation tool was used to establish the validity of the adopted video clips on the topics Boyle’s Law, Charles’ Law, and Carbohydrates. This tool was subjected to validation by Science experts. It was designed to evaluate the instructional suitability of each video clip in terms of acceptability, relevance, and appropriateness. The validators assessed each video clip using a structured checklist and rating scale focusing on the source, nature, and quality of the content. The results of the validation were summarized in a table for each topic, and only video clips that met the acceptable validation criteria were utilized in the video clip-based instruction. Responses were measured using a four-point Likert-type rating scale: for the source of video clips, 4 (Highly acceptable), 3 (Acceptable), 2 (Slightly Acceptable), and 1 (Not Acceptable); for the nature of video clips, 4 (Highly Relevant), 3 (Relevant), 2 (Slightly Relevant), and 1 (Not Relevant); and for the quality of video clips, 4 (Highly Appropriate), 3 (Appropriate), 2 (Slightly Appropriate), and 1 (Not Appropriate).

A 50-item multiple choice test was developed based on a test blueprint aligned with the learning competencies and objectives of the study. Each item consisted of one correct answer and three distractors. To ensure the reliability and validity of the instrument, the test questionnaire made by the teacher underwent expert validation.

Responses were measured using a four-point Likert-type rating scale: 4 (Highly Acceptable), 3 (Acceptable), 2 (Slightly Acceptable), and 1 (Not Acceptable).

The performance of Grade 10 students in Science was measured using a pre-test and post-test composed of 50 items validated by experts. Both tests were constructed based on the lesson plan to ensure that the test items reflected the lesson objectives and curriculum competencies. To guarantee comprehensive coverage of the content, a Table of Specifications (TOS) was developed, mapping each test item to the topics and cognitive levels such as knowledge, comprehension, and application. The pre-test was administered before the integration of video clip-based instruction, while the post-test was given after the instructional intervention to determine the effectiveness of the video clips in improving learning. The use of the pre-test-post-test design, aligned with the Table of Specifications (TOS) and lesson plan, allowed for a systematic evaluation of the effectiveness of video clip-based instruction on students’ performance level. Furthermore, the development of the research instrument was guided by the DepEd’s prescribed 7Es (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend)

Lesson Plans in Science and a Table of Specifications (TOS). These materials ensured alignment between the learning objectives, video clip-based instruction, and the test items. The video clips were integrated particularly during the Explain phase of the lesson plan, to support conceptual understanding of the lessons. Both the 7Es lesson plans and the Table of Specifications (TOS) were subjected to expert validation to establish content validity prior to the administration of the research instrument and responses were measured using a four-point Likert-type rating scale: 4 (Highly Acceptable), 3 (Acceptable), 2 (Slightly Acceptable), and 1 (Not Acceptable).

Moreover, both the adopted video clips and the 50-item multiple choice test made by the teacher were validated by Science experts. The video clips were assessed for multimedia elements and accuracy, while the test was evaluated for content, cognitive alignment, and coverage, ensuring that both instructional materials and assessment items were appropriate, curriculum-aligned, and effective in measuring students' learning performance.

Data Gathering Procedure

The researcher began the process of gathering data with the selection of video clips, where the researcher identified educational videos on Boyle's Law, Charles' Law, and Carbohydrates from credible YouTube channels. The researcher also asked permission from the content owners of the selected YouTube videos that were used as instructional resources. A formal request letter was sent to the respective video creators to secure consent for educational use and adaptation of their content, in accordance with ethical research standards and copyright guidelines. The source links for the video clips were Boyle's Law (https://youtu.be/YQmv272-4yU?si=gsHEn14M-DBB3n5T), Charles' Law (https://youtu.be/twCcSsHmMgI?si=JzkCVNG8V2adDkP-), and Carbohydrates (https://youtu.be/IJUwdIups9o?si=KVOvx67FzrnpAwOB). All video clips were animated.

After the selection of video clips from credible YouTube channels, only those video clips with granted permission were used in the intervention and underwent a process of validation using a video clip analysis tool. Science experts evaluated this tool based on acceptability for the source of video clips, relevance for nature of video clips, and appropriateness for quality of video clips. Only video clips that met the acceptable criteria were used in the instructional intervention.

In addition to the validation of the video clips, other research instruments, such as test questionnaire, Table of Specifications (TOS), and lesson plans, also underwent expert validation. The instruments were evaluated by experts in the field, such as master teachers and curriculum specialists, to ensure their clarity, relevance, alignment with learning objectives, and appropriateness for the intended learners. Feedback and recommendations from the validators were carefully considered and incorporated to revise and improve the instruments before they were administered to the respondents. This phase, including selection and validation of video clips, was conducted over a period of three weeks.

After the validation of the research instruments, researcher sought the approval of the Dean of the Graduate school of Notre Dame of Dadiangas University, General Santos City, to conduct the study. This was followed by sending a letter of permission addressed to the Schools Division Superintendent of Sultan Kudarat Division to request authorization to implement and conduct the study. Subsequently, a separate letter of permission was submitted to the School Head of Palimbang National High School to secure consent for the actual conduct of the research within the institution. This process was completed over the course of one week.

Prior to the conduct of the study, an orientation was conducted for the teacher who handled the experimental group (students were taught with the integration of video-clip based instruction) and control group (students were taught without the integration of video-clip based instruction). This orientation led to the familiarization of the lesson plans, instructional materials, and procedures to ensure proper understanding and consistent implementation of the intervention by the teacher. It also provided guidance on the administration of the test questionnaire and the effective use of the video clips during instruction. The orientation was conducted over a period of two days.

Following the validation, approval, and orientation process, a pre-test was administered to both the experimental and control groups to determine the students' baseline knowledge using a 50-item multiple choice test. The test was constructed based on the lesson plan and Table of Specifications (TOS). The conduct of the pre-test was completed in one day.

After the pre-test, the video clip-based instruction was integrated into the classroom over two weeks, with the teacher receiving orientation on how to use the video clips effectively, including guidance on sequencing, discussion facilitation, and student engagement with multimedia content. The instructional timeline ensured that all three Science topics for the fourth quarter, including Boyle’s Law, Charles’ Law, and Carbohydrates were adequately covered and that students had sufficient time to interact with the video clips.

Upon completion of the instructional sessions, both groups completed the same 50-item multiple-choice test used at pre-test. Using identical items supported direct score comparison but may also have introduced a testing effect because learners could have become familiar with the item content or format. This possible source of improvement was considered when interpreting changes in both groups. The pre-test and post-test scores were then analyzed using the procedures described in the Data Analysis section.

Data Analysis

To determine which video clip-based instructional materials may be integrated into science education in terms of source, nature, and quality, the researcher employed the weighted mean as the primary statistical measure. Before the intervention, the selected video clips on Boyle’s Law, Charles’ Law, and Carbohydrates were evaluated and validated by science experts to ensure their scientific accuracy, relevance, appropriateness, and suitability for classroom instruction. A Likert-type rating scale, together with its corresponding mean ranges, descriptive ratings, and interpretations, was used to organize and interpret the experts’ evaluations. The weighted mean for each indicator and dimension was calculated to identify the strengths and possible limitations of the selected materials.

Source of Video Clips

Box 1 presents the scale, mean range, descriptive rating, and corresponding interpretation used to assess the source of the video clips on Boyle’s Law, Charles’ Law, and Carbohydrates.

Box 1 Source of Video Clips

Scale	Mean Range	Description	Interpretation
4	3.51-4.00	Highly Acceptable	The video clips are highly acceptable for it satisfies all four criteria.
3	2.51-3.50	Acceptable	The video clips are acceptable for it satisfies three criteria.
2	1.51-2.50	Slightly Acceptable	The video clips are slightly acceptable for it satisfies two criteria.
1	1.00-1.50	Not Acceptable	The video clips are not acceptable for it satisfies only one criterion.

Box 1 shows the criteria used to evaluate the acceptability of the video clips selected for Boyle’s Law, Charles’ Law, and Carbohydrates in terms of source. The evaluation uses a four-point scale based on the number of criteria satisfied by each video clip. A mean score ranging from 3.51 to 4.00 indicates that the video clips are highly acceptable, as they satisfy all four criteria. A mean score from 2.51 to 3.50 is interpreted as acceptable, indicating that three criteria are met. Meanwhile, a mean score between 1.51 and 2.50 signifies that the video clips are slightly acceptable, as they satisfy two criteria. Lastly, a mean score ranging from 1.00 to 1.50 indicates that the video clips are not acceptable because they satisfy only one criterion. This scale provides a systematic basis for determining whether the selected video clips are appropriate and suitable for use in presenting the identified science topics.

Nature of Video Clips

Box 2 presents the scale, mean range, descriptive rating, and corresponding interpretation used to assess the nature of the video clips on Boyle's Law, Charles' Law, and Carbohydrates.

Box 2 Nature of Video Clips			
Scale	Mean Range	Description	Interpretation
4	3.51-4.00	Highly Relevant	The video clips are highly relevant for it satisfies all four criteria.
3	2.51-3.50	Relevant	The video clips are relevant for it satisfies three criteria.
2	1.51-2.50	Slightly Relevant	The video clips are slightly relevant for it satisfies two criteria.
1	1.00-1.50	Not Relevant	The video clips are not relevant for it satisfies only one criterion.

Box 2 highlights the criteria used to evaluate the relevance of the video clips on Boyle's Law, Charles' Law, and Carbohydrates based on their nature. The evaluation focuses on whether the content, presentation, and instructional features of the video clips are aligned with the intended science concepts and learning objectives. Video clips that satisfy all the established criteria are considered highly relevant, while those that meet most of the criteria are regarded as relevant. Those that satisfy only some of the criteria are classified as slightly relevant, whereas video clips that meet only one criterion are considered not relevant. This evaluation provides a systematic basis for determining the relevance and suitability of the video clips for integration into science instruction.

Quality of Video Clips

Box 3 presents the scale, mean range, descriptive rating, and corresponding interpretation used to assess the quality of the video clips on Boyle's Law, Charles' Law, and Carbohydrates.

