IMPROVING ACADEMIC PERFORMANCE IN STATISTICS & PROBABILITY THROUGH VIDEO-BASED INSTRUCTION



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Improving Academic Performance in Statistics & Probability through Video-Based Instruction

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Abstract

Statistics and Probability is a foundational discipline that equips learners with critical analytical and decision-making skills, essential for understanding and addressing real-world challenges in various academic and professional contexts. This study assessed the effectiveness of video-based instruction in enhancing the academic performance of Grade 11 learners in Statistics and Probability at Hinlayagan National High School, Trinidad II District, Bohol Division, during the academic year 2020-2021. The investigation aimed to explore learners' academic performance before and after implementing video-based instruction and determine whether the intervention resulted in a statistically significant improvement. This study was conducted in response to the identified challenge of low academic performance in Statistics and Probability. To address this issue, video-based instruction was introduced as a supplementary tool to the existing modular print-based instruction employed by the school. A pre-test-post-test research design was employed to collect and analyze data, focusing on the academic performance of learners during the third and fourth quarters in Statistics and Probability. Data collection utilized division-developed summative tests and performance tasks, which underwent rigorous statistical analysis to ensure the validity and reliability of the findings. Findings revealed a significant improvement in the learners' academic performance following the implementation of video-based instruction. Statistical analysis demonstrated a substantial increase in the number of learners achieving higher performance levels. The proportion of learners classified as performing at a satisfactory level increased, and notable improvements were observed in the very satisfactory and outstanding performance categories. Overall, a significant number of learners advanced by at least one performance level, highlighting the positive impact of video-based instruction on academic achievement. These results give emphasis to the potential of video-based instructional materials as an effective pedagogical tool to enhance learning outcomes in Statistics and Probability, particularly in contexts where modular print-based instruction is the primary mode of delivery.

Keywords: academic performance, statistics, probability, video-based instruction

Introduction

The COVID-19 pandemic has profoundly impacted educational systems, including Hinlayagan National High School. As a result, the school adopted the Modular Distance Learning Modality to ensure continuity of education. However, this shift has led to a noticeable decline in learners' academic performance, particularly in Statistics and Probability. To address this pressing issue, it is essential to engage in rigorous educational research aligned with the Department of Education's (DepEd) Basic Education Research Agenda, as outlined in DepEd Order No. 39, s. 2016. In this context, the researchers explored the potential of video-based instruction as a supplementary tool to enhance printed modules or learning activity sheets, thereby improving academic outcomes.

To emphasize the importance of Statistics and Probability, it is crucial to recognize its role in developing learners' mathematical proficiency and analytical skills, which are essential for success in various academic and professional domains. According to Hann (2020), students' ability to see the value and utility of Statistics and Probability, as well as their confidence in achieving success in the subject, significantly influences their overall mathematical proficiency. Furthermore, underperformance in mathematics poses long-term challenges for learners, leaving them unprepared for future opportunities and hindering national competitiveness in the global economy. Consistent with this, Delaney and Devereux (2020) highlighted that mathematical proficiency is strongly associated with improved labor market outcomes. Therefore, ensuring equitable and quality education in mathematics is a priority for the Department of Education, which aims to leave no learner behind.

Building on this premise, the study is anchored in Mayer's (2014) Multimedia Learning Theory (MMLT), which underscores the benefits of combining visual and auditory information for effective learning. Specifically, MMLT is based on three key assumptions: (a) information is processed through dual channels (visual and auditory), (b) working memory has a limited capacity for processing information in each channel, and (c) active cognitive processing is necessary for meaningful learning. By leveraging these principles, video-based instruction allows learners to engage with lessons at their own pace, fostering a deeper understanding of complex concepts such as those in Statistics and Probability.

In addition, prior studies provide valuable insights into the potential of video-based instruction. For example, Mendoza, Caranto, and David (2015) demonstrated that video presentations significantly enhance learners' motivation and address diverse learning styles, ultimately improving academic performance. Conversely, Capuno, Helen, Etcuban, Aventuna, and Demitrio (2019) found no significant relationship between instructional media use and learners' performance, emphasizing the importance of carefully selecting and contextualizing instructional materials. These mixed findings underscore the need for deliberate and strategic integration of video-based content to maximize its effectiveness.

The urgency of this intervention is further highlighted by performance data from Grade 11 Acacia, which emerged as the lowestperforming class among the four Grade 11 sections in Statistics and Probability during the third quarter. Specifically, the data revealed that the majority of students fell within the 75–79% grade bracket, with minimal representation in higher performance categories. Notably, Grade 11 Acacia's average academic performance of 78% was significantly lower than that of the other sections, which ranged from 82% to 86%. Consequently, these results underscore the learners' struggles and the critical need for innovative teaching strategies to address these gaps.

