



Integrating TikTok as a 21st Century Learning Innovation: A Quasi-Experimental Study on Student Engagement and Learning Outcomes

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Abstract: This study aims to examine the effectiveness of using TikTok as a 21st-century learning innovation on students' learning outcomes and engagement in the Spreadsheet subject. The research employed a quantitative approach with a quasi-experimental nonequivalent control group design. The research population consisted of all tenth-grade students of Accounting and Institutional Finance (AKL) at SMK Negeri Banyudono, Boyolali, while the sample comprised 72 students selected through cluster random sampling. Class X AKL 1 was designated as the experimental group receiving TikTok-based instruction, whereas Class X AKL 2 served as the control group with conventional learning methods. Research instruments included learning outcome tests (pre-test-post-test) and a learning activeness questionnaire that met validity and reliability criteria. Data were analyzed using paired sample t-tests and independent sample t-tests. The results indicated a significant difference between the two groups after treatment, with the experimental group showing greater improvements in learning outcomes and student engagement. These findings demonstrate that TikTok is an effective learning medium, enhancing student participation and understanding and contributing to the development of vocational education literature by providing empirical evidence of digital technology integration in the learning process.

Abstrak: Penelitian ini bertujuan untuk menguji efektivitas penggunaan media sosial TikTok sebagai inovasi pembelajaran abad ke-21 terhadap hasil belajar dan keaktifan siswa pada mata pelajaran Spreadsheet. Penelitian menggunakan pendekatan kuantitatif dengan desain kuasi-eksperimen *nonequivalent control group*. Populasi penelitian mencakup seluruh siswa kelas X Akuntansi dan Keuangan Lembaga (AKL) di SMK Negeri Banyudono, Boyolali, sedangkan sampel terdiri atas 72 siswa yang dipilih melalui teknik *cluster random sampling*. Kelas X AKL 1 ditetapkan sebagai kelompok eksperimen yang menerima pembelajaran berbasis TikTok, sedangkan kelas X AKL 2 menjadi kelompok kontrol dengan pembelajaran konvensional. Instrumen penelitian meliputi tes hasil belajar (*pretest-posttest*) dan kuesioner keaktifan belajar yang telah memenuhi kriteria validitas dan reliabilitas. Analisis data dilakukan menggunakan *paired sample t-test* dan *independent sample t-test*. Hasil penelitian menunjukkan adanya perbedaan signifikan antara kedua kelompok setelah perlakuan, dan kelompok eksperimen mengalami peningkatan hasil belajar serta keaktifan yang lebih tinggi. Hasil ini menunjukkan bahwa TikTok efektif digunakan sebagai media pembelajaran karena mampu meningkatkan partisipasi dan pemahaman siswa, serta memberikan kontribusi terhadap pengembangan literatur pendidikan vokasi melalui bukti empiris integrasi teknologi digital dalam proses pembelajaran.

A. Introduction

Digital transformation has become a major driving force of change in education, raising new demands on teaching and learning practices in the 21st century (Asmawan, 2018; Benavides et al., 2020). In this period, learning cannot rely solely on conventional methods, as students require experiences that foster critical thinking, creativity, collaboration, communication, and problem-solving skills (Meirbekov et al., 2022; Tan et al., 2023). These conditions pose challenges for educators in designing learning processes that are participatory, relevant, and aligned with the characteristics of digital-native generations who interact with technology daily (Smith et al., 2020; Tran et al., 2020).

In secondary and vocational education, one recurring issue is the low level of student engagement and the limited availability of instructional media that bridge today's learning styles with conceptual and practical subject matter. This problem is increasingly evident, as most students show a greater interest in digital and visual media, while classroom instruction remains dominated by verbal explanations and conventional exercises. This situation highlights the need for innovative learning media that align with students' characteristics and enhance their cognitive engagement.

TikTok is one medium with the potential to meet these needs. Young people widely use this short-video-based platform to create and consume content quickly, creatively, and personally (Kaye et al., 2021). DataReportal (2023) reports that more than 34.9% of TikTok users in Indonesia are aged 18–24, a group that dominates secondary and vocational education. These data indicate TikTok's potential as a learning medium closely connected to students' daily lives and capable of increasing learning motivation and participation.

Numerous studies have shown that social media can support flexible and interactive learning processes (Ansari & Khan, 2020; Siddig, 2020; Kurni & Saritha, 2021; Perguna et al., 2021; Hamadi et al., 2022). TikTok offers features that enable instructional content to be delivered through short videos, collaborative projects, and creative activities that stimulate student interaction. Wang et al (2020) state that short educational videos can increase interest in learning and retention. Shen & Pritchard (2022) also demonstrate that visual and textual cues can enhance both shallow and deep levels of cognitive engagement, thereby supporting the effectiveness of learning through short videos.