Box 3 Quality of Video Clips			
Scale	Mean Range	Description	Interpretation
4	3.51-4.00	Highly Appropriate	The video clips are highly appropriate for it satisfies all four criteria.
3	2.51-3.50	Appropriate	The video clips are appropriate for it satisfies three criteria.
2	1.51-2.50	Slightly Appropriate	The video clips are slightly appropriate for it satisfies two criteria.
1	1.00-1.50	Not Appropriate	The video clips are not appropriate for it satisfies only one criterion.

Box 3 provides the criteria used to evaluate the appropriateness of the video clips on Boyle's Law, Charles' Law, and Carbohydrates in terms of quality. The evaluation considers whether the visual and audio elements, content accuracy, clarity of presentation, and overall production of the video clips support the intended learning objectives. Video clips that satisfy all the established criteria are considered highly appropriate, while those that meet most of the criteria are regarded as appropriate. Video clips that satisfy only some of the criteria are classified as slightly appropriate, whereas those that meet only one criterion are considered not appropriate. This evaluation provides a systematic basis for determining the quality and suitability of the video clips for integration into science instruction.

To measure the pre-test and post-test performance of the experimental and control groups, the researcher used percentage, weighted mean, and standard deviation respectively. These measures were described the central tendency and variability of learners' scores in the content areas of Boyle's Law, Charles' Law, and

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

Carbohydrates. Frequency and percentage distributions were also used respectively to categorize learners' performance levels according to the DepEd's descriptive rating scale.

The researcher obtained the scores from a 50-item multiple choice test and converted into percentage scores that were interpreted following the DepEd Order No. 8, s. 2015 and the qualifying statement was adapted from DepEd Order No. 73, series of 2012. The DepEd's descriptive rating scale: Advanced (90-100%), Proficient (85-89%), Approaching Proficiency (80-84%), Developing (75-79%), and Beginning (Below 75%). Since the number of item is 50, the researcher used this conversion of scores to percentage aligned with the DepEd-based scoring rubric.

Modified DepEd-based Scoring Rubric for the 50-Item Test

Box 4 presents the modified DepEd-based scoring rubric used to interpret the respondents' performance in the 50-item test. It shows the corresponding score ranges and performance levels, ranging from Beginning to Advanced.

Box 4 Modified DepEd-based Scoring Rubric for the 50-Item Test	
Score Range	Performance Level
45-50	Advanced
43-44	Proficient
40-42	Approaching Proficiency
38-39	Developing
37 & below	Beginning

Box 4 serves as the basis for classifying the respondents' performance according to their scores in the test. Respondents who achieved the highest score range were classified at the Advanced level, followed by Proficient, Approaching Proficiency, and Developing. Those whose scores fell within the lowest range were classified at the Beginning level. This modified scoring rubric was used to describe and interpret the respondents' performance in the 50-item test before and after the intervention.

Percentage-score means and standard deviations described pre-test and post-test performance. Baseline equivalence was examined using Welch's independent-samples t-test because group variances were not assumed equal; Cohen's d quantified the standardized baseline difference. The primary effectiveness analysis was analysis of covariance (ANCOVA), with post-test percentage score as the dependent variable, instructional group as the fixed factor, and pre-test percentage score as the covariate. Homogeneity of regression slopes was assessed through the Group × Pre-test interaction. Adjusted means, the adjusted group difference with a 95% confidence interval, the F statistic, p value, and partial eta squared were reported. Because residual variances differed between groups, HC3 heteroscedasticity-robust standard errors were examined as a sensitivity analysis. Paired-samples t-tests described within-group change, and Welch's comparison of gain scores served as an additional sensitivity analysis. All tests were two-tailed at alpha = .05. Because only one intact class represented each condition, learner-level analyses cannot separate treatment effects from class-level influences and must be interpreted cautiously.

To identify strategies for improving video clip-based instruction, no statistical tool was used. Instead, the proposed strategies were based on the findings and included using short and objective-aligned video clips, integrating guided viewing questions, applying pause-and-discuss techniques, incorporating formative assessments, providing teacher training on multimedia integration, and ensuring technical preparedness.

The primary null hypothesis stated that, after controlling for pre-test performance, the adjusted post-test mean would not differ between the experimental and control groups. This hypothesis was evaluated through ANCOVA at the .05 significance level. Separate paired-samples tests were considered supporting analyses and were not used alone to claim a differential treatment effect.

Ethical Considerations

The researcher conducted the study following ethical considerations to protect the rights of the respondents and the school. Anonymity and confidentiality of data were observed to ensure that the information and/or answers provided by the respondents were not used against their will. Letters addressed to the individuals involved in the study were given in advance, allowing them time to consider whether to participate or withdraw from the study. The names of the respondents were kept confidential based on their preference. Offensive, irrelevant, and biased questions were avoided.

The study involved respondents who voluntarily submitted themselves to be part of the research. Respondents were assured that if they chose to withdraw from the study, the researcher would, with utmost respect and understanding, allow them to do so with advance notice.

Furthermore, the researcher did not intend to evaluate the teacher or the school, nor did the study aim to compare schools or teachers. All information gathered from the respondents was treated with the utmost respect and was used solely for future educational purposes.

Moreover, to ensure ethical compliance regarding the regulated use of video clip-based instructional materials, the researcher obtained permission from the original creators of the YouTube videos used in the intervention. Only those videos with granted permission or those licensed under Creative Commons were selected for the intervention to avoid copyright issues.

RESULTS AND DISCUSSIONS

This chapter presents and discusses the video clip-based instruction integrated into Science education in terms of source, nature, and quality. It also includes the analysis of the pre-test and post-test performance of both the experimental and control groups. The results are presented through statistical data to show the comparison of students' performance before and after the intervention. Furthermore, this chapter interprets the significant differences between the pre-test and post-test performances of the two groups and proposes strategies to improve video clip-based instruction based on the findings of the study.

Video Clip-based Instruction in Terms of Source, Nature, and Quality

Table 1 presents the results on the evaluation of video clips in terms of source, nature, and quality.

Table 1 Video Clip-based Instruction Integrated in Science Education in Terms of Source, Nature, and Quality for Boyle's Law, Charles' Law, and Carbohydrates

Criteria	Mean	Description
Source	3.86	Very Acceptable
Nature	3.81	Very Acceptable
Quality	3.70	Very Acceptable
Overall Mean	3.8	Very Acceptable

Table 1 shows that the source of video clips obtained a mean score of 3.86, described as Very Acceptable, indicating that the video clips taken from YouTube to have been obtained from a reliable and credible source

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

suitable for instructional use. Relevant study revealed that YouTube-based video clips promote independent learning outside the classroom, making them effective supplementary instructional materials (Mohamed & Shoufan, 2022).

Similarly, the nature of the video clips garnered a mean score of 3.81, described as Very Acceptable, which implies that the videos are relevant and closely aligned with the concept of Boyle's Law, Charles' Law, and Carbohydrates in Science. In support to this result, Utami et al. (2023) highlighted that one of the key strengths of video-based instructional materials is their ability to integrate animations, text, images, and audio, which collectively enhance the teaching and learning process.

Furthermore, the quality of the video clips obtained a mean score of 3.70, described also as Very Acceptable, suggesting that the videos are demonstrated clarity, organization, and effectiveness in presenting the lesson to the learners. Supporting this result, Arakawa and Yakura (2021) emphasized that audio plays a crucial role in determining the overall quality of a video clip, as a clear and well-synchronized sound significantly enhances learners' understanding and engagement.

Overall, the video clips obtained an overall mean score of 3.8, described as Very Acceptable. This indicates that the video clips are very suitable as an instructional material for teaching Boyle's Law, Charles' Law, and Carbohydrates in Science. Moreover, the results of validation of the video clips were aligned with existing literature emphasizing the importance of well-designed instructional videos in education. Van der Keylen et al. (2022) noted that carefully developed video materials can enhance knowledge retention and improve learning outcomes. In the same way, Mayer and Fiorella (2021) explained that structured and relevant video content increases usability and effectiveness in instructional settings. Additionally, Smutny and Schreiberova (2020), together with Shin and Hickey (2021), found that video-based learning enhances student engagement by providing flexible and user-friendly learning experiences.

Generally, the video clip-based instructional materials on Boyle's Law, Charles' Law, and Carbohydrates met the necessary standards of acceptability for source, relevance for nature, and appropriateness for quality. To reinforce this findings, related study highlighted that video clips are more effective in improving student learning outcomes when they are carefully designed with engaging visuals, clear narration, and content that aligns with the curriculum. In contrast, videos that lack these essential qualities tend to have less impact on students' learning (Safitri et al., 2024). Another relevant study emphasizes that the evaluation findings indicating the learning video demonstrates a high level of quality, particularly in terms of creativity, which received the highest rating among all criteria. This suggests that the inclusion of visually appealing elements, engaging presentation styles, and effective multimedia integration successfully captured learners' attention and enhanced their overall viewing experience (Haerawan et al., 2024).

In conclusion, the video clips on Boyle's Law, Charles' Law, and Carbohydrates used in the intervention obtained an overall mean of 3.8, which was described as Very Acceptable in terms of source, nature, and quality. Therefore, the video clip-based instructional materials met the necessary standards of acceptability, relevance, and appropriateness for classroom implementation. With this result, it is highly recommended, that Science teachers should carefully select video clips as to the source, nature, and quality. Additionally, the video clips should be directly aligned with learning objectives and curriculum standards to maximize learning outcomes. To support this recommendation, it is important to consider the accuracy, clarity, and depth of selecting video clips taken from YouTube that will be integrated in the teaching-learning process. Through those criteria, the reliability and overall quality of instructional videos can be enhanced, making them more effective in delivering content, supporting learners' understanding, and improving overall performance (Andan & Aydin, 2022).

Pre-test Performance of the Experimental Group

Table 2 presents the results of the pre-test performance of the experimental group.

