

The Efficacy of Self-Paced Video Lessons on the Performance of Grade 7 Students in Mathematics

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| Love Harzil L. Abugho^{1*} | Elizabeth L. Baguio² |

^{1,2}Saint Joseph Institute of
Technology, Butuan City,
Philippines

*oveharzilabugho@gmail.com



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ABSTRACT

This study investigated the effectiveness of self-paced video lessons delivered through Khan Academy in improving the Mathematics achievement of Grade 7 students at Lunao National High School, Division of Gingoog City, during the 2025–2026 academic year. The research utilized a quasi-experimental pretest–posttest control group design involving seventy Grade 7 learners who were assigned to either a control group or an experimental group through matched-pair random sampling based on their Mathematics Mean Percentage Scores (MPS). Students in the control group received conventional classroom instruction, whereas those in the experimental group participated in a blended learning approach incorporating Khan Academy self-paced video lessons for five weeks. A researcher-adapted 50-item multiple-choice examination aligned with the MATATAG curriculum served as the primary data-gathering instrument. Descriptive statistics, including mean and standard deviation, together with t-test analysis, were employed to evaluate the data. Results indicated that both groups demonstrated improvement after the intervention; however, the experimental group achieved significantly greater learning gains than the control group. Statistical analysis yielded a t-value of 3.671 and a p-value below .001, confirming a significant difference between the two groups in favor of the experimental condition. The findings suggest that integrating self-paced video lessons through Khan Academy is more effective than traditional teaching methods in enhancing Grade 7 students' Mathematics performance. Consequently, the study recommends the incorporation of Khan Academy as a supplementary instructional resource to support student achievement, engagement, and learning outcomes in Mathematics.

KEYWORDS

Self-paced video lessons; Khan Academy; blended learning; Mathematics performance; Grade 7 students; quasi-experimental design; instructional technology; mathematics achievement; digital learning and MATATAG curriculum

INTRODUCTION

The delivery of instruction has undergone significant transformation, shifting from conventional teacher-centered approaches toward more learner-centered models that utilize technology, including self-paced video-based lessons. This shift enables students to take greater responsibility for their learning, adapt instructional materials to their individual preferences, and progress according to their own learning pace. As a result, learners can develop deeper conceptual understanding and become more actively engaged in the

learning process. Evidence from rural Vietnam demonstrates that blended learning approaches have been employed to increase student participation and minimize educational disparities, although challenges such as limited teacher preparation and difficulties in implementation remained evident (Phạm, Tan, & Lee, 2019). While numerous countries have adopted flexible and technology-enhanced instructional strategies to address learning gaps, similar interventions are increasingly necessary in the Philippines, particularly in response to persistent deficiencies in students' foundational mathematics competencies.

The urgency of this concern is reflected in recent international assessment results. Findings from the Programme for International Student Assessment (PISA) revealed that only 16% of Filipino students achieved at least Level 2 proficiency in mathematics, the baseline level considered necessary for functional mathematical literacy. This indicates that only a small proportion of learners can independently identify and interpret mathematical representations in simple real-world situations. Moreover, approximately 84% of students failed to demonstrate essential mathematical skills, including comparing distances between alternative routes and converting values across currencies, competencies identified by PISA as fundamental mathematical abilities (Philstar, 2023). Recognizing these challenges, the Philippine government has initiated efforts to integrate digital technologies into the educational system as a means of strengthening students' mathematical performance.

One major initiative undertaken by the Department of Education (DepEd) involved establishing a partnership with Khan Academy, a globally recognized online learning platform. Through this collaboration, digital educational resources were made available to approximately 1,000 public schools nationwide. The agreement was formalized by DepEd Secretary Sonny Angara and Khan Academy founder Salman Khan, with the objective of improving Filipino learners' academic achievement, particularly in mathematics. The partnership was also envisioned as a strategic intervention to enhance student performance in the 2025 PISA assessment (Philippine Daily Inquirer, 2024). Following the signing of the agreement, several policy issuances and memoranda were released to support the nationwide implementation of the platform.

