

Original Article

Evaluating the Effectiveness of Khan Academy Assisted Instruction on the Proficiency of Grade 11 Students in General Mathematics

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Abstract. Mathematics proficiency remains a concern among senior high school students, particularly in developing the knowledge and skills required in General Mathematics. This study examined the effectiveness of Khan Academy-assisted instruction as a supplementary instructional approach for Grade 11 students. The study employed a quasi-experimental design with 63 Grade 11 students enrolled in General Mathematics at a public secondary school in Guihing, Hagonoy, Davao del Sur. One intact class served as the control group and received conventional instruction, while another intact class served as the experimental group and received Khan Academy-assisted instruction. Mathematics proficiency was measured using a 31-item adapted achievement test with a maximum score of 40 points, administered as a pretest and posttest. Descriptive statistics, paired-samples *t*-tests, and independent-samples *t*-tests were used to examine changes within groups and differences between groups. The pretest results showed that both groups were at the Beginning level, with no statistically significant difference between the groups, $t(61) = -1.53, p = .13$. After the intervention, the control group obtained a mean posttest score of 17.00, classified as Beginning, whereas the experimental group obtained a mean score of 31.17, classified as Proficient. The reported independent-samples *t*-test also indicated a statistically significant difference in posttest scores, $t(61) = -40.83, p < .001$. Similarly, the gain-score comparison showed a statistically significant difference between the groups, $t(61) = -40.65, p < .001$, with the experimental group showing a larger mean gain than the control group. These results indicate an observed difference in mathematics proficiency favoring the class that received Khan Academy-assisted instruction. However, because the study involved only one intact class per condition, the observed difference may also reflect class-level factors, and using the same test for the pretest and posttest may have introduced testing or familiarity effects. Therefore, the findings should be interpreted as evidence of an observed group difference rather than as definitive evidence that Khan Academy caused the improvement. The study was limited to Grade 11 students in one public secondary school and focused on mathematics proficiency as measured by the adapted achievement test.

Keywords: General Mathematics; Khan Academy-assisted instruction; Mathematics proficiency; Quasi-experimental design.

Mathematics proficiency remains an important concern in secondary education because students need adequate mathematical understanding to perform effectively in academic tasks (Edulsa, 2022). In Senior High School, learners are expected to develop conceptual understanding and apply mathematical knowledge when working with different mathematical tasks and situations (Raga-Abee, 2023). However, students continue to encounter difficulties in understanding mathematical concepts, which may affect their ability to solve mathematical problems effectively (Mutia, 2025). Difficulties in mathematical literacy and reasoning may also limit students' ability to apply mathematical knowledge to different contexts (Noves & Palomares, 2024). Consequently, instructional approaches that provide structured opportunities for practice and conceptual development remain important in mathematics education (Ramadhan et al., 2025).

The use of technology in mathematics instruction has received increasing attention as educators seek supplementary approaches to address persistent learning difficulties (Ariani et al., 2024). Technology-assisted learning can provide learners with additional opportunities to access instructional materials, practice mathematical skills, and receive support during the learning process (Clarín et al., 2025). In the United States, Kelly and Rutherford (2017) found that students who used Khan Academy as a supplemental instructional resource performed better in mathematics than students who relied solely on conventional classroom instruction. Although this study provides early evidence of Khan Academy's potential contribution to mathematics learning, its findings should be interpreted in relation to its specific educational context and participants. Likewise, Kreller (2022) reported that the systematic integration of Khan Academy into high school mathematics instruction was associated with improved student achievement and classroom engagement.

Evidence from other countries further demonstrates the potential of digital learning platforms in mathematics education. In Israel, Vidergor and Ben-Amram (2020) reported that secondary school students perceived Khan Academy as useful for supporting their understanding, confidence, and engagement in mathematics. In Nigeria, Diri (2023) found that students who received Khan Academy video-based instruction performed better in mathematics than those who received conventional instruction. Similarly, Ferman et al. (2019) in Brazil reported that using an online mathematics learning platform was associated with improved mathematics achievement and more positive attitudes toward mathematics.

In Slovenia, Brezavšček et al. (2020) emphasized that mathematics achievement is influenced not only by students' individual abilities but also by instructional strategies and learning environments that support conceptual understanding and sustained engagement. More recent evidence also supports the continued investigation of technology-assisted mathematics instruction. Jeffery et al. (2021) highlighted the potential of information and communication technology (ICT) to provide flexible and learner-centered learning opportunities, while Khan Academy (2024) reported learning gains among students who regularly used the platform as part of their learning activities.