Several educational institutions have integrated TikTok into learning activities, whether through content summaries, practicum tutorials, or creative, project-based assessments (Vizcaíno-Verdú & Abidin, 2023; Heyang & Martin, 2024). This integration aligns with the dominance of visual and auditory learning styles as well as the need for learning approaches that are adaptive to digital technology.

Nevertheless, a research gap remains, as most existing studies still focus on descriptive and exploratory analyses (e.g., Aji & Setiyadi, 2020; MacKinnon et al., 2021; Ramdani et al., 2021; Bahri et al., 2022; Cooper et al., 2022). Experimental studies examining TikTok's effectiveness in improving student engagement and learning outcomes, particularly in vocational education, remain limited. There is also a lack of research investigating the use of TikTok in subjects that require logical reasoning and technical skills,

such as Spreadsheet courses, which demand an understanding of calculations and their application through hands-on practice (Csernoch et al., 2021). This situation underscores the need for innovative learning approaches that combine visualization, interactivity, and active student involvement, using media closely integrated into students' everyday lives.

Based on these needs, this study proposes using TikTok as a learning medium in the Spreadsheet subject. The selection of this medium is based on its compatibility with students' characteristics, the ability of visual elements to enhance cognitive engagement, and the need for media that can effectively and efficiently connect conceptual understanding with practical application. The novelty of this study lies in its quasi-experimental empirical examination of the effectiveness of TikTok content in improving the activeness and learning outcomes of vocational high school students, particularly in vocational education and the Spreadsheet subject, which has rarely been examined through experimental research.

This study is guided by the following research questions: (1) Does the integration of TikTok as a learning medium significantly affect students' learning outcomes in the Spreadsheet subject? and (2) Does the use of TikTok significantly enhance students' learning activeness compared to conventional instructional methods in vocational education? Accordingly, this study aims to provide scientific evidence regarding the effectiveness of using TikTok in Spreadsheet learning at SMK Negeri Banyudono, Boyolali, particularly in improving students' learning outcomes and learning activeness. Academically, this research enriches the literature on social media as an innovation in vocational learning by offering empirical evidence from a quasi-experimental study and proposes an alternative instructional model that aligns with technological advancements and the demands of the 21st-century curriculum.

B. Method

This study employed a quantitative, quasi-experimental design with a nonequivalent control group (Campbell & Stanley, 2015; Dong et al., 2021; Kang & Bae, 2021). This design was selected because it allows researchers to compare the effects of using TikTok on learning outcomes and student activity, even without random assignment of subjects to groups. The study focused on the Spreadsheet subject and was conducted at SMK Negeri Banyudono, Boyolali Regency.

The study population comprised all tenth-grade students majoring in Accounting and Institutional Finance (AKL), divided into two classes: X AKL 1 and X AKL 2. Sampling was conducted using the cluster random sampling technique (Simkus & Simkus, 2022), in which both classes were designated as research clusters. Class X AKL 1 was assigned as the experimental group receiving TikTok-based learning, while Class X AKL 2 served as the control group receiving conventional instruction. Each class had 36 students, yielding a total sample of 72.

The research procedure began with the development of research instruments, including a learning outcomes test and a learning activeness questionnaire. Content validity was assessed using Pearson's correlation, and instrument reliability was assessed using

Cronbach's alpha. For the learning outcomes test, an item difficulty analysis was conducted to ensure that each test item had a proportional level of difficulty and fairly differentiated students' ability levels. The difficulty index criteria were classified as follows: difficult (0.00–0.30), moderate (0.31–0.70), and easy (0.71–1.00). All test items met the criteria and were categorized as difficult (see Table 1).

Table 1. Item Difficulty Test Results

Item	Number Correct (B)	Difficulty Index (P = B/N)	Interpretation
1.	8	0.222	Difficult
2.	6	0.167	Difficult
3.	7	0.194	Difficult
4.	10	0.278	Difficult
5.	5	0.139	Difficult
6.	4	0.111	Difficult
7.	9	0.250	Difficult
8.	6	0.167	Difficult
9.	8	0.222	Difficult
10.	3	0.083	Difficult
11.	7	0.194	Difficult
12.	4	0.111	Difficult
13.	6	0.167	Difficult
14.	8	0.222	Difficult
15.	10	0.278	Difficult
16.	5	0.139	Difficult
17.	9	0.250	Difficult
18.	4	0.111	Difficult
19.	6	0.167	Difficult
20.	7	0.194	Difficult

Prior to treatment, all participants completed a pre-test on learning outcomes and an initial learning activity questionnaire. The experimental group then received TikTok-based instruction in the form of educational video content aligned with the basic competencies of the Spreadsheet subject. At the same time, the control group participated in conventional learning through lectures and discussions. The treatment lasted two weeks and included two instructional sessions. After the treatment, students completed a post-test and a final questionnaire to measure changes in learning outcomes and activeness. A detailed sequence of the quasi-experimental research procedures is presented in Figure 1.