Implementation efforts commenced through DM-CT-2024-403, which introduced pilot activities for selected schools under Batches 2 and 3. This was followed by DepEd Memorandum No. 002, s. 2025, which required learning sessions focused on the effective utilization of Khan Academy for students preparing for the 2025 PISA examination. Subsequently, DM-CT-2025-143 expanded both online and face-to-face implementation activities during the school year. At the regional level, Regional Memorandum No. PE, s. 2025, further facilitated the execution of these initiatives. In alignment with these directives, the Schools Division of Gingoog City issued Division Memorandum No. 026, s. 2025, informing teacher-implementers of relevant meetings and activities, while Authority to Travel Control No. 2025-01-0037 enabled their participation in in-person Khan Academy training sessions. Despite the comprehensive support provided through these policies and activities, empirical evidence regarding the effectiveness of Khan Academy within the Division of Gingoog City remains limited. Consequently, there is a need for further investigation to determine the platform's impact on learners' mathematical performance within the local context.

Considering these persistent challenges, students at Lunao National High School continue to encounter difficulties associated with weak foundational knowledge and limited access to reliable internet services. Traditional classroom instruction and online learning modalities may not be sufficient to address these concerns effectively. Therefore, there is a need to explore alternative instructional approaches capable of supporting

students' learning despite existing technological constraints. One promising strategy is the integration of self-paced video lessons, which may help learners strengthen their understanding of mathematical concepts and improve their numeracy skills.

Although previous studies have reported positive outcomes associated with Khan Academy and other self-paced learning platforms in international settings and selected urban areas of the Philippines, evidence within the local context remains scarce. No study has yet examined the effectiveness of self-paced video lessons delivered through Khan Academy among learners in the Division of Gingoog City. As a result, it remains unclear whether the positive effects reported in other educational settings can be replicated among local students. The absence of localized empirical evidence limits educators' ability to determine whether such interventions can effectively address learning gaps in Mathematics.

To bridge this gap, the present study investigates the effectiveness of self-paced video lessons delivered through Khan Academy in improving students' academic performance in Mathematics. Specifically, the research focuses on determining the efficacy of this intervention among Grade 7 students at Lunao National High School, one of the public secondary schools within the Division of Gingoog City.

Objective of the Study

This study seeks to evaluate the effectiveness of incorporating self-paced video lessons delivered through Khan Academy, in accordance with the Department of Education (DepEd) initiative, in improving the Mathematics achievement of Grade 7 students at Lunao National High School.

RESEARCH METHODS

Research Design

This study adopted a quasi-experimental research approach utilizing a pretest–posttest control group design to evaluate the effectiveness of self-paced video lessons delivered through Khan Academy on the Mathematics achievement of Grade 7 learners. Participants were assigned to either a control group or an experimental group. The control group was taught using conventional classroom instruction, whereas the experimental group received blended instruction incorporating Khan Academy. Students' academic performance was assessed through pretest and posttest scores administered before and after the implementation of the intervention.

Participants of the Study

The respondents consisted of seventy (70) Grade 7 students enrolled at Lunao National High School in the Division of Gingoog City during the School Year 2025–2026. To ensure comparability between groups, matched-pair random sampling was employed using students' Mean Percentage Scores (MPS) in Mathematics as the matching criterion. The selected participants were evenly assigned to the control group (35 students) and the experimental group (35 students).

Research Locale

The research was carried out at Lunao National High School, situated in Barangay Lunao, Gingoog City, Misamis Oriental, Philippines. The institution primarily caters to learners from rural coastal areas where access to reliable internet services and digital learning resources remains limited.

Research Instrument

Data were collected using an adapted 50-item multiple-choice achievement test derived from the Department of Education's Second Quarterly Examination for Mathematics 7. The assessment instrument was aligned with the MATATAG curriculum and measured students' competencies in rational numbers, square roots, cubes, sets, unit conversions, volume, and problem-solving involving Venn diagrams. The same test was utilized for both the pretest and posttest to determine changes in students' academic performance.

Data Gathering Procedure

Prior to the conduct of the study, the researcher secured the necessary approvals from the appropriate authorities. Ethical standards, including the acquisition of informed consent from participants, were strictly observed throughout the research process. A pretest was first administered to both groups to establish their baseline level of performance.

