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Developing Technology-Based Instructional Videos to Enhance Cognitive and Physical Performance in Physical Education

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ABSTRACT

This study developed and evaluated a technology-based instructional video on locomotor and manipulative movements to improve the cognitive and physical performance of Grade VI learners at Tagbilaran City Central Elementary School. Guided by a quasi-experimental pre-test and post-test design, the intervention involved purposively selected learners and was validated by subject experts. The instructional video was assessed on multiple dimensions, including style, creativity, content, music, language, captions, and instructional value, and was rated as outstanding overall. Findings revealed significant improvements in both knowledge and physical skills, demonstrating the effectiveness of instructional videos in fostering comprehension, retention, and performance in Physical Education. While the material was well-received, further refinement in visual organization and inclusivity of language and captions is recommended to ensure broader accessibility. This study underscores the potential of technology-based instructional videos as powerful tools to enhance teaching and learning in Physical Education.

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1. INTRODUCTION

Physical Education (PE) is essential in promoting children's health, fitness, and well-being. However, elementary learners often face challenges such as low motivation, varying skill levels, and limited interest, which can reduce their participation and learning outcomes. Many reports regarding PE have been well-documented (Calixtro Jr., 2021; Escomes & Morbo, 2021; Ledesma *et al*., 2021; Albar *et al*., 2021; Rusyani *et al*., 2022; Manosa *et al*., 2022; Rosete *et al*., 2022; Saodat, 2023; Sultanto *et al*., 2023; Calixtro Jr., 2024; Micua *et al*., 2024; Arancillo *et al*., 2025; Calixtro Jr., 2025; Ernazarov *et al*., 2025). Traditional methods of instruction sometimes fail to engage learners effectively, resulting in gaps in both cognitive understanding and physical performance (Ramires *et al*., 2023; Scruggs *et al*., 2007).

The integration of technology into education offers opportunities to address these limitations (Al Husaeni *et al*., 2024). Instructional videos provide visual and auditory demonstrations that support diverse learning styles, especially among visual and kinesthetic learners. Studies have shown that videos improve performance, engagement, and knowledge retention, while also offering opportunities for self-paced and flexible learning (Fiorella & Carolin *et al*., 2020; Ilsa *et al*., 2021; Brecht, 2012; Zhang *et al*., 2006).

The ADDIE model (Analyze, Design, Develop, Implement, and Evaluate) serves as a recognized framework in producing instructional materials that are systematically designed and refined for educational effectiveness (Susilawati *et al*., 2025).

Theoretical perspectives also reinforce the use of videos in PE. Technological Determinism Theory highlights that advancements in technology shape educational practices, while Multimedia Learning Theory emphasizes that integrating visuals and audio enhances comprehension, retention, and performance. Recent studies further underline the role of creativity, accessibility, and personalization in developing effective videos that enhance learners' engagement and self-regulation (Guy & McNally, 2022; Kuhlmann *et al*., 2023). Against this background, this study develops and evaluates a technology-based instructional video on locomotor and manipulative movements for Grade VI learners. The novelty of this research lies in producing and validating an instructional video specifically designed for Physical Education in the Philippine elementary context, addressing both cognitive and physical domains, and emphasizing inclusivity and accessibility in PE instruction.

2. METHODS

This study employed a quasi-experimental design using a one-group pre-test and post-test approach to evaluate the effectiveness of a technology-based instructional material, specifically a learning video on locomotor and manipulative movements. Detailed information regarding this method is explained elsewhere (Susilawati *et al*., 2025). The research was conducted at Tagbilaran City Central Elementary School, located at 74 m Torralba Street, Tagbilaran, Bohol, the Philippines, during the school year 2024-2025.

Purposive sampling was applied to select one section of Grade VI learners, with a total of 30 participants. This sampling ensured that the group was suitable for testing the intervention.

Before implementation, the research instruments underwent validation by 15 experts, including curriculum specialists, master teachers, physical education instructors, and information technology professionals. A validation tool (Robles and Acedo, 2019) was used to gather expert feedback. Based on their recommendations, revisions were made to improve the learning video and questionnaires. The final evaluation instrument for the video was

adapted from previous studies (Generoso & Calixtro, 2023) and demonstrated high reliability, with a Cronbach's alpha value of 0.93.