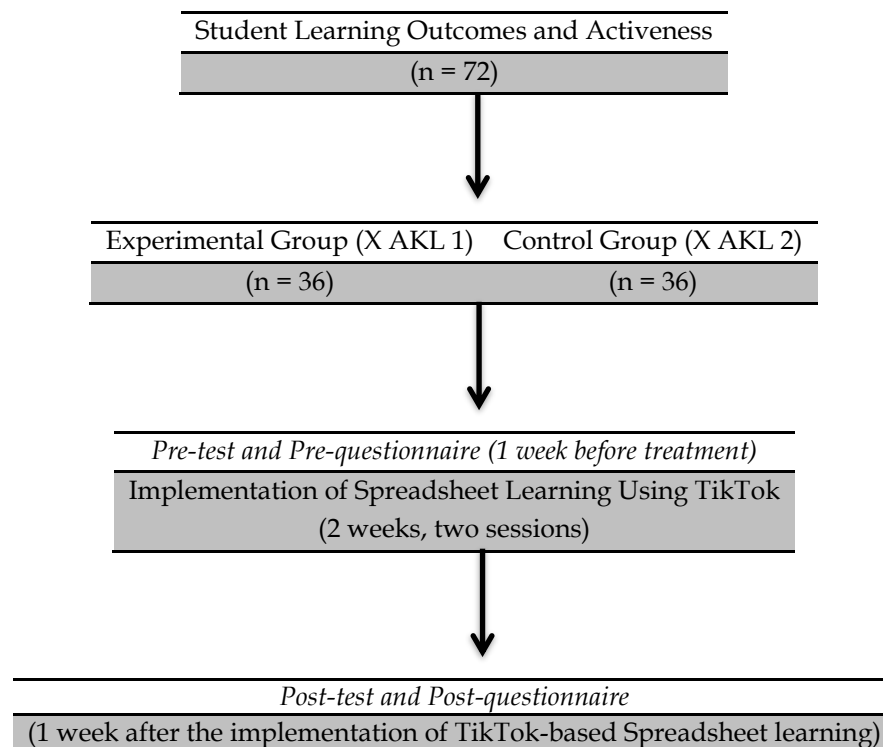


Figure 1. Sequence of Quasi-Experimental Research Procedures

Data analysis was conducted in two stages: descriptive and inferential analysis. Descriptive analysis was used to describe the distributions, means, and standard deviations for each variable. Inferential analysis was employed to test the research hypotheses. An independent-samples t-test was used to examine differences between the experimental and control groups, and a paired-samples t-test was used to examine differences within groups before and after the treatment (Kim, 2019; Afifah et al., 2022). Prior to conducting the t-tests, the data were tested for normality using the Shapiro-Wilk test and for homogeneity using Levene's test. All analyses were performed using the latest version of SPSS software, with the significance level set at $\alpha = 0.05$.

Hypothesis Development

The Effect of TikTok Media on Learning Outcomes

The use of TikTok in learning is believed to improve students' learning outcomes because it presents instructional material in a visual, engaging manner. According to Mayer (2024), in the Cognitive Theory of Multimedia Learning, information is more easily processed and retained when presented in an integrated format of text and images. Research by Poza-Méndez et al (2024) indicates that students who learn through TikTok demonstrate higher conceptual understanding. Similar findings were reported by Zaeriyah (2023), who found that learning outcomes increased significantly after the implementation of TikTok-based learning. In addition, Wang et al (2020) emphasized that short educational videos can

enhance students' retention and focus in online learning. Based on these arguments, the following hypotheses are proposed:

- H₁ : There is no significant difference in learning outcomes between the experimental group and the control group before the treatment.
- H₂ : There is a significant difference in learning outcomes between the experimental group and the control group after the treatment.
- H₃ : There is a significant difference in learning outcomes within the experimental group before and after the treatment.