Following the pretest, students in the control group underwent traditional face-to-face instruction, while those in the experimental group participated in a blended learning program that integrated self-paced video lessons through Khan Academy over a five-week period. Scheduled Khan Academy sessions were incorporated into regular classroom instruction to support learning. Student attendance and participation were monitored continuously throughout the intervention. At the conclusion of the treatment period, both groups completed the same achievement test as a posttest under standardized testing conditions.

Statistical Treatment of Data

Descriptive statistical measures, specifically the mean and standard deviation, were employed to summarize students' performance before and after the intervention. To determine whether significant differences existed within and between groups, paired-samples and independent-samples t-tests were conducted. All statistical analyses were performed using a significance level of 0.05.

RESULT AND DISCUSSION

To verify the homogeneity of the participants prior to the intervention, the pretest results of the control and experimental groups were compared. The findings of this analysis serve as a basis for interpreting the effectiveness of the intervention during the posttest phase. Prior to the study, the pre-test scores of Grade 7 students in the control and experimental groups were analyzed at a significance level of 0.05. Table 1 presents the test of significant difference in the pre-test scores of Grade 7 students in the control group using traditional instruction and the experimental group using self-paced video lessons through Khan Academy.

Table 1. Significant Difference of the Control and Experimental Group Prior to the Intervention

Comparison	Mean Difference	t-value	df	p-value	Interpretation
C1 vs C2	0.914	0.96	62	0.342	Not Significant

The results reveal that there is no significant difference between the pre- test scores of the control group and the experimental group, with the computed p- value 0.342 is greater than the level of significance at 0.05. Hence, the implementation of both traditional and blended instruction using Khan Academy started.

Table 2 shows the performance of the control group based on students' pre-test and post-test scores. The table includes the comparison of the mean grade, standard deviation, the minimum grade, and the maximum grade of the pre- test and post-test results.

Table 2. Performance of the Control Group

Statistic	Pretest		Posttest	
	Result	Remarks	Result	Remarks
Valid	35		35	
Mean Grade	69.09	did not meet expectations	72.20	did not meet expectations
Std. Deviation	2.318		1.324	
Minimum Grade	63.00	did not meet expectations	70.00	did not meet expectations
Maximum Grade	73.00	did not meet expectations	75.00	fairly satisfactory

The pre-test mean score of 69.09% indicates that the students originally "did not meet expectations," revealing a lack of mastery in the required competencies prior to instruction. Following the traditional approach, the post-test mean increased marginally to 72.20%. However, this score remained within the same performance range ("did not meet expectations"), resulting in only moderate progress.

Notably, the minimum scores rose from 63.00% to 70.00%, indicating slight improvements among the lowest-performing learners. There is an increase in the maximum scores from 73% to 75%, which indicates "fairly satisfactory". This shows that the high-performing students have improved slightly more than the others. The standard deviation decreased from 2.318 to 1.324 based on the group's pre-test and post-test results, indicating that the group's performance has improved and become more consistent.

This study is supported by Panco, et al (2025), who found that both traditional teaching and the use of Khan Academy improved the students' understanding of non-right triangles in trigonometry. However, there was no significant difference in the post-test scores between the two groups. This aligns with the finding that there is still a need for traditional instruction to improve students' mean grade.

Table 3. illustrates the test of the significant difference in the control group using traditional instruction.

Significant Difference in the Control Group				
Measure 1	Measure 2	t	df	p
Pretest	-	Posttest	-6.801	34
			< .001	
Decision: Reject Ho		Remarks: Significant		

The table presents a computed t-value of -6.801 with 34 degrees of freedom and a p-value of less than 0.001. Given the p-value is less than the 0.05 level of significance, the null hypothesis that there is no significant change between pre-test and post-test scores in the control group is rejected. This indicates that the difference in students' performance before and after the administration of traditional teaching is statistically significant. Even though the mean scores were low, the t-test results indicate that traditional teaching led to observable learning progress. In general, traditional teaching methods can effectively teach basic math skills, but the progress is insufficient.