Two instruments were utilized to measure learner outcomes. The first was a 10-item multiple-choice test designed to assess cognitive performance on locomotor and manipulative movements. The second was a performance-based test scored out of ten points to measure physical performance in executing the targeted skills. Both instruments had been validated by experts to ensure content relevance and appropriateness.

The intervention began with the presentation of the instructional video on locomotor and manipulative movements in a classroom session. After viewing, learners were given time to ask questions and clarify concepts, while the researchers facilitated discussion to highlight key learning points and their practical applications. Learners were then asked to perform an activity related to the lesson, followed by the administration of the post-test. Pre-test and post-test results were compared to determine changes in both cognitive and physical performance.

Data from the pre-test and post-test were analyzed using descriptive statistics, including mean scores and frequency distributions, to describe learners' performance levels. To determine whether the observed differences were statistically significant, paired-sample t-tests were conducted at a 0.05 level of significance. Detailed information regarding statistical analysis is explained elsewhere (Fiandini *et al*., 2024; Rahayu *et al*., 2024; Afifah *et al*., 2022).

3. RESULTS AND DISCUSSION

Table 1 presents the evaluation of the developed learning video in terms of style and organization, creativity, content, music, language, captions, and instructional value. Each of these criteria was rated by the evaluators, and the results were summarized as average weighted means. The overall rating of the video was Outstanding, with an average score across all criteria of 4.84. Among the categories, creativity received the highest rating, indicating that the video was engaging, original, and able to capture learners' interest effectively. Similarly, content and language with captions were also rated very highly, suggesting that the material was accurate, clear, and accessible, especially for young learners who benefit from simple explanations and visual supports. Instructional value and comprehension likewise achieved a strong evaluation, showing that the video effectively contributed to learning and understanding the targeted movements. Meanwhile, style and organization received a slightly lower, though still outstanding, rating compared to the other categories. This implies that while the video was well-prepared, there may be areas for refinement in how the visuals were sequenced and structured to further enhance clarity and smooth transitions. Music was also rated positively, highlighting its role in maintaining learner attention and making the lesson more enjoyable. Overall, the findings in **Table 1** demonstrate that the video was successful in combining both educational and creative qualities. The results suggest that learners were not only provided with accurate instructional content but were also engaged through appealing design and presentation. Minor improvements in visual coherence and flow could make the material even more effective.

The evaluation results showed that creativity in the learning video received the highest rating. This means that the use of creative features (such as attractive visuals, engaging presentation, and multimedia integration) successfully captured learners' attention and made the lesson more enjoyable. Previous studies also confirm that creativity in video content strongly enhances student engagement and academic performance (Haerawan *et al*., 2024).

In short, the more creative the video design, the more likely learners are to stay focused and understand the lesson.

In addition, language and captions were also highly rated. Captions supported learners in following the lesson more clearly, especially those who may struggle with oral explanations alone. This finding aligns with the literature (Hsieh, 2023), who demonstrated that captions significantly improve comprehension, particularly for younger learners. Therefore, providing clear and accessible language, along with captions, is essential for maximizing understanding.

Table 1. Quality level of the learning video in terms of style and organization, creativity, content, music, language, and captions, instructional value, and comprehension.

Criteria	Average Weighted Mean	Description
A. Style and Organization	4.81	Outstanding
B. Creativity	4.88	Outstanding
C. Content	4.87	Outstanding
D. Music	4.82	Outstanding
E. Language and Captions	4.86	Outstanding
F. Instructional Value and Comprehension	4.85	Outstanding
Overall	**4.84**	**Outstanding**