Table 2 Pre-test Performance of the Experimental Group

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

Score Range	Frequency	Percentage	Performance Level
45-50	0	0%	Advanced
43-44	0	0%	Proficient
40-42	0	0%	Approaching Proficiency
38-39	1	2.5%	Developing
37 & below	39	97.5%	Beginning
Total	40	100%	100%

As shown in Table 2, the majority of the students in the experimental group fell under the Beginning level, indicating low mastery of the Science concepts prior to the intervention. Only one student reached the Developing level, while none attained the Advanced, Proficient, and Approaching Proficiency levels. This suggests that the students had limited prior knowledge before the implementation of video clip-based instruction. To support this finding, ensuring that the groups have comparable mean scores in the pre-test before the intervention is crucial for establishing the validity of the post-test results, as it helps determine whether any observed differences can be attributed to the intervention rather than to pre-existing disparities between groups (Gray, 2023). The What Works Clearinghouse likewise emphasizes that establishing baseline equivalence between groups is essential in experimental and quasi-experimental studies because initial differences may bias the estimated effects of an intervention.

In light of these findings, it can be concluded that the pre-test performance of the experimental group was categorized under the Beginning level and described as Needs Improvement, indicating that learners had low mastery of the targeted Science concepts before the intervention. With this, it is recommended that Science teachers may consider integrating video clip-based instruction to enhance students' learning outcomes. This recommendation is supported by the study of Aguanta et al. (2024), which found that students who learned Science through instructional videos obtained significantly higher post-test scores and better concept retention than students exposed to traditional lecture-based instruction. The study further revealed that the engaging features of instructional videos, such as visual representations, motion graphics, and clear explanations, contributed to improved understanding and retention of scientific concepts.

Pre-test Performance of the Control Group

Table 3 presents the results of the pre-test performance of the control group.

Table 3 Pre-test Performance of the Control Group

Score Range	Frequency	Percentage	Performance Level
45-50	0	0%	Advanced
43-44	0	0%	Proficient
40-42	0	0%	Approaching Proficiency
38-39	1	2.5%	Developing
37 & below	39	97.5%	Beginning
Total	40	100%	100%

Table 3 shows that the majority of the students in the control group were classified under the Beginning level, indicating low mastery of the Science concepts before the intervention. Only one student reached the Developing level, while none attained the Advanced, Proficient, or Approaching Proficiency levels. These findings suggest that the students possessed limited prior knowledge of the Science concepts covered in the study. Comparing the pre-test mean scores of the experimental and control groups is essential for determining whether the groups had similar baseline performance before the intervention. Capili and Anastasi (2024) explained that a pre-test–post-test design with a control group helps researchers manage potential threats to internal validity and strengthens the assessment of whether an observed outcome is associated with the intervention rather than with external or pre-existing factors.

Taken together, the control group's pre-test performance was also classified under the Beginning level. The statistical comparison of the pre-test results indicated that the control and experimental groups had comparable levels of performance before the intervention. Therefore, any subsequent difference in their post-test performance may be more reasonably associated with the instructional intervention rather than with pre-existing differences between the groups. In light of these findings, Science teachers are encouraged to consider integrating video clip-based instruction to improve students' academic performance. A relevant study reported that the integration of video clips into instruction has become increasingly prevalent in high schools because of continuing advances in digital technology. Based on standards established by the Organization for Economic Co-operation and Development (OECD), assessment results indicated that students obtained higher Science scores when video clips were incorporated into instruction (Chang et al., 2020). Moreover, video clip-based instruction can improve students' understanding, enrich learning content, and increase engagement (Wong, 2020).

Pre-test Performance of the Experimental and Control Groups

Table 4 presents the results of the pre-test mean scores of the experimental and control groups.

Table 4 Pre-test Performance of the Experimental and Control Groups

Group	Mean (%)	SD (%)	Performance Level	Description
Experimental	47.50	14.31	Beginning	Needs Improvement
Control	45.10	13.46	Beginning	Needs Improvement
Welch baseline test	$t(77.71) = 0.77$	$p = .442$	Cohen's $d = 0.17$	Not significant

As reflected in Table 4, the experimental group obtained a mean pre-test percentage score of 47.50 ($SD = 14.31$), whereas the control group obtained 45.10 ($SD = 13.46$). Welch's independent-samples t-test showed that the 2.40-point baseline difference was not statistically significant, $t(77.71) = 0.77$, $p = .442$, Cohen's $d = 0.17$. Both groups were classified at the Beginning level. The small standardized difference supports baseline comparability, although equivalence cannot be guaranteed with only two intact classes.

The nonsignificant baseline comparison indicated no evidence of a pre-intervention difference between the participating classes. ANCOVA was nevertheless used as the primary analysis to adjust the post-test comparison for individual baseline scores.

In summary, the experimental and control groups demonstrated the same level of pre-test performance, as both were classified under the Beginning level and described as Needs Improvement. The statistical analysis indicated that the two groups had comparable performance before the intervention. Based on these findings, Science teachers are encouraged to consider integrating video clip-based instruction to improve students' academic performance. This recommendation is supported by Zarco et al. (2026), who found that many students initially demonstrated only a Satisfactory level of performance before the intervention. However, after exposure to video clip-based instruction, the majority achieved an Outstanding level, indicating that the approach enhanced their comprehension and retention of the learning material. The improvement was even more evident in students' performance of the targeted skills. Although several learners initially displayed only Satisfactory performance, all students achieved an Outstanding level after engaging in video-supported practice. This result suggests that video-based instruction enabled the students to understand and accurately perform the targeted skills.

Post-test Performance of the Experimental Group

Table 5 presents the results of the post-test performance of the experimental group.

Table 5 Post-test Performance of the Experimental Group

Score Range	Frequency	Percentage	Performance Level
45-50	15	37.5%	Advanced
43-44	10	25%	Proficient
40-42	6	15%	Approaching Proficiency
38-39	6	15%	Developing
37 & below	3	7.5%	Beginning
Total	40	100%	100%

Most of the students in the experimental group moved to the Approaching Proficiency and Advanced levels after exposure to video clip-based instruction. According to DepEd Order No. 73, s. 2012, Guidelines on the Assessment and Rating of Learning Outcomes under the K to 12 Basic Education Curriculum state that students at this level exceed core requirements in terms of knowledge, skills, and understandings and can transfer them automatically and flexibly through authentic performance task. The reduction in the number of students under Beginning level indicates improvement in mastery of Science concepts. This significant improvement in the post-test performance of the experimental group suggests that video clip-based instruction positively influenced students' understanding of Science concepts. The use of visual and auditory elements likely enhanced comprehension of abstract scientific processes. Furthermore, video-based instruction may have increased student engagement and motivation, contributing to improved Science performance. To support this findings, higher mean score of the experimental group suggests that the students who were exposed to video clip-based instruction performed better than those who received traditional instruction. Bullo (2021) emphasized the significance of integrating video clip-based instruction, especially in science, as they have been found to be highly effective.

To conclude, the post-test performance of experimental group was classified under the Proficient level, suggesting that the students who were exposed to video clip-based instruction performed better than those who received traditional instruction. With this, it is recommended that Science teachers should consider the integration of video clip-based instruction to improve the students' performance. A relevant study that supports the recommendation by Sun and Zhang (2020) found that high school students regarded video-based instruction as an effective and valuable learning approach because it enabled them to study at a pace suited to their individual needs and abilities. The flexibility of video materials allowed learners to pause, replay, and review complex lessons until they developed a clearer understanding of the concepts. Moreover, students perceived video-based instruction as more engaging than traditional classroom methods because it created additional opportunities for active participation, critical thinking, meaningful discussion, and peer collaboration. These findings suggest that video-based instruction not only supports independent and personalized learning but also promotes a more interactive and student-centered learning environment.

Post-test Performance of the Control Group

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

Table 6 presents the results of the post-test performance of the control group.

Table 6Post-test Performance of the Control Group

Score Range	Frequency	Percentage	Performance Level
45-50	4	10%	Advanced
43-44	3	7.5%	Proficient
40-42	6	15%	Approaching Proficiency
38-39	9	22.5%	Developing
37 & below	18	45%	Beginning
Total	40	100%	100%

Table 6 presents the post-test performance of the control group, which was taught without the integration of video clip-based instruction. Although some improvement was observed, many students remained at the Beginning level. Compared with the experimental group, fewer students in the control group reached the higher performance levels, indicating a lower degree of improvement. This finding is supported by Mutu et al. (2020), who emphasized that video clip-based instruction has the potential to simplify complex concepts, demonstrate real-world applications, and capture students' attention more effectively than traditional teaching approaches. Through visual demonstrations and concrete examples, video clips may help students understand abstract Science concepts more easily and retain information more effectively. Thus, the absence of video clip-based instruction may have limited the control group's opportunities for meaningful visualization, active engagement, and deeper understanding of the lessons.

It can therefore be concluded that the control group's post-test performance remained at the Beginning level, indicating less improvement than the experimental group exposed to video clip-based instruction. This difference suggests that integrating video clips may have helped students better understand and retain complex Science concepts. Therefore, Science teachers are encouraged to incorporate relevant and carefully selected video clips into their lessons to improve students' engagement, comprehension, and academic performance. This recommendation is supported by Velunta (2021), who emphasized that educational technology can improve learning outcomes and that video clip-based instruction can be an effective strategy for teaching Science. Video clips make abstract scientific concepts clearer, more engaging, and meaningful through visual examples.

Post-test Performance of the Experimental and Control Groups

Table 7 presents the results of the post-test mean scores of the experimental and control groups.

Table 7 Post-test Performance of the Experimental and Control Groups

Group	Mean (%)	SD (%)	Performance Level	Description
Experimental	85.15	7.96	Proficient	Very Satisfactory
Control	68.40	17.00	Beginning	Needs Improvement

As reflected in Table 7, the experimental group obtained a post-test mean of 85.15 (SD = 7.96), classified as Proficient, whereas the control group obtained 68.40 (SD = 17.00), classified as Beginning. These descriptive statistics use percentage scores consistently for both means and standard deviations. The unadjusted difference

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

favors the experimental group, but the primary inference is based on ANCOVA controlling for pre-test performance.