These results are similar to the findings of San and Aykac (2020). The control group's pre-test and post-test scores differed significantly, according to the Wilcoxon Signed-Rank test. Their findings showed that the 2017 Secondary Education English Curriculum

improved students' academic performance, demonstrating the efficacy of standardized curricula in a traditional teaching setting. This result suggests the need to use traditional instruction blended with an online platform for Grade 7 learners to improve their performance in Mathematics in the 2nd quarter.

Table 4 shows the performance of the experimental group exposed to blended instruction through Khan Academy. It also presents the mean grade, standard deviation, minimum grade and maximum grade of the respondents' results in the pre-test and post test.

Table 4. Performance of the Experimental Group

Statistic	Pretest		Posttest	
	Result	Remarks	Result	Remarks
Valid	35		35	
Mean Grade	69.57	did not meet expectations	75.77	fairly satisfactory
Std. Deviation	1.720		3.820	
Minimum Grade	66.00	did not meet expectations	70.00	did not meet expectations
Maximum Grade	73.00	did not meet expectations	88.00	very satisfactory

The Thirty-five (35) students from Grade 7 completed the questionnaires. It shows that the mean score in the pre-test was 69.57, which indicates “did not meet expectations”; this implies that the expected mathematical competencies were not fully achieved prior to the intervention.

After implementing blended instruction with Khan Academy, the mean post-test score is 75.77, classified as “fairly satisfactory”. This implies that the online-based technique significantly improved students' performance in Mathematics. The minimum score has increased from 66 to 70, indicating progress among low-performing students. Remarkably, the maximum score has increased from 73 to 88, indicating “very satisfactory” and implying significant improvement among higher-performing students. Overall, the findings show that using Khan Academy yielded significant benefits, suggesting that the experimental group benefited more from this strategy than from traditional approaches.

This is in accordance with the findings of the Ulum (2023) study at Necmettin Erbakan University. Using a pre-test/post-test control group method, Ulum discovered that the experimental group using Khan Academy outperformed the control group taught through the Education Information Network (EBA). The findings revealed that the Khan Academy platform had a significantly greater influence on math achievement than traditional strategies.

Table 5. The Test of Significant Difference in the Pre- Test And Post Test Scores of the Experimental Group using Self- Paced Video Lessons through Khan Academy.

Significant Difference in the Control Group				
Measure 1	Measure 2	t	df	p
Pretest -	Posttest	-8.634	34	< .001
Decision: Reject Ho		Remarks: Significant		

Table 5 shows that the experimental group's post-test scores increased significantly ($t(34) = -8.634, p < 0.001$). Consequently, the null hypothesis is rejected. The results show that the intervention had a significant and positive impact on the participants' performance. The large t-value indicates that the improvement from pre-test to post-test was not due to chance but was most likely caused by the treatment administered.

Notably, it is in line with the findings of Armando et al. (2024), who discovered that Khan Academy has a favorable and significant impact on mathematics teaching and learning among students in the Mathematics- Physics program at UNDAC. Their study found that students who used the platform performed much better in math, demonstrating that Khan Academy benefits both struggling and advanced learners by providing high-quality, relevant content.

Table 6 presents a comparison of Mean Gains between the pre-test and post-test scores of the control and experimental groups.

Table 6. Comparison of Mean Gains

Measure 1	Measure 2	t	df	p
Post-Pre (Experimental)	Post-Pre (Control)	.671	4	.001
Decision: Reject Ho		Remarks: Significant		

The result shows a significant difference in mean gains: $t(34) = 3.671$, $p < .001$. The null hypothesis was rejected because the p-value was below 0.05. This suggests that the experimental group made significantly more progress from pre-test to post-test than the control group.

The t-value indicates that Khan Academy was more effective than the traditional teaching method used in the control group. Students who used Khan Academy have improved their performance in a given competency. Overall, the results clearly support the effectiveness of self-paced video lessons on the performance of Grade 7 students, and they show that the intervention made a real impact. The experimental group performed better due to the "gamification" (rewards/badges) gained during the exercises.