The Effect of TikTok Media on Learning Activeness

As a social media platform popular among adolescents, TikTok has the potential to serve as a learning tool that promotes active student participation. According to Zhang et al (2022), within sociocultural learning theory, meaningful social interaction can enhance learning activity. Research by Ansari & Khan (2020) shows that social media supports academic interaction and increases student activeness in the learning process. Similar findings were reported by Rizal et al (2024), who found that using TikTok in Civic Education increased students' enthusiasm and classroom participation. Furthermore, Wang et al (2024) added that student involvement in the creation and presentation of TikTok content can significantly enhance motivation and learning activeness. Based on this foundation, the following hypotheses are proposed:

- H₄ : There is no significant difference in learning activeness between the experimental group and the control group before the treatment.
- H₅ : There is a significant difference in learning activity between the experimental group and the control group after the treatment
- H₆ : There is a significant difference in learning activeness within the experimental group before and after the treatment.

C. Result

Before discussing the main findings of this study, it is important to understand the initial conditions of the two subject groups: the experimental and control groups. A descriptive analysis of students' learning outcomes before and after the treatment provides an initial overview of the effectiveness of the learning intervention, particularly through TikTok media. This information is presented in detail in Tables 2 and 3.

Table 2. Descriptive Statistics of Students' Learning Outcomes

	N	Ideal Score	Minimum Score	Maximum Score	Mean
Pre-test (Experimental)	36	100	70	79	74.75
Pre-test (Control)	36	100	70	79	73.78
Post-test (Experimental)	36	100	85	96	90.89
Post-test (Control)	36	100	70	79	74.17

Source: Pre-test and post-test results, processed by the authors using SPSS (2025). Notes: N = number of students (sample); Mean = average student score.

Table 2 shows a marked difference in learning outcome scores between the experimental and control groups. Prior to treatment (pre-test), the experimental group had an average learning outcome score of 74.75, while the control group had an average score of 73.78. This indicates that both groups had relatively equivalent initial abilities. The identical range of minimum and maximum scores (70–79) further confirms that the initial mastery of the Spreadsheet material was balanced across both groups.

However, after implementing TikTok-based learning in the experimental group, the average post-test score increased significantly to 90.89. In contrast, the control group, which continued to use conventional learning methods, showed only a slight increase, with a mean score of 74.17. This substantial improvement indicates that using TikTok as a learning medium positively enhanced students' understanding and academic achievement, and was more effective than conventional methods. These findings provide initial evidence that integrating social media aligned with the characteristics of digital-native learners can serve as an innovative strategy for 21st-century learning.

Table 3. Descriptive Statistics of Students' Learning Activeness

	N	Ideal Score	Minimum Score	Maximum Score	Mean
Pre-test (Experimental)	36	60	35	47	40.42
Pre-test (Control)	36	60	36	46	39.86
Post-test (Experimental)	36	60	48	59	52.50
Post-test (Control)	36	60	35	47	40.42

Source: Questionnaire data, processed by the authors using SPSS (2025). Notes: N = number of students (sample); Mean = average student score.

Table 3 indicates that students' learning activeness also increased significantly in the experimental group after the treatment was implemented. At the initial stage (pre-questionnaire), the average learning activity score for the experimental group was 40.42 out of 60, indicating a moderate level of activity. The control group recorded a slightly lower average score of 39.86. This similarity in initial levels of activity strengthens the validity of the quasi-experimental design used in this study.

After the treatment, the learning activeness score of the experimental group increased sharply to 52.50. In contrast, the control group showed no meaningful change and remained at approximately the same level as the initial average of 40.42. These results indicate that using TikTok in learning not only affected academic achievement but also significantly enhanced active participation, emotional engagement, and student initiative in the learning process. Thus, social media platforms such as TikTok have proven effective in strengthening the affective dimension of learning, which is a crucial element in creating a collaborative and meaningful educational ecosystem in the digital era.

Before conducting the main hypothesis testing, an essential preliminary step was to ensure that the research instruments met the criteria of validity and reliability. Tables 4 and 5 present the results of the validity and reliability tests of the instruments, analyzed based

on the significance values of each item and the internal consistency coefficients, to ensure the accuracy and stability of the measurement tools.