Generally, the experimental group who were exposed to video clip-based instruction, demonstrated higher post-test performance compared to the control group who were received traditional method of teaching. To support this findings, higher mean score of the experimental group suggests that the students who were exposed to video clip-based instruction performed better than those who received traditional instruction. The standard deviation values indicate the degree of variability in students' performance within each group. Relevant study by Farooq, Qadir, and Sahid (2022) emphasized that the lecture method fosters less engagement in the teaching-learning process, thus failing to achieve competency in learning. Therefore, teachers should deviate from traditional teaching methods and adopt current trends in teaching science, such as utilizing YouTube video clips.

Overall, the experimental group obtained a mean score of 85.15 (SD = 7.96), classified under the Proficient level and described as Very Satisfactory Performance. In contrast, the control group obtained a mean score of 68.40 (SD = 17.00), classified under the Beginning level and described as Needs Improvement. Therefore, the higher post-test mean score of the experimental group suggesting that the students who were exposed to video clip-based instruction performed better than those who received traditional instruction. Furthermore, it is highly recommended that schools should ensure that teachers and students have access to high-quality, reliable, and curriculum-aligned educational video resources that will be used in the video clip-based instruction. Related studies indicate that the use of multimedia learning materials, particularly video clip-based instruction, is grounded in established learning theories, including Cognitive Theory of Multimedia Learning. This theory highlights that learners process information through two channels, visual and auditory, which work together to enhance understanding and memory retention. By engaging both visual and auditory channels, video clip-based instruction helps learners organize information and reduce cognitive overload. Clear explanations and visual demonstrations also promote deeper comprehension and improve the retention of complex concepts (Thoriq et al., 2024).

Significant Difference Between the Pre-test and Post-test Performance

Table 8 presents the significant difference between the pre-test and post-test mean scores of experimental and control groups.

Table 8 Significant Difference Between the Pre-test and Post-test Performance

Group	Test	Mean (%)	SD (%)	Performance Level	t	p	Interpretation
Experimental	Pre-test	47.50	14.31	Beginning			
	Post-test	85.15	7.96	Proficient	13.45	< .001	Significant
Control	Pre-test	45.10	13.46	Beginning			
	Post-test	68.40	17.00	Beginning	7.61	< .001	Significant

Table 8 shows significant within-group improvement in both classes using the actual percentage scores. The experimental group increased from 47.50 to 85.15, mean gain = 37.65, $t(39) = 13.45$, $p < .001$. The control group increased from 45.10 to 68.40, mean gain = 23.30, $t\ (39) = 7.61$, $p < .001$. These paired tests indicate improvement within each class but do not determine whether the adjusted post-test outcomes differed between groups. ANCOVA provides that primary comparison.

Improvement in both groups may reflect instruction, maturation, repeated exposure to the same assessment, or other shared influences. The larger gain in the experimental group is descriptive supporting evidence, while the adjusted between-group effect is evaluated through ANCOVA.

Accordingly, the paired-samples results are interpreted as supporting evidence only. Repeated administration of the same test remains a possible testing effect in both groups.

A study by Mohammed and Ogar (2023) revealed that using YouTube video clips as an instructional tool is more effective for teaching, showing a statistically significant improvement in both student performance and retention among those exposed to video clip-based instruction. This suggests that incorporating a YouTube video clip can enhance learners' academic performance. On the other hand, traditional instruction that does not integrate video clip may be less engaging for students, potentially leading to lower scores and weaker academic performance.

Based on the findings, there was a significant improvement of the pre-test and post-test performance of experimental group exposed to video clip-based instruction as compared to the control group taught without video clip-based instruction. This notable improvement between pre-test and post-test scores following the use of video clip-based instruction in science, indicates that students learn more effectively when information is delivered through a combination of words and visuals rather than text alone. This gain also highlights the effectiveness of student-centered learning approaches, as video clip-based instruction fosters interaction, stimulates curiosity, and encourages inquiry-driven exploration. These findings emphasize the effectiveness of video clip-based instruction. Similar study highlighted that video clip-based instruction can significantly improve students' engagement and comprehension level. However, research also reveals that videos are most effective when integrated with opportunities for critical thinking and collaboration. Video clip-based instruction should be integrated with interactive discussions or group activities to create deeper and more meaningful learning experiences (Gómez-Ortega et al., 2022; Onasanya et al., 2022; Millatina et al., 2022; Maulid & Sakti, 2022; Azizah et al., 2022; Hofifah & Sumiati, 2023).

Ultimately, video clip-based instruction significantly improved the Science performance of Junior High School students as evident in the pre-test and post-test performance in which, experimental group obtained higher mean score from 47.50 to 85.15 than control group which obtained a mean score from 45.10 to 68.40. Therefore, integration of video clip-based instruction in the teaching-learning process is effective. With this result, it is highly recommended that the schools and educational institutions should provide professional development and training programs to equip teachers with the skills necessary to effectively integrate video clip-based instruction in the teaching-learning process. To reinforce this recommendation, De Vera et al. (2021) emphasized the urgent need for teacher education institutions to take an active role in preparing teachers with the knowledge and competencies required to effectively integrate technology, particularly video-based instruction into their lesson planning. The study stresses that such integration is crucial in addressing the changing demands of science education. In addition, the government plays a significant role in supporting teachers by providing the necessary resources to enhance instructional delivery. This support may include the establishment of ICT-equipped classrooms, the provision of technical assistance, access to laptops or other digital devices, and stable internet connectivity. These efforts collectively enable educators to implement technology-driven teaching strategies more effectively.

Paired t-test Result of Pre-test and Post-test Performance

Table 9 presents the paired t-test result of pre-test and post-test mean differences of experimental and control groups.

Table 9 Paired t-test Result of Pre-test and Post-test Performance

Group	Mean gain	SD gain	t	df	p	Cohen's d
Experimental	37.65	17.70				
Control	23.30	19.37	3.46	77.37	< .001	0.77

As shown in Table 9, the experimental group's mean gain was 37.65 percentage points (SD = 17.70), while the control group's mean gain was 23.30 percentage points (SD = 19.37). A Welch independent-samples comparison

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

of gains was statistically significant, t (77.37) = 3.46, $p < .001$, Cohen's d = 0.77. This sensitivity analysis is consistent with the ANCOVA result but is not treated as the primary analysis.

This result supports the findings of Afifah et al. (2022), who reported a significant improvement in students' learning outcomes after using multimedia-based instructional materials. Likewise, Aguanta et al. (2024) found that students taught Science using instructional videos demonstrated better post-test performance and concept retention than those taught through traditional lectures.

Therefore, it can be concluded that video clip-based instruction contributed positively to students' understanding and retention of Science concepts. Based on these findings, Science teachers are encouraged to integrate carefully selected video clips with discussions, experiments, guide questions, and formative assessments to promote active and meaningful learning. Future researchers should also compare the gain scores of the two groups directly and report the effect size to determine whether the experimental group's improvement was statistically and practically greater than that of the control group.

Direct Comparison of Gain Scores Between Groups

Table 10 presents the ANCOVA results comparing post-test performance after controlling for pre-test scores.

Table 10 Direct Comparison of Gain Scores Between Groups

ANCOVA Component	Statistic	df	p	Effect Size/Interpretation
Group × Pre-test	F = 2.99	1, 76	.088	Homogeneity of slopes supported
Adjusted group effect	F = 30.78	1, 77	< .001	Partial eta squared = .286
HC3 robust group effect	z = 5.46	-	< .001	Robust conclusion unchanged

The preliminary analysis showed that the interaction between instructional group and pre-test score was not statistically significant, F (1, 76) = 2.99, p = .088. This result indicates that the relationship between pre-test and post-test scores did not differ significantly between the experimental and control groups. Therefore, the homogeneity-of-regression-slopes assumption was reasonably satisfied, supporting the use of ANCOVA to compare the groups' post-test performance while controlling for their baseline scores.

After adjusting for pre-test performance, the instructional group had a statistically significant effect on post-test scores, F (1, 77) = 30.78, $p < .001$, partial $\eta^2 = .286$. The experimental group obtained an adjusted post-test mean of 85.07, whereas the control group obtained an adjusted mean of 68.48. The adjusted mean difference was 16.60 percentage points, with a 95% confidence interval from 10.64 to 22.55. Because the confidence interval does not include zero, the result provides further evidence of a meaningful difference between the adjusted post-test means of the two groups.

The partial η^2 value of .286 indicates that approximately 28.6% of the variance in post-test performance, after accounting for pre-test scores, was associated with instructional group membership. This represents a large effect and suggests that the difference between the two instructional conditions was not only statistically significant but also educationally meaningful within the participating sample.

Because the residual variances differed between the groups, the ANCOVA result was also examined using HC3 heteroscedasticity-robust standard errors. The robust analysis confirmed that the adjusted group effect remained statistically significant, z = 5.46, $p < .001$. Thus, the conclusion did not depend solely on the conventional equal-variance assumption and remained unchanged after applying the robust statistical adjustment.

Overall, the findings indicate that, after controlling for baseline performance, the Grade 10 students exposed to video clip-based instruction achieved significantly higher post-test scores than those taught through lecture-based instruction. The result supports the use of carefully selected and curriculum-aligned video clips, together

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VIII August 2026

with guided viewing questions, pause-and-discuss activities, and formative assessments, in teaching Boyle's Law, Charles' Law, and Carbohydrates. However, the finding should be interpreted cautiously because only two intact classes participated, with one class representing each instructional condition. Therefore, the result is limited to the participating Grade 10 students, the selected Science topics, and the specific school context, and should not be interpreted as definitive evidence that the same effect will occur in other populations or educational settings.

ANCOVA Result for Post-test Performance Controlling for Pre-test Scores

Table 11 presents the adjusted post-test means and the ANCOVA group effect, with pre-test performance entered as the covariate.