This is supported by the study by Karimov et al. (2023), which found that online platforms improved students' motivation and learning productivity in different situations. Gamification is considered one of the most effective techniques for increasing engagement on online educational platforms.

Based on the findings, the experimental group, which received blended learning using Khan Academy, outperformed the control group, which received a traditional approach. Hence, Table 7 presents the proposed enhancement program that uses video lessons from Khan Academy.

Table 7. Proposed Enhancement program using video lessons through Khan academy
 Mathematics Enhancement Program using self- paced video lessons through Khan Academy

Title:	Mathematics Enhancement Program using self- paced video lessons through Khan Academy	Type of Intervention	Capacity Building, School-Based Mentoring
Rationale:	The implementation of this program responds to the need of improving student's performance in Mathematics. Based on the results of the student's scores in mathematics for the 2 nd quarter, there is a need to integrate self-paced video lessons through Khan Academy. Since traditional teaching may not be enough to aid the existing gap of student's performance.		
Program/	The proposed enhancement program aims to strengthen teachers' classroom		

Project Description:	assessment practices through sustained mentoring, guided practice, and collaborative professional learning.			
Milestone	Activity	Timeline	Resource Needed	Expected Output
1. Teacher Training	Facilitate face to face training on Khan Academy for teachers handling Mathematics 7	June- July, 2026	Laptop, internet connection,	Teachers effectively implement and guide students in using of Khan Academy
2. Khan Academy Integration in the Lesson Plan	Integrate video lessons and exercises as part of formative assessment in the lesson plan	June- March, 2026	Least learned competencies identified in Khan Academy	Individualized assessment of learners
3. Schedule of Khan Academy (Khan time)	Develop and implement class schedule for Khan Academy	June, 2026	Teachers' individual schedule, class program	Regular use of Khan Academy in the class
4. Infrastructure	Ensure availability of computer, laptops and internet connection	June- March, 2026	ICT laboratory, computer, laptops and internet connection	Functional learning environment for learners
5. Monitoring and Evaluation	Conduct monitoring of students' performance	June- March, 2026 (weekly)	Khan Academy (Teacher's Dashboard)	Teachers effectively assigned appropriate activities to learners based on their performance in khan Academy

CONCLUSION

Based on the findings of the study, the following conclusions were made:

1. The pre- test and post-test scores in the 2nd quarter in Mathematics indicate that the Grade 7 students in the control group are still struggling. Even though the post-test result has improved slightly, they still belong to the “did not meet expectations” level. This implies that the traditional teaching method helped the students a little in improving their mathematical skills or in leveling up to a higher proficiency level. Traditional intervention yielded only moderate mean gains and did not achieve a sufficient proficiency level; more intensive or alternative learning strategies are needed to address these underlying deficiencies.
2. The significant difference between the pre-test and post-test scores of students in the control group in the 2nd quarter of Mathematics shows that the traditional teaching

method helped students' progress in their learning. They have increased their knowledge, which demonstrates that the teaching method improves students' proficiency. However, it is insufficient to achieve mastery.

3. The pre-test and post-test results indicate that the experimental group showed significant improvement, advancing from "did not meet expectations" to "fairly satisfactory". This indicates that Khan Academy, as an intervention, was effective in enhancing students' proficiency in Mathematics 7 topics for the 2nd quarter.
4. The experimental group's significant difference in test scores between the pre-test and post-test implies that the applied intervention, namely Khan Academy, was effective.
5. The significant difference in learning gains between the control and experimental groups indicates that the experimental group's intervention was more effective than the traditional method. This indicates that blended learning with Khan Academy was more beneficial in advancing students' proficiency levels. This means that using self-paced video lessons is a much better approach for bridging competency gaps and enhancing mathematical skills than the traditional approach alone. Therefore, the Ho1 and Ho2 are rejected. This validated the theory of Garrison and Kanuka (2024) on blended learning; indeed, blended instruction using face-to-face and Khan Academy is effective in improving students' performance.
6. Based on the findings, the researcher proposed using Khan Academy as an enhancement and remedial program for identified students, based on the results of the pre-test scores for the 2nd quarter.