In the Philippine context, mathematics proficiency continues to be a significant educational concern despite curriculum reforms and the increasing use of technology in instruction. Filipino learners may struggle to understand mathematical concepts, retain previously learned knowledge, and apply mathematical principles to complex problem-solving situations. Bringula et al. (2021) reported challenges associated with mathematics learning, including low mathematics self-concept, limited conceptual understanding, and difficulties in adapting to technology-supported learning environments. These concerns suggest that introducing technology alone may not be sufficient; digital resources must be appropriately integrated into instruction to support students' mathematical learning. Similarly, Cabildo et al. (2024) emphasized difficulties associated with the retention of mathematical concepts, highlighting the importance of instructional approaches that provide repeated exposure, meaningful practice, and opportunities for learners to consolidate their understanding.

Consequently, educators interested in more flexible, learner-centered approaches have increasingly explored integrating ICT into mathematics instruction. ICT-supported learning environments can provide learners with opportunities to access instructional materials, practice skills repeatedly, receive immediate feedback, and revisit explanations when necessary (Jeffery et al., 2021; Mayer, 2009). Khan Academy is particularly relevant to this approach because it provides structured instructional materials, interactive exercises, and practice activities that allow learners to work through mathematical content at their own pace (Khan Academy, 2024). However, the availability of these features does not automatically establish their effectiveness in improving mathematics proficiency. Their contribution needs to be examined using measurable learning outcomes and appropriate

research designs.

Within the Davao Region, technology-enhanced mathematics learning has likewise received attention. Tuba et al. (2026) investigated the use of Khan Academy among Junior and Senior High School students in Kiblawan South District, Davao del Sur. Their study reported high levels of student engagement and learning motivation among learners using the platform and found a significant positive relationship between these two variables. The study also emphasized teachers' role in facilitating students' effective use of Khan Academy. Although these findings are relevant to the present study because they provide local evidence regarding the use of Khan Academy, the outcomes examined by Tuba et al. (2026) were primarily engagement and motivation rather than mathematics proficiency. Consequently, their findings do not directly establish whether Khan Academy-assisted instruction improves students' measurable mathematics performance.

This distinction highlights an important gap in the existing literature. Previous studies have examined Khan Academy in relation to mathematics achievement, conceptual understanding, engagement, motivation, and students' perceptions across different educational settings. However, relatively limited local evidence specifically addresses the effectiveness of Khan Academy-assisted instruction on the mathematics proficiency of Grade 11 students enrolled in General Mathematics. In addition, some existing studies focus on elementary or lower-secondary learners or examine non-cognitive outcomes rather than changes in measured mathematics performance. This gap warrants further investigation using a quasi-experimental approach that compares students receiving conventional instruction with those receiving Khan Academy-assisted instruction.

The study is aligned with Sustainable Development Goal 4 (Quality Education), particularly its emphasis on improving the quality of education and promoting effective learning opportunities. By investigating a technology-assisted instructional approach, the study contributes to the continuing search for instructional strategies that may support improved mathematics learning outcomes.

The present study aimed to evaluate the effectiveness of Khan Academy-assisted instruction as a supplementary instructional approach in teaching General Mathematics to Grade 11 students. Specifically, the study sought to answer the following questions: What are the pretest mean scores of Grade 11 students in the control group and the experimental group in General Mathematics? What are the posttest mean scores of Grade 11 students in the control group and the experimental group in General Mathematics? Is there a statistically significant difference between the pretest scores of Grade 11 students in the control group and the experimental group? Is there a statistically significant difference between the posttest scores of Grade 11 students in the control group and the experimental group? Is there a statistically significant difference between the learning gains of Grade 11 students in the control group and the experimental group?

Methodology

Research Design

This study used a quasi-experimental research design to evaluate the effectiveness of Khan Academy-assisted instruction in supporting Grade 11 students' mathematics proficiency in General Mathematics. A quasi-experimental design was appropriate because participants were drawn from two pre-existing intact classes, and individual random assignment was not feasible. The study used a pretest-posttest comparison between a control group and an experimental group.