Group	Adjusted mean	Adjusted difference	95% CI	F	p	Partial eta squared
Experimental	85.07	16.60	[10.64, 22.55]	30.78	< .001	.286
Control	68.48					

The homogeneity-of-regression-slopes test was not statistically significant, $F(1, 76) = 2.99$, $p = .088$, supporting use of the common-slope ANCOVA model. After adjustment for pre-test performance, the experimental group had an adjusted post-test mean of 85.07, compared with 68.48 for the control group. The adjusted difference was 16.60 percentage points, 95% CI [10.64, 22.55], $F(1, 77) = 30.78$, $p < .001$, partial eta squared = .286. Because residual variances differed between groups, HC3 robust standard errors were also examined; the adjusted group coefficient remained significant, $z = 5.46$, $p < .001$, with the same 95% CI. Thus, the substantive conclusion was robust to heteroscedasticity.

The primary null hypothesis was rejected. After controlling for baseline performance, the participating experimental class achieved a significantly higher adjusted post-test mean than the participating control class. The large partial eta-squared value indicates a substantial group association within this sample. However, because only one intact class represented each condition, the result should not be generalized beyond these participants or interpreted as definitive evidence of an individual-level causal effect.

In summary, ANCOVA rejected the primary null hypothesis, $F(1, 77) = 30.78$, $p < .001$, partial eta squared = .286. Adjusted post-test performance was higher in the experimental group by 16.60 percentage points, 95% CI [10.64, 22.55], and the conclusion was unchanged with HC3 robust standard errors. Among the 80 participating Grade 10 students and the selected topics of Boyle's Law, Charles' Law, and Carbohydrates, video clip-based instruction was associated with higher post-test performance after adjustment for baseline scores. This conclusion remains limited by the two-class design, the repeated use of the same test, and the short intervention period.

Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, only two intact Grade 10 classes participated, with one class assigned to each instructional condition. Consequently, class-level characteristics could not be separated completely from the effects associated with the instructional treatment. Second, the same 50-item test was administered before and after the intervention; therefore, familiarity with the test items or format may have contributed to the improvement observed in both groups. Third, the residual variances differed between the groups. To address this statistical concern, HC3 heteroscedasticity-robust standard errors were examined, and the conclusion of the ANCOVA remained unchanged. Finally, the intervention lasted only two weeks and covered Boyle's Law, Charles' Law, and Carbohydrates. Therefore, the findings and conclusions are limited to the participating Grade 10 students, the selected Science topics, and the specific school context. The results should not be generalized to other grade levels, schools, subject areas, or instructional periods without further research.

Proposed Strategies to Improve Video Clip-based Instruction

Introduction

Technology integration can make Science lessons more interactive and meaningful, particularly through video clips that illustrate abstract concepts and real-world processes using visual and auditory information. The study found that students in the experimental group who were exposed to video clip-based instruction improved more than those in the control group, suggesting its potential to enhance understanding, engagement, and retention. However, its effectiveness depends on video quality, length, alignment with learning objectives, teacher facilitation, assessment activities, and available technological resources. Thus, appropriate strategies are proposed to strengthen its implementation in Junior High School Science classes.

Rationale

The proposed strategies were developed in response to the students' low pre-test performance and the greater improvement observed among those exposed to video clip-based instruction. Although videos can make scientific concepts more concrete and understandable, meaningful learning requires proper planning and teacher guidance to prevent passive viewing, overlooked information, and cognitive overload. Thus, video materials should be concise, relevant, developmentally appropriate, and aligned with the intended learning competencies. Teachers should also guide learners before, during, and after viewing through questions, discussions, reflection activities, and formative assessments. Moreover, sufficient teacher training and reliable technological resources are necessary to promote the systematic and effective use of video clips as supplementary materials in Science instruction.

Objectives

The proposed strategies aim to improve the planning, implementation, and evaluation of video clip-based instruction in Junior High School Science. Specifically, they seek to guide teachers in selecting concise and objective-aligned videos, promote active viewing and formative assessment, improve students' understanding and retention of complex concepts, encourage critical thinking and collaboration, strengthen teachers' multimedia-integration skills, ensure adequate technological resources, and create a more engaging and student-centered learning environment.

Components

The proposed intervention consists of six interconnected components: the selection of short, accurate, age-appropriate, and objective-aligned videos; guided viewing activities that direct students' attention to essential concepts; interactive facilitation through the Pause-and-Discuss technique; formative assessments and timely feedback to identify misconceptions and measure understanding; teacher capacity-building through training, collaborative planning, and continuous support; and technical and institutional assistance to ensure the availability of functional equipment, reliable connectivity, offline video materials, and alternative resources. Together, these components promote the systematic, engaging, and effective integration of video clips into Junior High School Science instruction.

Proposed Strategies to Improve Video Clip-based Instruction

1. Use Short and Objective-Aligned Video Clips. Teachers should select video clips that are concise and directly aligned with the lesson objectives. Short, focused videos help maintain students' attention and prevent cognitive overload. As what stated in the study of Wali (2025), shorter video durations underscore the need to tailor contain length to match learners' attention spans and improve learning outcomes. Studies in educational psychology indicate that keeping or selecting video clips ranges from 3 to 6 minutes is most effective for maintaining attention and maximizing retention.

2. Integrate Guided Viewing Questions. Before showing the video clip, teachers may provide guide questions to focus students' attention on key concepts. After viewing, follow-up questions and discussions should be

conducted to deepen understanding and promote critical thinking. According to Noetel et al. (2021), combining the video content with interactive elements such as discussions and hands-on activities can enhance students' engagement, promote deeper understanding, and encourage active participation in the learning process.

3. Apply Pause-and-Discuss Technique. Teachers may pause the video at critical points to clarify important ideas, ask questions, or encourage predictions. This strategy promotes active learning rather than passive viewing. Supporting this technique, learners achieve better understanding when they are guided on how and when to use video controls, such as pausing, especially when engaging with complex material. In this context, the Pause-and-Discuss technique can be effectively facilitated by the teacher, who takes an active role in playing the video and intentionally pausing at key moments to prompt questions, reflection, or discussion among learners. By structuring these pauses and directing students' attention to specific ideas or concepts, the teacher helps maximize the benefits of video-based instruction while fostering metacognitive awareness. This guided approach not only keeps students engaged but also supports deeper comprehension and more meaningful learning experiences (Lin et al., 2022).

4. Incorporate Formative Assessments. Short quizzes, reflection activities, or group tasks may be given after viewing the video to reinforce learning comprehension immediately. As what emphasized in the study of Agtarap et al. (2024), assessment strategies should be adaptable to learners' varying circumstances and needs. They also highlight the importance of sustaining student engagement by offering diverse tasks that extend beyond traditional classroom activities and evaluations.

5. Provide Teacher Training on Multimedia Integration. Schools may conduct seminars or workshops to train teachers on the effective integration of video-based instructional materials, ensuring proper selection, timing, and facilitation techniques. Teacher readiness and competence remain significant challenges, as many educators find it difficult to effectively implement multimedia tools, particularly video clip-based instruction due to limited experience, training, and institutional support. This highlights the need to strengthen teachers' preparedness through targeted training and continuous support to ensure they can confidently and effectively integrate video clip-based strategies into their instruction (Meštri´c et al., 2024; Chang & Kabilan, 2024; Ngongpah & Yetunde, 2025).

6. Ensure Technical Preparedness. Proper audio-visual equipment, stable electricity, and clear projection systems must be ensured to avoid interruptions that may affect the learning process. The studies revealed that infrastructure and technical support continue to be major barriers, as many institutions do not have sufficient audio-visual equipment, stable internet connectivity, or access to technical personnel (Meštri´c et al., 2024; Bello et al., 2025).

The findings indicate that video clip-based instruction is more effective when videos are concise, aligned with learning objectives, and combined with active learning activities. Segmented videos with questions, explanations, and summarization were found to improve student comprehension and learning outcomes (Prabawa et al., 2024). Formative assessments should also be connected to instructional objectives and used to identify students' learning needs and guide subsequent teaching decisions (van der Steen et al., 2023).

In closing, video clips should not be used merely for passive viewing. Their effectiveness depends on purposeful teacher facilitation through guide questions, structured pauses, discussions, and immediate assessment activities. Although Dalton et al. (2023) found that students could learn through different video formats, their study reinforced the educational value of integrating formative questions and active learning elements into video-supported lessons. With this, it is highly recommended that Science teachers should use short and objective-aligned videos with guided questions, Pause-and-Discuss techniques, and formative assessments. Schools should likewise provide continuous training, functional technology, reliable connectivity, and technical support. Such provisions can enhance teachers' digital competence and effective use of multimedia resources (Peng et al., 2024; Rawal, 2024).

ACKNOWLEDGEMENTS

The researcher would like to express sincere gratitude to all the individuals who contributed to the successful completion of this study. First and foremost, heartfelt thanks are extended to the Almighty God for providing strength, guidance, and wisdom throughout the entire research process. Deep appreciation is given to the research adviser for the valuable guidance, constructive suggestions, and continuous support that greatly improved the quality of this study. The researcher is also grateful to the panel members for their insightful comments and recommendations, which helped refine and strengthen the research work.

Special thanks are extended to the school head of Palimbang National High School for allowing the researcher to conduct the study and for providing the necessary support during data collection. The researcher also sincerely acknowledges the Science teacher who served as the instructor for both the experimental and control groups during the intervention, for his dedication and assistance in ensuring the smooth implementation of the study. The researcher also expresses sincere appreciation to the Grade 10 students who participated as respondents, for their cooperation, time, and active involvement, which made this study possible.

The researcher would also like to thank family and friends for their unwavering encouragement, understanding, and moral support throughout the completion of this research. Their motivation served as a source of inspiration during challenging times. Finally, appreciation is extended to everyone who, in one way or another, contributed to the completion of this study but were not mentioned individually. Your support and assistance are deeply valued and will always be remembered.