Table 4. Validity Test Results of Learning Activeness Questionnaire for the Experimental and Control Groups

Item	Pre Sig.	Post Sig.	Conclusion
Pre & Post 1	0.000*	0.000*	Validity Achieved
Pre & Post 2	0.000*	0.000*	Validity Achieved
Pre & Post 3	0.000*	0.000*	Validity Achieved
Pre & Post 4	0.000*	0.000*	Validity Achieved
Pre & Post 5	0.000*	0.000*	Validity Achieved
Pre & Post 6	0.001*	0.000*	Validity Achieved
Pre & Post 7	0.000*	0.000*	Validity Achieved
Pre & Post 8	0.000*	0.000*	Validity Achieved
Pre & Post 9	0.000*	0.000*	Validity Achieved
Pre & Post 10	0.000*	0.000*	Validity Achieved
Pre & Post 11	0.003*	0.000*	Validity Achieved
Pre & Post 12	0.000*	0.000*	Validity Achieved

Source: Questionnaire data, processed by the authors using SPSS (2025). Notes: Pre Sig. = pre-questionnaire significance; Post Sig. = post-questionnaire significance; * significant at $\alpha = 0.01$.

Table 4 shows that all items in the learning activeness questionnaire, both at the pre- and post-stages, met the validity criteria. This is evidenced by significance values (Sig.) below 0.01 for all items in both the experimental and control groups. The Sig. values for items Pre & Post 1 through Pre & Post 12 were recorded as 0.000 or less than 0.001, indicating statistical significance. These findings confirm that the instrument accurately and consistently measures the construct of learning activeness, in line with targeted aspects such as enthusiasm, participation, and initiative in learning.

Table 5. Reliability Test Results of Learning Activeness Questionnaire for the Experimental and Control Groups

Instrument	CR	Sig.	Conclusion
CR Pre-questionnaire	0.774	0.700	Reliability Achieved
CR Post-questionnaire	0.941	0.700	Reliability Achieved

Source: Questionnaire data, processed by the authors using SPSS (2025). Notes: CR = Cronbach's Alpha.

Table 5 shows that the learning activeness questionnaire instrument demonstrated an excellent level of reliability, as indicated by Cronbach's Alpha (CR) values exceeding the minimum threshold of 0.700. In the pre-questionnaire stage, the reliability value was 0.774 and increased to 0.941 in the post-questionnaire stage. These values indicate high internal consistency in measuring students' learning activeness both before and after the treatment. Therefore, the data obtained are stable and reliable.

In addition to descriptively analyzing improvements in learning outcomes and student activeness, this study also ensured that the data met the fundamental assumptions required for inferential statistical analysis. Two critical assumptions—normality and homogeneity of variances—must be met as prerequisites for the use of parametric tests such as the paired-samples t-test and the independent-samples t-test. Therefore, prior to hypothesis testing, normality and homogeneity tests were conducted to confirm that the data distributions and variances across groups were within statistically acceptable limits (see Tables 6, 7, 9, and 10).

Table 6. Results of the Shapiro–Wilk Normality Test for the Experimental Group

Variable	Sig.	α	Conclusion
Pre-test Learning Outcomes	0.068	0.05	Normal Distribution
Post-test Learning Outcomes	0.309	0.05	Normal Distribution
Pre-questionnaire Learning Activeness	0.119	0.05	Normal Distribution
Post-questionnaire Learning Activeness	0.089	0.05	Normal Distribution

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS (2025).

Table 6 shows that the experimental group data met the normality assumption, as indicated by the Shapiro–Wilk test. The significance (Sig.) values for all variables—both pre-test and post-test learning outcomes as well as pre- and post-questionnaire learning activeness—were above the $\alpha = 0.05$ threshold. The Sig. value for pre-test learning outcomes was 0.068, and for the post-test was 0.309, indicating a normal distribution—similarly, the Sig. The pre- and post-learning activeness values were 0.119 and 0.089, respectively, indicating normal distributions.

Table 7. Results of the Levene’s Homogeneity Test for the Experimental Group

Variable	Based on Mean			Conclusion
	Lavene Statistic	Sig.	α	
Pre-Post Learning Outcomes	0.202	0.655	0.05	Homogeneous
Pre-Post Learning Activeness Questionnaire	0.032	0.859	0.05	Homogeneous

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS (2025).

Table 7 indicates that the data in the experimental group met the homogeneity-of-variance assumption, as assessed by Levene's test. The significance value for pre–post learning outcomes was 0.655, while that for pre–post learning activeness was 0.859. Both values exceeded $\alpha = 0.05$, indicating no significant difference in variance. Therefore, the data were considered homogeneous.

Table 8. Paired Samples Test Results (Learning Outcomes and Learning Activeness) for the Experimental Group

Variable	Sig.	Hypothesis	Conclusion
Pre-Post Learning Outcomes	0.000*	H ₃ Accepted	Significant
Pre-Post Learning Activeness Questionnaire	0.000*	H ₆ Accepted	Significant

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS (2025). Notes: Sig. = significance; * significant at $\alpha = 0.01$.