The two intact classes were designated as the experimental and control groups. The experimental group received General Mathematics instruction supplemented with Khan Academy, whereas the control group received conventional classroom instruction. A fishbowl draw determined which intact class would serve as the experimental or control group; this procedure did not involve random assignment of individual students. Section B was designated as the experimental group, while Section A served as the control group. Both groups completed a pretest before the intervention and a posttest after the intervention. Learning gains were computed from the difference between students' posttest and pretest scores.

Because the intervention was implemented at the intact-class level and only two classes participated, treatment assignment is completely confounded with class membership. Consequently, differences between the groups may also reflect pre-existing section characteristics and other class-level factors, such as teacher effects, scheduling,

peer composition, classroom environment, or other conditions that could not be independently separated from the intervention. Thus, the findings are interpreted as evidence from this specific classroom-level implementation rather than as a definitive estimate of a general class-level treatment effect.

Participants and Sampling Technique

The participants were 63 Grade 11 students enrolled during School Year 2025–2026 at a public secondary school in Barangay Guihing, Hagonoy, Davao del Sur. The school is the only public secondary school in the barangay and serves learners from Grades 7 to 12, including students enrolled in academic and technical-vocational senior high school programs. The participants came from two intact Grade 11 classes: Section A, with 33 students, and Section B, with 30 students. The study included all students in the two selected classes. Thus, the term complete enumeration refers specifically to the inclusion of all eligible students within the two selected intact classes and does not imply complete enumeration of the entire Grade 11 population of the school. The classes had already been constituted before the study was conducted. Therefore, individual students were not randomly assigned to the experimental and control conditions. Instead, a fishbowl draw determined which of the two intact classes would receive Khan Academy-assisted instruction and which would receive conventional instruction. The draw designated Section B as the experimental group and Section A as the control group.

Research Instrument

Table 1. *Interpretation of Students' Mathematics Performance*

Mean Range	Level of Proficiency	Interpretation
36 – 40	Advanced	This student at this level exceeds the core requirements in terms of knowledge, skills, and understanding and can transfer them automatically and flexibly.
31 – 35	Proficient	This student at this level has developed fundamental knowledge, skills, and a core understanding that can be transferred independently.
26 – 30	Approaching Proficiency	This student at this level has developed fundamental knowledge and skills, as well as a core understanding. With minimal guidance from the teacher and some assistance from peers, they can also apply this understanding.
21 – 25	Developing	This student at this level possesses the minimum knowledge, skills, and core understanding but needs help throughout the performance of authentic tasks.
0 – 20	Beginning	This student at this level struggles with their understanding; prerequisite and fundamental knowledge and skills have not been acquired or developed adequately to aid learning.

The study used an adapted achievement test to measure Grade 11 students' mathematics proficiency in General Mathematics. The test was adapted from the achievement test developed by Kreller (2022), which assessed students' learning in a high school mathematics course using Khan Academy as an instructional tool. The adapted instrument contained 28 multiple-choice items and three problem-solving tasks based on the selected General Mathematics competencies covered in the study. The multiple-choice items were scored one point for every correct answer and zero for an incorrect answer, while each problem-solving task was scored using a four-point analytic rubric. The test had a maximum possible score of 40 points.

The adapted test was aligned with the General Mathematics competencies included in the intervention and was administered before and after the intervention. The same test was used for the pretest and posttest to ensure students were assessed using the same competencies and scoring criteria. However, repeated use of the same test may have allowed students to become familiar with some items, which was considered when interpreting the results. A panel of three (3) experts in Mathematics Education and Educational Technology reviewed the instrument to establish its content validity. The validators examined the items for clarity, relevance, presentation, suitability for the target learners, alignment with the intended competencies, and objectivity. A validation rating of 4.60 was interpreted as Very Highly Valid. The validators' suggestions were considered when revising the test before administering it to the participants.

A pilot test was conducted with 30 Grade 11 students who were not included in the actual study. The 28 multiple-choice items were scored dichotomously and analyzed using the Kuder-Richardson Formula 20 (KR-20) to determine internal consistency. The analysis produced a KR-20 coefficient of .84, indicating good reliability. The three problem-solving tasks were excluded from the KR-20 computation because they were scored using a four-point analytic rubric. The reliability result showed that the multiple-choice portion of the test had acceptable consistency for use in the study. The students' total scores were interpreted according to the following proficiency levels: 36–40, Advanced; 31–35, Proficient; 26–30, Approaching Proficiency; 21–25, Developing; and 0–20,

Beginning. Thus, the assessment consisted of 31 items with a maximum score of 40 points, combining the 28 multiple-choice items and three problem-solving tasks.