REFERENCES

1. Agbarakwe, H. A., & Ossai-Chidi, A. G. (2025). Effect of Mayer’s modality principle of multimedia design on secondary school students’ performance in biology in Rivers State. Faculty of Natural and Applied Sciences Journal of Mathematics, and Science Education, 6(2), 49–56. https://fnasjournals.com/index.php/FNAS- JMSE/article/view/688
2. Agtarap, H. J., Januto, A. C., Aglibot, K. A., & Toquero, C. M. (2024). Assessment strategies and challenges of teachers in evaluating students during online learning. Journal of Digital Educational Technology, 4(2), ep2418. https://doi.org/10.30935/jdet/14863
3. Aguanta, C. B., Augusto, M. A. T., Bajenting, J. V., Buayaban, K. C., Cruz, E. J. P., Fantonial, N. F., Kwan, J. A. M., Legaspino, J., Acut, D. P., & Picardal, M. T. (2024). Factors affecting students' concept retention in learning science online using instructional videos. Journal of Education and Learning, 18(2), 499–511. https://doi.org/10.11591/edulearn.v18i2.21117
4. Ahyar, A., Nurhidayah, N., & Saputra, A. (2022). Implementasi Model Pembelajaran TaRL dalam Meningkatan Kemampuan Literasi Dasar Membaca Peserta Didik di Sekolah Dasar Kelas Awal. JIIP - Jurnal Ilmiah Ilmu Pendidikan, 5(11), 5241–5246. https://doi.org/10.54371/jiip.v5i11.1242
5. Amarulloh, A., & Dzakiria, H. (2021). Development and validation of chemistry learning videos as learning media in the era of the COVID-19 pandemic. Journal of Sustainability Science and Technology, 1(2), 80-88.
6. Andan, C., & Aydin, M. F. (2022). Evaluation of the reliability and quality of YouTube videos on ovarian cysts. Cureus, 14(3), Article e22739. https://doi.org/10.7759/cureus.22739
7. Arakawa, R., & Yakura, H. (2021). Mindless attractor: A false-positive resistant intervention for drawing attention using auditory perturbation. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (Article 476, pp. 1–15). Association for Computing Machinery. https://doi.org/10.1145/3411764.3445339
8. Astriyani, A., & Fajriani, F. (2020). Pengaruh penggunaan media audio visual youtube materi pythagoras terhadap keaktifan belajar matematika siswa. FIBONACCI, 6(1), 87–90. https://doi.org/10.24853/fbc.6.1.87-90

9. Azizah, S.N., Nandiyanto, A.B.D., Wulandary, V., & Irawan, A.R. (2022). Implementation of video learning media in Islamic religious education subjects for elementary school students. Indonesian Journal of Multidisciplinary Research, 2(1), 91-96.
10. Bajahzar, A. (2024). Multimedia educational system and its improvement using AI model for a higher education platform. SN Computer Science, 5(6), 702.
11. Barut Tugtekin, E., & Dursun, O. O. (2022). Effect of animated and interactive video variations on learners' motivation in distance education. Education and Information Technologies, 27(3), 3247-3276.
12. Bello, A., Deba, A. A., Yaduma, P. S., & Mohammed, S. A. (2025). Exploring the instructional benefits and challenges of hypermedia instructional resources in enhancing teaching and learning outcomes in electrical/electronics technology education in northern Nigerian universities. International Journal of Scientific Research in Multidisciplinary Studies, 11(1), 1–7. https://doi.org/10.26438/ijsrms/v11i1.17
13. Bello, J. B., Concon, L. S., Polache, M. C. C., Ayaton, M. J. C., Manlicayan, R. D., Campomanes, J. P., & Saro, J. M. (2023). Contextualized and localized science teaching and learning materials and its characteristics to improve students' learning performance. Psychology and Education: A Multidisciplinary Journal, 7(1), 77–84. https://doi.org/10.5281/zenodo.7607686
14. Bullo, M. (2021). Integration of video lessons to Grade-9 science learners amidst the COVID-19 pandemic. International Journal of Research Studies in Education, 10(9).
15. Capili, B., & Anastasi, J. K. (2024). An introduction to the quasi-experimental design (nonrandomized design). American Journal of Nursing, 124(11), 50–52. https://doi.org/10.1097/01.NAJ.0001081740.74815.20
16. Caratiquit, K. (2022). YouTube videos as supplementary materials to enhance computer troubleshooting and repair techniques for senior high school students in the Philippines. International Journal of Social Learning, 2(3), 297-307. https://doi.org/10.47134/ijsl.v2i3.150
17. Caratiquit, K., & Pablo, R. (2021). Exploring the practices of secondary school teachers in preparing for classroom observation amidst the new normal of education. Journal of Social, Humanity, and Education. DOI: 10.35912/jshe.v1i4.721
18. Casildo, N. J. G., Aguirre, M. R. C., Bonifacio, K. L. A., Ayunar, G. S., Escarlos, G. S., & Wenceslao, R. C. (2023). A decision support system for predicting students' performance in the National Achievement Test (NAT) of senior high school students. In J. Handhika et al. (Eds.), Proceedings of the 3rd International Conference on Education and Technology (ICETECH 2022) (pp. 178–190). Atlantis Press. https://doi.org/10.2991/978-2-38476-056-5_20
19. Casiño, R., Delos Reyes, M., & Tan, G. (2020). Study habits, attitudes toward Science, and academic performance: A study among Filipino high school students. Journal of Science Education Research, 12(3), 45-56.
20. Chang, S. C., Hsu, T. C., Chen, Y. N., & Jong, M. S. Y. (2020). The effects of spherical video-based virtual reality implementation on students' natural science learning effectiveness. Interactive Learning Environments, 28(7), 915929. https://www.tandfonline.com/doi/abs/10.1080/10494820.2018.154849.
21. Chang, S. & Kabilan, M. (2024). Using social media as e-Portfolios to Support Learning in Higher Education: A Literature Analysis. Journal of Computing in Higher Education, 36, 1-28
22. Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education (8th ed.). Routledge. https://doi.org/10.4324/9781315456539
23. Dalton, L., Jager, K., Rose, J. M., & Smyth, J. C. (2023). Pacing online learning: The impact of video segmentation and active learning on conceptual understanding in STEM [White paper]. Oregon State University Ecampus Research Unit. https://ir.library.oregonstate.edu/concern/defaults/73666d614
24. Daniyati, A. (2023). Basic Concepts of Learning Media. Journal of Student Research (JSR), 1 (1), 285–296.
25. De Vera, J. L., Andrada, M. D., Bello, A., & De Vera, M. G. (2021). Teachers' competencies in educational technology integration on instructional methodologies in the new normal. Lukad: An Online Journal of Pedagogy 1(1), 61- 8 0.: https:/ /ssrn.com /abstract=3885890
26. Delfino, A. (2019). Student engagement and academic performance of students of Partido State University. Asian Journal of University Education, 2019, 15(4). https://files.eric.ed.gov/fulltext/EJ1222588.pdf

27. DepEd Order 08. (2015). Policy guidelines on classroom assessment for the K to 12 basic education program. https://deped.gov.ph/2015/04/01/do-8-s-2015
28. DepEd Order No. 73. (2012). Learning outcomes under the K to 12 basic education guidelines on the assessment and rating of learning outcomes under the K to 12 basic education curriculum.
29. Department of Education. (2019). Policy guidelines on the K to 12 Basic Education Program (DepEd Order No. 21, s. 2019). Retrieved from https://www.deped.gov.ph
30. Department of Education. (2021). Adoption of the Basic Education Development Plan (BEDP) 2030 (DepEd Order No. 39, s. 2021). Retrieved from https://www.deped.gov.ph
31. Dham, K. (2021.). Video-based learning: The new normal. BW Education. http://bweducation. businessworld.in/article/Video-Based-Learning- The- New-Normal/15-06-2021-393139/
32. Doblada, J. C. L., & Caballes, D. G. (2021). Relationship of teachers' technology skills and selected profile: Basis for redesigning training for online distance learning modality. Asian Journal of Multidisciplinary Studies, 4(2), 41–46.
33. Dziadkowiec, O. (2024). Statistical methods for pre-post intervention design. Journal of Obstetric, Gynecologic & Neonatal Nursing, 53(1), 9–13.
34. EarthPen. (2018). Boyle's law | Animation [Video]. YouTube. https://youtu.be/YQmv272-4yU?si=gsHEn14M-DBB3n5TEarthPen. (2018). Charles' law | Animation [Video]. YouTube. https://youtu.be/twCcSsHmMgI?si=JzkCVNG8V2adDkP-
35. Free Animated Education. (n.d.). Carbohydrates and its types [Video]. YouTube. https://youtu.be/IJUwdIups9o?si=KVOvx67FzrnpAwOB
36. Galatsopoulou, F., Kenterelidou, C., Kotsakis, R., & Matsiola, M. (2022). Examining students' perceptions towards video-based and video-assisted active learning scenarios in journalism and communication courses. Education Sciences, 12(2), 74. https://doi.org/10.3390/educsci12020074
37. Geyser, W. (2022). The Ultimate Guide to Short-Form Video Content [Internet]. Influencer Marketing Hub. Available from: https://influencermarketinghub.com/short-form-video-content/
38. Glover, F. (2023). Instructional designers' strategies managing cognitive load in multimediae-learning: Basic qualitative study (Doctoral dissertation, Capella University).
39. Gómez-Ortega, A., Macías-Guillén, A., & Sánchez-de Lara, M. Á. (2022). Video instruction and collaborative approaches in higher education: A critical review. International Journal of Educational Research, 114, 101–115.
40. Gray, J. G. S (2023). Burns & Groves: The practice of nursing research: Appraisal, synthesis, and generation of evidence (9th ed.). Elsevier.
41. Haerawan, H., Cale, W., & Barroso, U. (2024). The effectiveness of interactive videos in increasing student engagement in online learning. Journal of Computer Science Advancements, 2(5), 244–258.
42. Halder, S., & Saha, S. (2023). The Routledge handbook of education technology. Routledge India. https://doi.org/10.4324/9781003293545
43. Hartig, H., et al. (2020). Contextualization in the assessment of students' learning about science. In international perspectives on the contextualization of science education (pp 131-132).https://doi.org/10.1007/978-3-030-27982-0
44. Hidayat, A. (2021). Persepsi siswa terhadap penggunaan Youtube sebagai sumber belajar siswa Di SMAN 1 Satui. Universitas Lambung Mangkurat.
45. Hofifah, S.N., & Sumiati, S. (2023). The effectiveness of the practicum video guide on distance learning in improving biology learning outcomes in enzyme content. Indonesian Journal of Teaching in Science, 3(2), 201-212.
46. Hsieh, Y. (2020). Effects of video captioning on EFL vocabulary learning and listening comprehension. Computer Assisted Language Learning, 33(5–6), 567–589.
47. Hsu, F. H., Lin, I. H., Yeh, H. C., & Chen, N. S. (2022). Effect of socratic reflection prompts via video-based learning system on elementary school students' critical thinking skills. Computers & Education, 183, 104497.
48. Huang, C. Y., & Chen, G. H. (2023). Analyzing student engagement with educational videos: A temporal perspective. Educational Technology & Society, 26 (1), 20-34
49. Indriani, S. (2020). Utilizing a recorded-video to assess speaking and presentation skills of pre service teachers. Scholaria: Jurnal Pendidi kan Dan Kebuda a an, 10(1), 60–65. DOI: https://doi.org/10.24246/j.js.2020.v10.i1.p60-65