Table 8 demonstrates significant differences between pre-test and post-test learning outcomes, as well as between pre- and post-learning activeness scores in the experimental group. The significance value (Sig.) of 0.000 for both variables indicates a highly significant difference ($\alpha < 0.01$). Thus, hypotheses H₃ and H₆ were accepted, indicating a significant improvement in both learning outcomes and learning activity following the implementation of TikTok-based learning.

These results reinforce earlier descriptive findings (see Tables 2 and 3) and confirm that TikTok, as a learning medium, has a positive impact on the learning process. It not only improves cognitive achievement, as measured by academic performance, but also enhances students' affective engagement. The effectiveness of TikTok in improving both aspects provides evidence that integrating technology aligned with the characteristics of digital-native learners can serve as an innovative and practical learning strategy, particularly in vocational education.

Table 9. Results of the Shapiro-Wilk Normality Test for the Experimental and Control Groups

Variable	Sig.	A	Conclusion
Pre-test Learning Outcomes (Experimental)	0.108	0.05	Normal Distribution
Pre-test Learning Outcomes (Control)	0.092	0.05	Normal Distribution
Post-test Learning Outcomes (Experimental)	0.309	0.05	Normal Distribution
Post-test Learning Outcomes (Control)	0.070	0.05	Normal Distribution
Pre-questionnaire Learning Activeness (Experimental)	0.119	0.05	Normal Distribution
Pre-questionnaire Learning Activeness (Control)	0.097	0.05	Normal Distribution
Post-questionnaire Learning Activeness (Experimental)	0.324	0.05	Normal Distribution
Post-questionnaire Learning Activeness (Control)	0.478	0.05	Normal Distribution

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS.

Table 9 shows that the data from both the experimental and control groups met the normality assumption, as assessed by the Shapiro-Wilk test. The significance values for pre-test learning outcomes were 0.108 (experimental) and 0.092 (control), while the post-test values were 0.309 and 0.070, respectively, indicating normal data distributions. Similarly, the pre- and post-learning activity questionnaire results showed normal distributions in both groups.

Table 10. Results of the Levene's Homogeneity Test for the Experimental and Control Groups

Based on Mean				
Variable	Lavene Statistic	Sig.	α	Conclusion
Pre-test Learning Outcomes	0.721	0.399	0.05	Homogeneous
Post-test Learning Outcomes	0.344	0.565	0.05	Homogeneous
Pre-questionnaire Learning Activeness	0.041	0.839	0.05	Homogeneous
Post-questionnaire Learning Activeness	0.033	0.856	0.05	Homogeneous

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS.

Table 10 indicates that the data from both groups met the homogeneity assumption according to Levene's test. The significance values for pre-test and post-test learning outcomes were 0.399 and 0.565, respectively, while those for pre- and post-test activeness were 0.839 and 0.856, respectively. All values exceeded $\alpha = 0.05$, indicating homogeneous variances across groups.

Table 11. Independent Samples Test Results (Learning Outcomes and Learning Activeness) for the Experimental and Control Groups

Variable	Sig.	Hypothesis	Conclusion
Pre-test Learning Outcomes	0.180	H ₁ Rejected	Not Significant
Post-test Learning Outcomes	0.000*	H ₂ Accepted	Significant
Pre-questionnaire Learning Activeness	0.460	H ₄ Rejected	Not Significant
Post-questionnaire Learning Activeness	0.000*	H ₅ Accepted	Significant

Source: Pre-test and post-test results and questionnaire data, processed by the authors using SPSS (2025). Notes: Sig. = significance; * significant at $\alpha = 0.01$.

Table 11 presents the results of the difference tests between the experimental and control groups at the post-test stage for the two main variables: learning outcomes and learning activeness. Based on the independent-samples t-test, the significance value (Sig.) was 0.000 for both variables, which is far below the $\alpha = 0.01$ significance level. This indicates a highly significant statistical difference between the two groups. Therefore, hypotheses H₂ and H₅ were accepted, meaning that the use of TikTok as a learning medium was significantly more effective in improving students' learning outcomes and learning activeness compared to conventional learning methods.

Conversely, at the pre-test stage, no significant differences were found between the experimental and control groups. The significance values for learning outcomes (0.180) and learning activity (0.460) both exceeded the $\alpha = 0.05$ threshold. This indicates that, prior to treatment, both groups had relatively equivalent initial conditions in terms of material mastery and participation in learning.