Intervention Procedure

The intervention was conducted for eight weeks, with three sessions per week and approximately 60 minutes per session. Both groups were taught the same General Mathematics competencies, learning objectives, and assessment requirements. The experimental group received Khan Academy-assisted instruction as a supplement to regular teacher-led lessons, while the control group received conventional classroom instruction.

In the experimental group, the teacher introduced the lesson, provided explanations and worked examples, and then assigned related Khan Academy videos and practice exercises. The activities covered functions and their representations, operations on functions, rational functions, and problem-solving involving functions. Students used smartphones or available school computers and spent approximately 20–30 minutes per session on Khan Academy activities. A 70% mastery target was set for assigned exercises, and students who did not meet the target were allowed to review the lesson and repeat the practice activities.

The teacher monitored students' activity completion and mastery progress through the platform and provided additional assistance when needed. The same teacher handled both groups and followed the same lesson objectives, competencies, instructional schedule, and assessment procedures. The researchers used an implementation checklist to monitor intervention delivery and ensure the planned activities were followed.

For the control group, the same competencies were taught through teacher explanations, worked examples, guided practice, individual exercises, and formative assessment, without using Khan Academy. The Khan Academy assignments were provided only to the experimental group during the intervention. Students in the control group were not given access to the assigned platform activities, although the possibility of students independently accessing online materials outside the classroom could not be eliminated.

Data Gathering Procedure

Before implementing the study, the researchers secured permission from the school administration and coordinated with the concerned teacher on the schedule and procedures. The purpose, objectives, procedures, expected duration, and voluntary nature of participation were explained to the participants. Written informed consent was obtained from parents or legal guardians, and student assent was obtained before participation. The pretest was administered to both groups before the intervention to establish their initial mathematics proficiency. The experimental group then received Khan Academy-assisted instruction, while the control group received conventional instruction. Both groups were taught the same selected General Mathematics competencies and followed the same general instructional schedule and assessment objectives. After completion of the intervention, the same adapted achievement test was administered as the posttest. The test papers were checked and scored according to the established scoring procedures. The scores were encoded in Microsoft Excel, checked for accuracy, and subsequently analyzed using JASP statistical software. The researcher maintained attendance and assessment completion records to identify missing observations and determine whether all participants completed both assessments. Any missing data or absences were documented and considered in the statistical analysis.

Data Analysis

The data were encoded and analyzed using JASP. Descriptive statistics, particularly the mean and standard deviation, were computed to summarize the students' pretest and posttest scores in both groups. The same statistics were used to describe students' learning gains, calculated by subtracting the pretest score from the posttest score for each student. JASP was used to facilitate the statistical analysis and reporting of the results (Love et al., 2019).

A paired-samples *t*-test was conducted separately for the control and experimental groups to determine whether the students' posttest scores differed significantly from their pretest scores. An independent-samples *t*-test was then used to compare the two groups' pretest scores, posttest scores, and learning gains. The level of significance was set at .05. The analysis also included the mean difference, *t*-value, degrees of freedom, *p*-value, 95% confidence interval, and effect size to provide a clearer account of the observed differences. Before conducting the *t*-tests, the data were checked for normality, extreme values, and equality of variances. The Shapiro–Wilk test showed that the pretest scores were normally distributed for the control group ($W = .963, p = .316$) and the experimental group

($W = .958, p = .271$). The posttest scores also showed no significant departure from normality for the control group ($W = .951, p = .142$) and the experimental group ($W = .964, p = .337$). For the gain scores, the control group ($W = .967, p = .393$) and experimental group ($W = .955, p = .234$) likewise met the assumption of normality. No extreme observations were identified during the data screening. Levene's test indicated comparable variances between the groups for the pretest ($p = .641$), posttest ($p = .284$), and gain scores ($p = .517$). These results indicated that the assumptions required for the t -tests were sufficiently met.

The analysis was based on the individual scores of the students; however, the participants came from only two intact classes, with one class assigned to each condition. Thus, the effect of the instructional approach cannot be completely separated from possible differences between the two classes. Factors such as class composition, peer interaction, schedule, and other section-related conditions may have contributed to the observed results. For this reason, the statistical comparisons were interpreted as differences observed between the two participating classes rather than as conclusive evidence of a treatment effect that can be generalized to other classes or schools.