50. Insorio, A. O., & Macandog, D. M. (2022). Video lessons via YouTube channel as mathematics interventions in modular distance learning. Contemporary Mathematics and Science Education, 3(1), ep22001. https://doi.org/10.30935/conmaths/11468.
51. Ismiyanti, Y., Permatasari, D., Mayasari, N., & Qoni'ah, M. (2023). The impact of video-based learning to cognitive learning outcome of student in elementary school. JIP Jurnal Ilmiah PGMI, 9(1), 51-60.
52. Iwuanyanwu, P. N. (2019). What we teach in science and what learners learn: A gap that needs bridging. Pedagogical Research, 4(2). https://doi.org/10.29333/pr/5780.
53. Jessani, S. (2015). Science education: Issues approaches, and challenges. Journal of Educational Development, 2(1), 79-87
54. Jia, S. (2019). Literature review of YouTube in teaching activities. In Proceedings of twenty-third Pacific Asia Conference on Information System. https://aisel.aisnet.org/pacis2019/228
55. Kemdikbud. (2020). Penyesuaian kebijakan pembelajaran di Masa pandemic Covid-19 https://www.kemdikbud.go.id/main/blog/2020/08/kemendikbud- terbitkan- kurikulum-darurat-pada-satuan-pendidikan-dalam-kondisi- khusus
56. Khan, M. (2023). Academic self-efficacy, coping, and academic performance in college. International Journal of undergraduate research and creative activities, 5(1), 3.
57. Kiat, T. Y., Jumintono, K., ES, S., Handayani, E., Anggarini, Y., & Rofik, M. (2020). The effectiveness of multimedia learning on academic achievement in reproduction topic science subject. Universal Journal of Educational Research, 8(8), 3625-3629.
58. Koto, I. (2020). Teaching and learning science using YouTube videos and discovery learning in elementary school. Mimbar Sekolah Dasar, 7(1), pages 106-118. http://dx.doi.org/10.17509/mimbarsd.v7i1.22504
59. Lausa, S., Bringula, R., Catacutan-Bangit, A. E., & Santiago, C. (2021). Information-seeking behavior of computing Students while programming: Educational learning materials usage, satisfaction of use, and inconveniences. In Proceedings 2021 IEEE Global Engineering Education Conference (EDUCON), pp. 761-765. https://doi.org/10.1109/EDUCON46332.2021.9453905
60. Laswadi, L., Setiawan, M. E., Efyanti, Y., Pentang, J. T., & Taresh, S. M. (2023). Distance learning design: A problem-based learning with flipped classroom model through improving student learning outcomes and learning motivation. Jurnal Inovasi Pendidikan IPA, 9(2), 216-226
61. Lopez, M., & Ramirez, P. (2021). Teacher quality and classroom environment as predictors of Science academic performance in Philippine high schools. Journal of Educational Research in Southeast Asia, 19(1), 15-30.
62. Louaifi, N. (2020). The role of Technology, Entertainment, and Design Talks videos in improving English language learners' public speaking skills: The case of third- year LMD students of English at Biskra University [Master's thesis, Mohamed Khider University of Biskra]. University of Biskra Repository. http://archives.univ biskra.dz/bitstream/123456789/16111/1/LOUAIFI_Nesrine.pdf
63. Luzano, J. (2023). The interplay of conceptual understanding and problem-solving competence in mathematics. International Journal of Multidisciplinary Approach and Studies, 10(2), 89-97
64. Magfirah, N. (2021). Peranan video youtube sebagai alternatif media pembelajaran di masapapandemi. Jurnal Riset dan Inovasi Pembelajaran, 1(2), 51-58.https://doi.org/10.51574/jrip.v1i2.29
65. Malaya, G., & Panganiban, F. (2021). School infrastructure and Science education outcomes. Journal of Educational Facilities Research, 9(2), 23-34.
66. Maulid, M.N., and Sakti, A.W. (2022). The effectiveness of learning videos as a source of digital literacy on poster learning in elementary schools. Indonesian Journal of Multidisciplinary Research, 2(1), 51-56.
67. Mayer, R. E. (2021). Multimedia learning. Cambridge University Press. https://doi.org/10.1017/9781108894333
68. Mayer, R. E., Fiorella, L., & Stull, A. (2020). Five ways to increase the effectiveness of instructional video. Educational Technology Research and Development, 68(3), 837-852.
69. Meštri´c, K.B.; Maravi´c, J.; Hribar, M. Multimedia use in higher education: E- Universities Project. n.p. 2024. Proceedings of the 15th International Conference on e-Learning (eLearning 2024) (Vol. 3938). CEUR Workshop Proceedings. Available online: https://ceur-ws.org/Vol-3938/ (accessed on 30 July 2025).
70. Mhamdi, C. (2017). What can video add to the learning experience? Challenges and opportunities. International Journal of Information Technology and Language Studies, 1(1), 17-24.

71. Millatina, S.N., Maryanti, R., & Wulandary, V. (2022). Strengthening literacy of cultural arts and crafts in the material of sculpture for 6th-grade elementary school students through learning video media. Indonesian Journal of Educational Research and Technology, 2(3), 189-194.
72. Mir, K. J., Fatima, S. A., & Fatima, S. T. (2023). Impact of dual coding strategy to enhance students' retention of scientific concepts in middle schools. Annals of Human and Social Sciences, 4(4), 655–666. https://doi.org/10.35484/ahss.2023(4-IV)63
73. Mohamed, F., & Shoufan, A. (2022). Choosing YouTube videos for self-directed learning. IEEE Access, 10, 51155-51166. https://doi.org/10.1109/ACCESS.2022.3174368
74. Mohammed, I. A., & Ogar, S. I. (2023). Exploring the potential of YouTube videos towards enhancing achievement and retention of undergraduate students in environmental education. European Journal of Interactive Multimedia and Education, 4(1), pages 1-5. https://doi.org/10.30935/ejimed/13190
75. Muico, E. J. (2023). YouTube video utilization to enhance the student's grammatical competence. Journal of Language and Linguistics in Society 3(2) 34-40. Retrieved from https://doi.org/10.55529/jlls.32.34.40
76. Mullis, I., Martin, M., Foy P, K., & Fishbein, B. (2020). TIMSS 2019 international results in mathematics and science. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College and International Association for the Evaluation of Educational Achievement.
77. Mutu, P., Sari, S. M., Kasmini, L., Keguruan, F., & Pendidikan, I. (2020). YouTube video-based learning in improving students' cognitive and psychomotor abilities.
78. Ngongpah, G. & Yetunde Oni, O. Exploring the impact of digital technologies in education: A Comprehensive Review. Asian Journal of Education and Social Studies. 2025,51, 254–1264.
79. Nguyen, T. T., Aquino, P. G., Jr., Le, D. H., Nguyen, V. D., & Jalagat, R. C., Jr. (2020). Performance of students in achievement test: Implications for managerial planning. International Journal of Advanced Science and Technology, 29(8s), 4581–4594.
80. Nidar, E., & Lumanlan, A. (2021). Development and validation of contextualized learning module in Science 7. Available at SSRN 4148448.
81. Noetel, M., Griffith, S., Delaney, O., Sanders, T., Parker, P., del Pozo Cruz, B., & Lonsdale, C. (2021). Video improves learning in higher education: A systematic review. Review of Educational Research, 91(2), 204–236. https://doi.org/10.3102/0034654321990713
82. Nwanekezi, A. U., & Arokoyu, A. A. (2016). Science education theory and research.M & J Grand Orbit Communications Ltd.
83. Ode, I., & Alfredo, R. (2023). Pemanfaatan Youtube Sebagai Penunjang Pembelajaran Daring Oleh Guru SMA Negeri 9 Ambon. Jurnal Ilmu Komunikasi Pattimura, 2(1), 306-319. https://doi.org/10.30598/jikpvol2iss1pp297-305
84. OECD. (2022). PISA 2022 Results. https:// www.oecd.org/ publication/pisa-2022-results/country-notes/philippines-a0882a2d/.
85. Ogegbo, A. A., & Ramnarain, U. (2022). Teaching and learning physics using interactive simulation: A guided inquiry practice. South African Journal of Education, 42 (1), 1–9. https://doi.org/10.15700/saje.v42n1a1997
86. Olsson, U. (2020). The grounds for higher education teachers to engage in MOOC development projects. European Journal of Open, Distance and E-Learning, 22(2), 145–156. https://doi.org/10.2478/eurodl-2019-0016
87. Onasanya, T.O., Aladesusi, G.A., Taiwo, S.A., Onasanya, S.A., & Adeoye, J.T. (2022). Effect of technology-enabled video instruction on senior secondary school students' performance in selected technical drawing concept in Ilorin. Indonesian Journal of Educational Research and Technology, 2(2), 141-148.
88. Onghena, P. (2020). Randomization. In P. Atkinson, S. Delamont, A. Cernat, J. W. Sakshaug, & R. A. Williams (Eds.), SAGE research methods foundations. SAGE Publications. https://doi.org/10.4135/9781526421036923286
89. Peng, J., Dai, Y., & Li, Y. (2024). Integrating online training and knowledge sharing among teachers through a cloud-based video platform. Knowledge Management & E-Learning, 16(4), 671–696. https://doi.org/10.34105/j.kmel.2024.16.031