These findings confirm that the improvements observed in the experimental group were not due to initial differences between groups but were a direct result of the TikTok-based learning intervention. In other words, the use of relevant social media aligned with the characteristics of 21st-century learners has proven to be an innovative and compelling learning strategy for enhancing student engagement, both cognitively and affectively.

D. Discussion

The findings of this study indicate that integrating TikTok into learning has a significant impact on students' learning outcomes in the Spreadsheet subject. These results are consistent with constructivist theory, which emphasizes students' active involvement in constructing knowledge through meaningful, contextual learning experiences (García-Almeida & Cabrera-Nuez, 2020). The increase in post-test scores in the experimental group reflects that a learning approach based on short video content is more effective in facilitating students' conceptual understanding than conventional instructional methods. This finding reinforces the results of Fiorella et al (2020), Wang et al (2020), and Anisa et al (2023), who argue that dynamically presented visual content can enhance information processing and long-term retention.

Through its short-duration video features, TikTok enables teachers to deliver instructional materials in a concise, focused, and visually engaging manner. This format aligns well with the learning preferences of digital-native generations, who tend to favor audiovisual and interactive materials (Nur et al., 2023). This study confirms that TikTok's microlearning approach can reduce students' cognitive load, making it easier for them to concentrate on the material's core concepts (Conde-Caballero et al., 2024). In addition, TikTok's personalized algorithmic features allow students to revisit learning materials according to their individual needs and learning pace, thereby enhancing learning flexibility and autonomy. The observed improvement in learning outcomes also reflects TikTok's effectiveness as a differentiated instructional medium, enabling variations in presentation styles and encouraging teachers' creativity in constructing meaningful learning narratives (Nurviantika & Umam, 2023; Poza-Méndez et al., 2024). These findings align with the principles of 21st-century pedagogy, which emphasize integrating digital technology to improve the quality and inclusivity of learning.

Beyond its positive impact on learning outcomes, the use of TikTok in instruction was also found to enhance students' learning activities significantly. Learning activeness is a key indicator of student-centered learning approaches, in which students are positioned as the leading agents in the knowledge construction process (Abdigapbarova & Zhiyenbayeva, 2023). This study demonstrates that TikTok-based learning encourages students' active participation in classroom discussions, increases their confidence in asking and answering questions, and fosters initiative in expressing ideas and creating educational content.

These findings are supported by previous studies by Sari (2019), Vizcaíno-Verdú & Abidin (2023), and Heyang & Martin (2024), which highlight the role of social media as a form of social learning that enhances students' emotional and affective engagement. Beyond serving as a medium for information consumption, TikTok also functions as a platform for creative and collaborative self-expression. The content production process undertaken by students not only strengthens their sense of ownership of the learning process but also enhances intrinsic motivation and self-confidence. Consequently, TikTok-based learning expands the dimensions of student engagement cognitive, affective, and social creating

learning experiences that are more relevant and closely connected to students' everyday lives.

E. Implications

The results of this study provide significant theoretical implications for the development of technology-based learning literature, particularly regarding the use of social media as a pedagogical tool in vocational education. These findings strengthen the foundations of constructivist and sociocultural learning theories, which emphasize the importance of active, contextually situated student engagement in the learning process. This study demonstrates that TikTok not only improves learning outcomes but also promotes active student participation. Thus, it expands current understanding of the effectiveness of short educational videos as generative learning media. Moreover, this research contributes to the development of the microlearning approach, which has previously been more extensively studied in higher education and online learning contexts.

From a practical perspective, the main implication of this study is the recommendation of TikTok as an instructional medium that aligns with the characteristics of digital-native learners, particularly in vocational high school settings. These findings are valuable for teachers, school principals, and educational policymakers in designing learning strategies that are not only innovative but also adaptive to technological developments and students' learning preferences. TikTok can be utilized to deliver learning content in a concise, engaging, and interactive manner, while simultaneously fostering student creativity and collaboration.

Socially, this study opens a broader discussion on the importance of adequate regulation and digital literacy to ensure that the use of social media in educational environments is ethical and responsible. These implications also provide direction for future research, particularly in examining the effectiveness of other digital platforms across different disciplines and educational levels, as well as their impact on students' affective and metacognitive variables.

F. Limitation and Suggestion for Further Research

This study has several limitations that should be acknowledged. First, although the quasi-experimental design employed is appropriate for educational research, it does not fully control for external variables that may influence students' learning activeness and outcomes, such as initial levels of digital literacy, classroom environmental conditions, and individual motivation. Second, the research sample was limited to one vocational high school with two classes in a single subject, namely Spreadsheet. This limitation restricts the generalizability of the findings to other educational contexts, levels, majors, or school types. In addition, the relatively short treatment duration of 2 weeks did not allow for measuring the long-term effects of TikTok-based learning on students' academic development and sustained learning engagement. Therefore, these limitations should be carefully considered when drawing broader conclusions from the study.