The pretest comparison was used to determine whether a statistically significant difference was observed between the two groups before the intervention. A nonsignificant result was not taken to mean that the groups were fully equivalent at the beginning of the study. The posttest and learning-gain comparisons were considered together with the descriptive results and the limitations of the two-class design when drawing conclusions about the effectiveness of Khan Academy-assisted instruction.

Ethical Considerations

The study followed accepted ethical standards for research involving student participants. Before the conduct of the study, formal ethical approval was secured, and permission to conduct the study was obtained from the school administration. The purpose, procedures, duration, and requirements of the study were explained to the students and their parents or legal guardians before data collection.

Written informed consent was obtained from the parents or legal guardians, while student assent was secured from the participants. Participation was voluntary, and the students were informed that they could decline or withdraw from the study at any time without academic penalty or any effect on their grades. The confidentiality and privacy of the participants were maintained throughout the study. Participant names were not included in the research dataset; instead, identification codes were used. The pretest, posttest, and Khan Academy-related data were used solely for the purposes of the study. Access to the research records was limited to the researchers and authorized personnel. Electronic files were stored in password-protected storage, while printed documents were kept in a secure location.

The researchers also ensured that participation in the study did not affect the students' academic standing. Both groups continued to receive the required General Mathematics instruction, and participation or nonparticipation in the study did not influence their grades. The experimental group used the Khan Academy activities as supplementary learning and did not replace the required classroom instruction.

For the Khan Academy component, only information relevant to the study was collected. Students' account information and learning activity records were treated as confidential and were not reported in a manner that could identify individual participants. The researchers took appropriate measures to prevent unauthorized access to or disclosure of platform-related information. The research data were retained for five years after the study's completion and were accessible only to the researchers and authorized personnel. After the retention period, electronic records were permanently deleted and printed documents were securely destroyed. Throughout the research process, the researchers maintained accuracy, confidentiality, voluntary participation, and fairness in collecting, analyzing, and reporting the data.

Results and Discussion

Level of Pretest Scores of the Control and Experimental Group

Table 2 presents the pretest performance of Grade 11 students in the control and experimental groups before the instructional intervention. The results revealed that the control group obtained a mean score of 13.27 ($M = 13.27, SD = 1.35$), while the experimental group obtained a mean score of 13.77 ($M = 13.77, SD = 1.22$). Based on the Department of Education proficiency descriptors, both groups were classified under the Beginning level. This

indicates that the students had not yet acquired the prerequisite knowledge and fundamental skills necessary for a satisfactory understanding of the General Mathematics concepts covered in the study.

Table 2. *Level of Pretest Performance of Students*

Group	Mean	SD	Level	Interpretation
Control	13.27	1.35	Beginning	This student at this level struggles with their understanding; prerequisite and fundamental knowledge and skills have not been acquired or developed adequately to aid learning.
Experimental	13.77	1.22	Beginning	This student at this level struggles with their understanding; prerequisite and fundamental knowledge and skills have not been acquired or developed adequately to aid learning.

The relatively close mean scores of the two groups indicate that participants had comparable levels of prior mathematics proficiency before the intervention. Likewise, the small standard deviation values suggest that students' pretest scores were relatively homogeneous within each group, indicating minimal variation in their initial level of mathematics proficiency. These findings established a comparable baseline between the control and experimental groups, thereby providing an appropriate basis for examining the effects of Khan Academy-assisted instruction on students' mathematics proficiency.

The Beginning level of proficiency also implies that students needed additional instructional support to strengthen their conceptual understanding and foundational mathematical skills. Weak prior knowledge may limit students' ability to solve higher-order mathematical problems, emphasizing the need for instructional approaches that promote active engagement, repeated practice, immediate feedback, and mastery of essential concepts before introducing more complex competencies.

The findings are consistent with the study of Bringula et al. (2021), who reported that many learners experienced difficulties in mathematics learning due to limited conceptual understanding, low mathematics self-concept, and challenges encountered in technology-supported learning environments. Similarly, Cabildo et al. (2024) found that students often struggled to retain mathematical concepts over time, suggesting that inadequate mastery of prerequisite knowledge may hinder subsequent learning. Consequently, the low pretest performance observed in both groups underscores the need for instructional interventions that strengthen conceptual understanding and improve mathematics proficiency.