To address this challenge effectively, the researchers propose the integration of video-based instruction as a supplemental tool. These videos, which range from 10 to 20 minutes, are carefully curated to align with daily lessons and are delivered in both English and Filipino to ensure accessibility and comprehension. Through this multimedia approach, the videos aim to provide alternative perspectives on the subject matter and enhance the engagement of learners who may struggle with text-heavy modules.

Along this line, the study evaluated the effectiveness of video-based instruction in improving the academic performance of Grade 11 learners in Statistics and Probability. Specifically, the goal was to increase learners' performance by at least one grade bracket and analyze the significance of this intervention in addressing learning gaps exacerbated by the pandemic.

Research Questions

This action research was conducted to determine the effectiveness of video-based instruction in improving the academic performance of selected Grade 11 students of Hinlayagan National High School, Trinidad II District, Trinidad, Bohol S.Y. 20202021. Specifically, this study sought to answer the following questions:

- 1. What is the academic performance of the participants in Statistics and Probability before and after the video-based instruction?
- 2. Is there an improvement in the learners' academic performance after exposure to the intervention?

Methodology

This action research employed pre-experimental method with a pretest-posttest design. It involves conducting an intervention or change in a specific setting and measuring its impact by comparing participant outcomes before and after the intervention without using a control group (Mills, 2011). This was conducted among selected Grade 11 students at Hinlayagan National High School, Trinidad District, Division of Bohol due to low academic performance

Video instructions were introduced as a supplemental tool to the existing modular distance learning modality. These video-based materials were monitored weekly, with verification done through photos shared in exclusive messenger group chats. The research team also ensured proper communication and distribution of materials through an organized system involving teachers, researchers, and participants.

Before implementation, an orientation was conducted for teachers, and a group chat was created to maintain effective communication. The researchers downloaded topic-specific videos for the 4th quarter lessons, saving them on students' devices or borrowed school PC tablets. A Memorandum of Agreement was prepared between the school and parents regarding the use of school-issued devices. During implementation, the videos were distributed electronically or via PC tablets, and students were required to provide weekly photo evidence of their usage. Their performance was assessed through summative tests and tasks, with their scores compared between the 3rd and 4th quarters to analyze any significant improvements.

Post-implementation, the results of the summative tests and performance tasks were communicated to the learners and their parents, with significant progress reported to the School Head. This study involved 36 learners from Grade 11 Acacia, selected through complete enumeration due to their low performance in the subject. The data gathering method was quantitative, focusing on the 3rd and 4th quarter performances, with statistical analysis conducted to determine improvements. Ethical considerations were meticulously followed, ensuring informed consent, confidentiality, and adherence to the Data Privacy Act.

Results and Discussion

This section presents the results of the study. Interpretations are provided per table, reflection is also drawn from the results, and recommendations are made to solve the problem.

Participants' Academic Performance

Table 1 presents the academic performance of learners in Statistics and Probability before and after the implementation of video-based instruction.

Initially, 72.22% of the learners were performing at a fairly satisfactory level, but this decreased to only 25% after the introduction of video-based instruction. Meanwhile, the percentage of learners performing at a satisfactory level increased from 25% to 30.56%. A notable increase was also observed among learners at the very satisfactory level, rising from 2.78% to 19.44% after using the video-based instruction. Moreover, the percentage of learners performing at the outstanding level saw a significant increase of 25%. Overall, seventeen learners improved by at least one performance level following the implementation of video-based instruction, demonstrating

the positive impact of this intervention.

	F	%	Rank
Before (Q3)			
Fairly Satisfactory (75-79)	26	72.22	1
Satisfactory (80-84)	9	25.00	2
Very Satisfactory (85-89)	1	2.78	3
Outstanding (90 - 100)	0	0.00	4
Total	36	100.00	
After (Q4)			
Fairly Satisfactory (75-79)	9	25.00	2
Satisfactory (80-84)	11	30.56	1
Very Satisfactory (85-89)	7	19.44	4
Outstanding (90 - 100)	9	25.00	2
Total	36	100.00	

Table 1. Academic Performance Before and After th
Implementation Of Video- Based Instruction

Effectiveness of Video-Based Instruction in Improving Learner's Academic Performance in Statistics and Probability

Table 2.	Mean	Difference	of the	Ouarter 3	å	Ouarter 4	Per	formance
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Variable	Mean	Mean Difference	Remarks
Q3	77.5833	6.7222	Performance Improved
Q4	84.3056		_

The data presented in Table 2 highlights a notable improvement in learners' academic performance in Statistics and Probability after the implementation of video-based instruction. The mean score of learners during Quarter 3 was 77.5833, which increased significantly to 84.3056 in Quarter 4. This resulted in a mean difference of 6.7222, indicating substantial progress in learners' performance. The findings underscore the effectiveness of video-based instruction as a pedagogical intervention in addressing learning gaps and improving academic outcomes.