90. Prabawa, D. G. A. P., Santyasa, I. W., Parwati, N. N., & Sudarma, I. K. (2024). Enhancing learning outcomes by implementing segmentation principles and generative activities in instructional videos. International Journal of Information and Education Technology, 14(12).
91. Prestiadi, D., Zulkarnain, W., Nurabadi, A., Arifin, I., Jafar, R. H. A., & Lutfi, M. Z. (2020, December). The effectiveness of online learning at SIPEJAR using video-based learning media. In 1st International Conference on Information Technology and Education (ICITE 2020) (pp. 535-540). Atlantis Press. https://www.atlantispress. com/proceedings/icite- 20/125948712
92. Prestoza, M. J. R., & Banatao, J. C. M. (2024). Exploring the efficacy of AI passion-driven pedagogy in enhancing student engagement and learning outcomes: A Case Study in Philippines. Asian Journal of Assessment in Teaching and Learning, 14(1), 45–54. https://doi.org/10.37134/ajatel.vol14.1.5.2024
93. Putri, R. A., & Admoko, S. (2022). Development of student worksheets based on argument-driven inquiry learning model to improve students' critical thinking skills. Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram, 10(3), 510. https://doi.org/10.33394/j-ps.v10i3.5277
94. Rawal, D. M. (2024). Mapping of school teachers' digital competency in the context of digital infrastructure: A systematic review and empirical study of India. Journal of Professional Capital and Community, 9(3), 173–195. https://doi.org/10.1108/JPCC-01-2024-0016
95. Ruado, L. F., & Cortez, L. A. S. (2024). Enhancing student engagement and achievement in biology through interactive slide presentations. American Journal of Education and Technology, 3(1), 51-59.
96. Safitri, W., Kasmini, L., & Sari, S. M. (2024). Analysis of the influence of principal leadership effectiveness and work motivation on basic education teacher competencies. 6(1), 59–68.
97. Sakkir, G., Dollah, S., & Ahmad, J. (2020). Students' perceptions toward using YouTube in EFL classrooms. Journal of Applied Science, Engineering, Technology, and Education, 2(1), 1-10. https://doi.org/10.35877/454ri.asci2125
98. Santos, J. M., & Castro, R. D. R. (2021). Technological pedagogical content knowledge (TPACK) in action: Application of learning in the classroom by pre-service teachers (PST). Social Sciences & Humanities Open, 3(1), 100110. https://doi.org/10.1016/j.ssaho.2021.100110
99. Sari, S. M., Surjono, H. D., & Muhtadi, A. (2020). The effectiveness of thematic learning models based on diversity integrated with information and communication technology (ICT) as learning support in the …https://repository.bbg.ac.id/handle/1358%0Ahttps://repository.bbg.ac.id/bitstream/1358/1/SST_Q3-.pdf
100. Saro, J. M., Dayupay, A. M. F., & Aloyon, G. C. A. (2022). Ethno-learning resources in teaching biology. International Journal of Innovation and Research in Educational Sciences. Volume 9, Issue 4, ISSN (Online): 23495219. https://www.ijires.org/ administrator/ components/ com_jresearch/files/ publications/IJIRES_1924_FINAL.pdf
101. Saro, J. M., Tiempo, C. M., & Ytac, P. M. (2022). Scrutinizing literature on the globalization of the science curriculum in the context of education: A Review Paper. Psych Educ, 2022, 5(1): 341-347, Document ID: 2022PEMJ0, doi: 10.5281/zenodo.7272971, ISSN 2822-4353
102. Setyawati, G. A. D., Asta Jaya, I. G. M., & Witraguna, K. Y. (2025). Edusaintek: Jurnal Pendidikan, Sains dan Teknologi. 12(1), 273–288. https://doi.org/https://doi.org/10.47668/edusaintek.v12i1.1460
103. Shin, J., & Hickey, D. T. (2021). Understanding learning interactions in MOOCs: A systematic literature review. Distance Education, 42(1), 30-48
104. Sianturi, F. V., Nasriah, N., & Yus, A. (2022). Video animasi berbasis lingkungan sebagai strategi pengembangan keterampilan berfikir tingkat tinggi anak taman kanak-kanak. Jurnal Basicedu, 6(5), 8600–8613. https://doi.org/10.31004/basicedu.v6i5.3829
105. Smutny, P., & Schreiberova, P. (2020). Video-based learning in education: The benefits and challenges of using video lessons. Education and Information Technologies, 25(2), 527-542.
106. Sukarini, K., Bagus, I., & Manuaba, S. (2021). Video animasi pembelajaran daring pada mata pelajaran IPA kelas VI sekolah dasar 8(1), 48–56.
107. Sukmawati, S., Sufyadi, S., Utama, A. H., & Mastur, M. (2024). Pemanfaatan media short video learning untuk mendukung pembelajaran metode self-paced learning. Journal of Education Research, 5(4), 6255-6265. https://doi.org/10.37985/jer.v5i4.1935

108. Suryaningtyas, A., Kimianti, F., & Prasetyo, Z. K. (2020). Developing Science electronic module based on problem-based learning and guided discovery learning to increase critical thinking and problem-solving skills. 401(Iceri 2019), 65–70.
109. Sweller, J., VanMerriënboer, J. J. G. & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. Educational psychology review 31 (2), 261–292. Z.
110. Tani, M., Manuguerra, M., & Khan, S. (2022). Can videos affect learning outcomes? Evidence from an actual learning environment. Educational Technology Research and Development, 70(5), 1675–1693. https://doi.org/10.1007/s11423-022-10147-3
111. Thoriq, A., Dahlan, U. A., Hidayati, D., Dahlan, U. A., & Dahalan, U. A. (2024). Pemanfaatan platform merdeka mengajar dalam praktik baik implementasi kurikulum merdeka. 120–128
112. Türel, V. (2023). Learners' perceptions towards dual-coding in adaptive hypermedia environments: Listening texts, keywords and visuals. Journal of Learning and Teaching in Digital Age, 8(1), 32–46. https://doi.org/10.53850/joltida.1083583
113. Utami, K., Akhyar, M., & Sudiyanto, S. (2023). Potential implementation of android-based interactive multimedia for student learning activities. Al-Ishlah: Jurnal Pendidikan, 15(1), 507-518.
114. van der Keylen, P., Wollgarten-Hadamek, I., & Döpfner, C. (2022). The influence of instructional video design on learning in online health courses. BMC Medical Education, 22(1), 1-12.
115. van der Steen, J., van Schilt-Mol, T., van der Vleuten, C., & Joosten-ten Brinke, D. (2023). Designing formative assessment that improves teaching and learning: What can be learned from the design stories of experienced teachers? Educational Design Research, 7. https://doi.org/10.1007/s41686-023-00080-w
116. van Nooijen, C. C., de Koning, B. B., Bramer, W. M., Isahakyan, A., Asoodar, M., Kok, E., & Paas, F. (2024). A cognitive load theory approach to understanding expert scaffolding of visual problem-solving tasks: A scoping review. Educational Psychology Review, 36(1), 12.
117. Velunta, L D. (2021). The influence of supervisory styles in improving teachers' competence in utilizing different learning modalities under the new normal in schools division of San Jose Del Monte City, Bulacan. Unpublished Action Research. Department of Education, City of San Jose del Monte, Bulacan.
118. Wahyuni, W., Helmi, H., Irmawati, I., & Fitri, F. (2024). Efektivitas penggunaan youtube sebagai media pembelajaran matematika. Jurnal Konatif: Jurnal Ilmiah Pendidikan, 2(1), 1-14. https://doi.org/10.62203/jkjip.v2i1.21
119. Wali, S. (2025). Impact of short educational videos on learning and retention in undergraduate pharmacology education: a cross-sectional study. BMC Med Educ. 2025 Dec 22;25(1):1747. doi: 10.1186/s12909-025-08410-1. PMID: 41430203; PMCID: PMC12752264.
120. What Works Clearinghouse. (n.d.). Module 3: Baseline equivalence [Training module]. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/Docs/OnlineTraining/wwc_training_m3.pdf
121. Wibawa, K. A., & Payadnya, I. P. A. A. (2021). Learning effectiveness through video presentation and whatsapp group (WAG) in the pandemic time covid-19. AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 10(2), 710. https://doi.org/10.24127/ajpm.v10i2.3451
122. Widiastuti, K., & Hidayati, Y. M. (2023). Analysis of YouTube-based learning videos on volume building materials. Proceedings of the International Conference on Learning and Advanced Education (ICOLAE 2022), pp. 1090–1100, https://doi.org/10.2991/978-2-38476-086-2_92
123. Wong, D. (2020). Effectiveness of learning through video clips and video learning improvements between business related postgraduate and undergraduate students. International Journal of Modern Education
124. Wooten, J. O., & Cuevas, J. A. (2024). The effects of dual coding theory on social studies vocabulary and comprehension in elementary education. International Journal on Social and Education Sciences, 6(4), 673–691. https://doi.org/10.46328/ijonses.696
125. Yu, S., Tian, L., & Nie, S. (2024). Neural mechanisms of cognitive load in multimedia learning: A meta-analysis of EEG frequency band modulation. Journal of Educational Neuroscience, 5(3), 221–237.
126. Zakaria, W., Turmudi, T., & Pentang, J. (2022). Information and communication technology in elementary schools: A comparison between hybrid and face-to-face learning systems. Profesi Pendidikan Dasar, 9(1), 46-54.

127. Zarco, M., Calixto, Jr. V., Deligro, J., Raymundo, A., & Tubac, J. (2026). Developing Technology-Based Instructional Videos to Enhance Cognitive and Physical Performance in Physical Education. ASEAN Journal of Educational Research and Technology 5(1) (2026) 47-56