Level of Posttest Scores of the Control and Experimental Group

Table 3 presents the posttest performance of Grade 11 students after completing the instructional intervention. The results indicate that the students in the control group obtained a mean score of 17.00 ($M = 17.00$, $SD = 1.52$), which is described as Beginning. At this proficiency level, students struggle with understanding; they have not acquired or developed the prerequisite and fundamental knowledge and skills needed to support learning. In contrast, the experimental group recorded a considerably higher mean score of 31.17 ($M = 31.17$, $SD = 1.23$), corresponding to the Proficient level. This level indicates that students had developed sufficient conceptual understanding and mathematical competence to apply learned concepts independently to solve mathematical problems.

Table 3. *Level of Posttest Performance of Students*

Group	Mean	SD	Level	Interpretation
Control	17.00	1.52	Beginning	This student at this level struggles with their understanding; prerequisite and fundamental knowledge and skills have not been acquired or developed adequately to aid learning.
Experimental	31.17	1.23	Proficient	This student at this level has developed fundamental knowledge, skills, and a core understanding that can be transferred independently.

A comparison of the posttest results shows a substantial difference in the performance of the two groups following the instructional intervention. Although both groups demonstrated progress after instruction, the students who participated in Khan Academy-assisted learning achieved markedly higher levels of proficiency than those who received the conventional teaching approach. Furthermore, the relatively small standard deviation values obtained by both groups indicate that the posttest scores were fairly consistent among the students within each group, reflecting a similar level of learning achievement after instruction. The higher mean score obtained by the experimental group suggests that the integration of Khan Academy provided additional instructional support

that facilitated a deeper understanding of the mathematical concepts included in the lessons.

These findings are consistent with Kreller (2022), who reported that students who used Khan Academy as a supplementary instructional resource achieved better mathematics performance and demonstrated greater conceptual understanding than those who relied solely on conventional classroom instruction. Likewise, Diri (2023) found that integrating Khan Academy video-based instruction into mathematics lessons significantly improved students' academic performance compared with traditional teaching methods.

Difference in the Pretest Scores of the Control and Experimental Group

Table 4 presents the comparison of the pretest scores of the control and experimental groups. The analysis showed no statistically significant difference between the pretest scores, $t(61) = -1.53$, $p = .130$. Thus, the null hypothesis was not rejected. The result indicates that no statistically significant difference was detected between the observed pretest scores of the two groups. However, a nonsignificant pretest result does not establish complete baseline equivalence. Because the participants belonged to only two intact classes, other differences between the classes may have existed even though the pretest comparison did not detect them.

Table 4. *Significant Difference in the Pretest Scores of the Control and Experimental Group*

Group	Mean	Difference	t value	P value	Remarks	Decision
Control	13.27	-.50	-1.53	.13	Not Significant	Failed to reject Ho
Experimental	13.77					

The similarity in the pretest scores suggests that both groups entered the study with relatively equal mathematical preparedness. Because neither group had been exposed to Khan Academy at the beginning of the study, the pretest scores reflected only the students' existing knowledge and skills acquired through previous classroom instruction. Establishing comparable baseline performance is essential in intervention studies because it provides a fair basis for determining whether any subsequent differences in learning outcomes are associated with the instructional strategy rather than with pre-existing differences among learners (Gopalan et al., 2020; Fabrigar et al., 2024).

Difference in the Posttest Scores of the Control and Experimental Group

Table 5 presents the comparison of the posttest scores of the control and experimental groups after the intervention. The analysis showed a statistically significant difference between the two groups' posttest scores, $t(61) = -40.83$, $p < .001$. The experimental group obtained a higher mean posttest score than the control group, with a mean difference of 14.17 points. Because the study involved one intact class for each instructional condition, the instructional condition was confounded with class membership. Thus, the observed difference may reflect not only the instructional approach but also differences between the two classes, such as classroom composition, prior learning experiences, peer influences, or other class-level factors.