This improvement aligns with Mayer's (2014) Multimedia Learning Theory, which emphasizes the importance of integrating visual and auditory modalities to facilitate effective learning. Through leveraging video-based materials, learners were able to process information through dual channels, enabling a deeper understanding of complex topics in Statistics and Probability. The intervention also allowed students to engage with the content at their own pace, reducing cognitive overload and promoting retention of knowledge.

Moreover, the significant increase in performance levels reflects the potential of video-based instruction to complement modular printbased learning. This approach not only addresses the limitations of text-heavy modules but also caters to diverse learning styles, providing learners with alternative means of accessing and understanding the subject matter. The findings are consistent with Mendoza et al's (2015) study, which demonstrated that video presentations enhance learners' motivation and academic performance.

While the intervention proved effective, it also raises questions about how such approaches can be further optimized to ensure sustained improvement across all performance levels. Future research could explore the integration of contextualized video materials, tailored to specific learner needs, to maximize the impact of multimedia instruction. These findings serve as a foundation for the broader adoption of video-based instruction in addressing performance challenges in other subject areas, particularly in modular learning environments exacerbated by the COVID-19 pandemic.

Conclusions

The COVID-19 pandemic has significantly altered the landscape of education, compelling the Department of Education to implement alternative modes of learning delivery. Among these, Modular Distance Learning (MDL) has been adopted by Hinlayagan National High School to address the unique challenges faced by its learners. This modality is particularly suited to the school's context, where many students reside in remote areas with limited access to stable internet connectivity. Additionally, the socioeconomic challenges of the learners, many of whom come from low-income families, further hinder their ability to acquire the necessary tools and equipment for online learning.

Given the varying circumstances and capacities of learners to adapt to new learning modalities, the need for additional teacher support becomes evident. Observations during discussions with learners revealed that many struggled to comprehend and complete the Learning Activity Sheets (LAS) and modules for Statistics and Probability without direct guidance from their subject teacher. This highlighted a critical gap in the current instructional approach, necessitating innovative solutions to address the issue of declining academic performance.

To bridge this gap, the researchers introduced Video-Based Instruction (VBI) as a supplementary tool to the existing MDL framework. This intervention provided learners with accessible and engaging instructional materials that enabled them to grasp complex concepts more effectively. The findings confirmed the effectiveness of VBI, as evidenced by a significant improvement in learners' academic

Moving forward, there is a clear need to refine the implementation of VBI by contextualizing the content to better address the specific learning needs of students. Additionally, incorporating complementary strategies, such as regular teacher feedback and opportunities for interactive engagement, could further improve learning outcomes. By addressing these areas for improvement, the intervention can become a more robust and equitable solution for overcoming the challenges posed by modular learning in the current educational landscape.

Future researchers are encouraged to refine the sampling techniques and data treatment methodologies to enhance the reliability and generalizability of the findings. Incorporating diverse sampling methods and robust statistical analysis could provide deeper insights into the effectiveness of video-based instruction.

School administrators and teachers should collaboratively develop and implement a strategic plan for integrating video-based instruction as a primary intervention to improve learners' performance in Statistics and Probability. This strategy should include capacity-building programs for educators to effectively create and utilize video-based materials. Video-based instruction should not be limited to Statistics and Probability but should be expanded to other subject areas facing similar performance challenges. Developing contextualized, subject-specific video lessons can address diverse learning needs and improve overall academic outcomes. It is strongly recommended that this study be replicated in other senior high schools within the Trinidad II District to validate the findings and explore the broader applicability of video-based instruction in different educational contexts. This replication could also identify potential barriers and best practices for scaling up the intervention.

References

Captures, A. J. (2020, May 2). WOW MATH Channel. Retrieved from Youtube. https://www.youtube.com/channel/UCJhnuTiKL2KmhrOTh3KsU0g/about

Capuno, R., Revalde, H., Etcuban, J. O., Aventuna, M., Medio, G., & Demeterio, R. A. (2019). Facilitating Learning Statistics & Probability Through the Use of Instructional Media. International Electronic Journal of Statistics & Probability Education, 14(3), 677688. https://doi.org/10.29333/iejme/5785

Delaney, J. M., & Devereux, P. J. (2020). Math Matters! The importance of mathematical and verbal skills for degree performance. Economics Letters, 186, 108850.

Hann, T. M. Z. (2020). What's Math Good for, What I Can Do with It, and Why Do I Even Care? (Doctoral Dissertation, John Hopkin's University).

Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 43–71). Cambridge University Press. https://doi.org/10.1017/CBO9781139547369.005

Mendoza, L., Caranto, L.C., & David, J.T. (2015). Effectiveness of Video Presentation to Learners' Learning. International Journal of Nursing, 5(2), 81-86. doi: 10.5923/j.nursing.20150502.07

Scribbr. (2020, August 20). Develop a theoretical framework in three steps [Video]. YouTube. https://youtube.be/4y1BAqOnhMM

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