Table 2 illustrates a substantial improvement in students' performance after the intervention. In terms of cognitive performance, learners showed remarkable growth in their understanding of locomotor and manipulative movements. Before the intervention, many students scored only at the "satisfactory" level. After using the video, however, the majority of them achieved the "outstanding" level, indicating that the video made it easier for them to comprehend and retain the material. In terms of physical performance, the improvement was even more striking. At the beginning, several learners performed only at a "satisfactory" level. After practicing with the help of the video, every learner reached the "outstanding" level. This means that all learners were able to correctly demonstrate the targeted physical skills. These results suggest that the instructional video was highly effective in improving both knowledge and skill development. This supports the principles of multimedia learning theory, which argue that combining visual and auditory elements helps reduce cognitive load, allowing students to process and understand information more effectively (Yu *et al*., 2024; Agbarakwe & Ossai-Chidi, 2025; van Nooijen *et al*., 2024). However, some scholars caution that standardized teaching methods are not equally effective for all learners. Some researchers (Rajapov, 2024; Sbitan *et al*., 2025; Leong *et al*., 2025), for example, notes that a one-size-fits-all approach often fails to address individual differences. This implies that while instructional videos are powerful, teachers still need to adjust their strategies to meet the needs of diverse learners.

Table 3 summarizes the statistical comparison between learners' scores before and after the intervention. The analysis shows that there was a clear and significant improvement in both cognitive and physical performance after the students used the instructional video. This means that the learners not only understood the lesson better but also demonstrated stronger physical skills compared to their performance before the intervention. The results also confirmed that the learning video had a meaningful impact when the two areas (cognitive and physical) were considered together. Before the intervention, there were noticeable differences in students' performance levels, but after watching and practicing with the video, these differences were minimized, and most students achieved consistently high outcomes.

These findings reinforce the value of video-based learning materials. Similar to the conclusions in the previous studies, videos can significantly increase student engagement and improve understanding of even complex subjects. However, research also shows that videos are most effective when combined with opportunities for critical thinking and collaboration. Instructional videos should not replace interactive discussions or group activities, but should complement them 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).

Table 2. Level of learners' achievement before and after in terms of cognitive and physical performance (N= 30).

PERFORMANCES							
COGNITIVE				PHYSICAL			
Score	**Note**	**Pretest (%)**	**Posttest (%)**	**Score**	**Note**	**Pretest (%)**	**Posttest (%)**
9- 10	Outstanding	7	80	10	Outstanding	0	100
7-8	Very Satisfactory	33	20	8	Very Satisfactory	27	0
4-6	Satisfactory	37	0	6	Satisfactory	73	0
2-3	Fairly Satisfactory	17	0	4	Poor	0	0
0-1	Did Not Meet Expectations	7	0				
Mean		**5.57**	**9.10**	**Mean**		**6.53**	**10.00**
Description		**Satisfactory**	**Outstanding**	**Description**		**Satisfactory**	**Outstanding**

Table 3. Difference of the learners' cognitive and physical performance (N= 30).

Differences	**Computed t-Value** / **p-value** (At the d=0.05 level of significance)		**Interpretation**	**Decision**
Pretest and Posttest Scores for Cognitive Performance	-8.05	<0.001	Significant	Reject the null hypothesis
Pretest and Posttest Scores for Physical Performance	-21.11	<0.001	Significant	Reject the null hypothesis
Pretest Scores for Both Performances	-2.29	0.029	Significant	Reject the null hypothesis.
Posttest Scores for Both Performances	-6.92	<0.001	Significant	Reject the null hypothesis

4. CONCLUSION

This study demonstrated that a technology-based instructional video focusing on locomotor and manipulative movements is an effective tool for enhancing both the cognitive and physical performance of Grade VI learners in Physical Education. The video was evaluated as outstanding in terms of creativity, content, accessibility, and instructional value, showing its potential to engage learners and support skill acquisition. The findings confirmed that integrating multimedia learning resources in PE can significantly improve comprehension, retention, and practical performance. Beyond its effectiveness, the study highlights the importance of designing instructional materials that are inclusive, accessible, and visually coherent. Teachers are encouraged to adopt technology-enhanced approaches in Physical Education, while also combining videos with interactive discussions and collaborative activities to maximize learning outcomes. The novelty of this work lies in its application of a validated, context-specific instructional video for elementary learners in the Philippines, offering valuable insights for educators and curriculum developers in advancing innovative and inclusive PE instruction.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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