Table 5. *Significant Difference in the Posttest Scores of the Control and Experimental Group*

Group	Mean	Difference	t value	P value	Remarks	Decision
Control	17.00	-14.17	-40.83	$p < .001$	Significant	Reject Ho
Experimental	31.17					

The present finding is consistent with the study of Diri (2023), who found that students exposed to Khan Academy video-based instruction achieved significantly better mathematics performance than those who learned through conventional classroom instruction. Likewise, Kreller (2022) reported that incorporating Khan Academy as a supplementary instructional resource positively influenced students' mathematics achievement in a high school mathematics course, highlighting the value of technology-assisted learning in supporting classroom instruction. Furthermore, Vidergor and Ben-Amram (2020) found that secondary school students perceived Khan Academy as an effective learning platform because its self-paced activities, instructional videos, and immediate feedback helped them better understand mathematical concepts and supported their learning experiences.

Test familiarity may also have affected the results because the same achievement test was administered as both the pretest and posttest. Students may have become familiar with the test items or format during the first administration. The study also did not directly measure engagement, self-paced learning, independent learning, or the effect of immediate feedback. Therefore, these factors cannot be used to explain the higher posttest

performance.

Difference in Learning Gains Between Groups

Table 6 presents the results of the independent-samples t-test comparing the gain scores of the control and experimental groups. The analysis showed a statistically significant difference between the gain scores, $t(61) = -40.65$, $p < .001$. Thus, the null hypothesis was rejected. The experimental group obtained a higher mean gain score ($M = 17.40$, $SD = 1.23$) than the control group ($M = 3.73$, $SD = 1.44$), indicating a greater increase in mathematics proficiency among students in the experimental class during the intervention period.

Table 6. Significant Difference in the Gain Scores of the Control and Experimental Groups

Variable	Group	Mean Gain	Mean Gain Difference	SD	t	df	p	Decision
Gain	Control	3.73		1.44				
	Experimental	17.40	-13.67	1.23	-40.65	61	< .001	Significant

The findings of the present study are consistent with those of Diri (2023), who reported that students who received Khan Academy video-based instruction achieved significantly higher mathematics performance than those taught using conventional teaching strategies. Similarly, Kreller (2022) concluded that integrating Khan Academy as a supplementary instructional resource enhanced students' mathematics achievement in a high school mathematics course, suggesting that technology-supported instruction can effectively reinforce classroom learning. Likewise, the Khan Academy (2024) Annual Report documented that students who regularly engaged with the platform demonstrated learning growth beyond expected levels, particularly when Khan Academy was implemented consistently as part of classroom instruction.

Conclusion

The study concludes that the control and experimental groups showed different levels of improvement in measured General Mathematics proficiency following the intervention. The groups did not differ significantly in their pretest scores, while the experimental group obtained a significantly higher posttest mean and gain score than the control group. These results indicate an observed difference in mathematics proficiency between the two intact classes following the use of Khan Academy-assisted instruction. However, the findings should be interpreted cautiously because the study involved only one intact class per condition, making it difficult to separate the instructional condition from class-level factors. The results therefore provide preliminary evidence of an association between Khan Academy-assisted instruction and higher mathematics achievement in the participating classes, rather than definitive evidence of a causal effect.

The study was limited to the measured outcome of mathematics proficiency and did not directly assess conceptual understanding, long-term retention, engagement, motivation, self-efficacy, or other learning processes. Therefore, conclusions about these outcomes cannot be drawn from the present findings. The possibility of testing effects should also be considered because the same achievement test was administered as the pretest and posttest. Likewise, differences between the two intact classes may have contributed to the observed results. These limitations should be considered when interpreting the experimental group's higher posttest and gain scores.

Based on the results, teachers in similar General Mathematics classes may consider Khan Academy as a supplementary instructional resource, particularly when its use is aligned with the competencies being taught. Such use should be considered in relation to available devices, connectivity, teacher support, and classroom conditions rather than as a general policy recommendation. School-level decisions regarding digital learning resources should be based on the needs and resources of the particular school. Future researchers may conduct studies involving multiple classes and schools, larger samples, and longer intervention periods to provide stronger evidence regarding the relationship between Khan Academy-assisted instruction and mathematics achievement. Future studies may also investigate engagement, motivation, self-efficacy, conceptual understanding, and retention as separate outcomes rather than assuming that changes in these variables resulted from the intervention.

Contributions of Authors

Author 1: conceptualization, data gathering, writing of the manuscript, editing, data analysis

Author 2: writing, supervising, and revising

Author 3: supervising and revising

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Conflict of Interests

No conflict of interest.

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