Recommendations

On the basis of the findings and conclusions of this study, the following recommendations are made:

1. School administrators, They are enticed to use Khan Academy regularly as a supplemental blended-learning tool for teaching mathematics, with students demonstrating considerable improvement. To ensure equal access and efficient application, the department must include annual funding for infrastructure, such as laptops, internet connectivity, and teacher training on tracking students' performance in the system.
2. Teachers, They are advised to use the Khan Academy platform in their lessons twice a week for the 2nd quarter. Regular use of Khan Academy maximizes the platform's effectiveness. Additionally, teachers should attend training regarding the online platform. These training sessions will help them become familiar with the platform's features, especially for tracking students' progress using the teacher's dashboard. This information will allow teachers to assess learners based on their individual needs.
3. Students, They could use Khan Academy regularly by completing video lessons and exercises. They should practice frequently and follow the platform's suggested remarks to be aware of upgrading their levels from proficient to mastered. Constant engagement will improve their mathematical skills and knowledge.
4. Parents. They can show support for their children by providing access to technology and the internet, and by following up so that they can use Khan Academy at home. They are encouraged to advise their children to complete their assigned task on Khan Academy and, if possible, to monitor their children's progress. This act will help

students perform their tasks and be reinforced in completing them, improving their math scores.

5. Future Researchers. They are advised to conduct similar research with larger groups or across different grade levels to evaluate Khan Academy's effectiveness. They can use other digital platforms, which will prove more effective at improving students' academic performance in Mathematics. Furthermore, they should examine the challenges students encounter when using the platform, such as limited infrastructure and poor internet connectivity. Examining these topics extensively can help the implementation phase in supporting students in their learning.

REFERENCES

- Armando, A., Ruiz, M., & Lovatón, J. (2024). The impact of Khan Academy on mathematics learning in the Mathematics-Physics program at UNDAC. *Latin American Journal of Educational Technology*, 7(1), 85–98.
- Department of Education. (2025). *DepEd Memorandum No. 002, s. 2025: Learning sessions on the utilization of Khan Academy for PISA 2025 preparation*. Department of Education, Philippines.
- Department of Education. (2025). *DM-CT-2025-143: Expanded implementation of Khan Academy online and face-to-face activities for School Year 2025–2026*. Department of Education, Philippines.
- Department of Education. (2024). *Launch of pilot activities for Batch 2 and 3 schools (DM-CT-2024-403)* [Memorandum].
- Schools Division of Gingoog City. (2025). *Division Memorandum No. 026, s. 2025: Orientation and implementation activities for Khan Academy teacher-implementers*. Department of Education, Schools Division of Gingoog City.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential. *The Internet and Higher Education*, 7(2), 95–105. <https://doi.org/10.1016/j.iheduc.2004.02.001>
- Karimov, A., Saarela, M., & Kärkkäinen, T. (2023). Gamification and learning productivity: Insights from Khan Academy in underserved communities. *Computers & Education*, 193, Article 104667. <https://doi.org/10.1016/j.compedu.2023.104667>
- Panco, M., Valila, J., & Valila, A. (2025). Evaluating Khan Academy's effectiveness in trigonometry: A mixed-methods study. *Journal of Mathematics Education and Innovation*, 11(1), 77–91.
- Phạm, T. T. N., Tan, C. K., & Lee, K. W. (2019). *Issues and challenges in using ICT for teaching English in Vietnam*. Universiti Malaysia Sabah.
- Philippine Daily Inquirer. (2024, February 5). DepEd taps Khan Academy to improve Filipino students' math skills.
- Philstar. (2023, December 7). 84% of Filipino students struggle in math—PISA 2022 report. <https://www.philstar.com/headlines/2023/12/07/2319786/84-filipino-students-struggle-math-pisa-2022-report>
- San, I., & Aykac, M. (2020). The use of Khan Academy in teaching English tenses: An experimental study. *International Journal of Language Education*, 6(3), 15–27.
- Ulum, H. (2023). The impact of Khan Academy on fourth-grade students' math achievement: A pre-test post-test control group study. *International Journal of Educational Methodology*, 9(1), 14–22. <https://doi.org/10.12973/ijem.9.1.14>