As a follow-up, future studies are recommended to employ longitudinal designs to observe the long-term impact of TikTok-based learning over extended periods. Expanding the sample to include various schools, subjects, and educational levels is also essential to enhance the generalizability and applicability of the findings. Furthermore, qualitative approaches such as in-depth interviews, classroom observations, or focus group discussions can be used to explore more deeply students' and teachers' perceptions, learning experiences, and challenges in integrating social media into formal instruction. Future research may also compare TikTok's effectiveness with other digital platforms, such as Instagram Reels or YouTube Shorts, to gain a more comprehensive understanding of the potential of short-video media in supporting 21st-century learning.

G. Conclusion

Based on the main objectives of this study, it can be concluded that the use of TikTok as a learning medium significantly improves students' learning activities and learning outcomes in the Spreadsheet subject. The integration of TikTok into the teaching and learning process not only strengthens students' conceptual understanding cognitively but also encourages their active engagement in learning activities. The consistent increase in post-test scores and learning activity in the experimental group indicates that this short-video-based social media platform can serve as a practical, relevant, and adaptable pedagogical tool for digital-native learners in vocational education.

The implications of these findings suggest that the use of TikTok in education represents not merely a technology-based innovation but also a transformative pedagogical approach that bridges students' digital worlds with academic demands. Educators can optimize this platform to create learning experiences that are more contextual, participatory, and enjoyable. At the same time, educational institutions and policymakers need to provide support through training in educational content creation, strengthening digital literacy, and developing policies that ensure the ethical, productive, and goal-oriented use of social media aligned with 21st-century learning outcomes.

For future research, it is recommended that the scope of subjects be expanded to examine TikTok's effectiveness across various disciplines, both theoretical and practical. In addition, longitudinal approaches may be used to assess the long-term impact of TikTok use on students' competency development. Qualitative research is also needed to explore students' and teachers' perceptions, motivations, and challenges in integrating social media into instructional practices, thereby enabling more comprehensive and applicable contributions to the formulation of future digital education policies.

References

- Abdigapbarova, U., & Zhiyenbayeva, N. (2023). Organization of Student-Centered Learning Within the Professional Training of a Future Teacher in a Digital Environment. *Education and Information Technologies*, 28(1), 647–661. <https://doi.org/10.1007/s10639-022-11159-5>

- Afifah, S., Mudzakir, A., & Nandiyanto, A. B. D. (2022). How to Calculate Paired Sample T-Test Using SPSS Software: From Step-by-Step Processing for Users to the Practical Examples in the Analysis of the Effect of Application Anti-Fire Bamboo Teaching Materials on Student Learning Outcomes. *Indonesian Journal of Teaching in Science*, 2(1), 81–92. <https://doi.org/10.17509/ijotis.v2i1.45895>
- Aji, W. N., & Setiyadi, D. B. P. (2020). Aplikasi Tik Tok Sebagai Media Pembelajaran Keterampilan Bersastra. *Metafora: Jurnal Pembelajaran Bahasa dan Sastra*, 6(2), 147–157. <https://doi.org/10.26877/metafora.v6i2.6083>
- Anisa, Y., Malik, M., Putri, T. O. D. S., Hafiz, M., & Novita, N. (2023). Animaker Animation Video Design as a Digital-Based Learning Media With the Theme of Comparison and Scale in Elementary School. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(1), 184–196. <https://doi.org/10.51276/edu.v4i1.328>
- Ansari, J. A. N., & Khan, N. A. (2020). Exploring the Role of Social Media in Collaborative Learning the New Domain of Learning. *Smart Learning Environments*, 7(1), Article 9. <https://doi.org/10.1186/s40561-020-00118-7>
- Asmawan, M. C. (2018). Kepemimpinan Transformasional Kepala Sekolah Dalam Mendukung Gerakan Literasi Sekolah. *Jurnal Pendidikan Ilmu Sosial*, 28(1), 46–57. <https://doi.org/10.23917/jpis.v28i1.6771>
- Bahri, A., Damayanti, C. M., Sirait, Y. H., & Alfarisy, F. (2022). Aplikasi Tiktok Sebagai Media Pembelajaran Bahasa Inggris di Indonesia. *Jurnal Indonesia Sosial Sains*, 3(1), 120–130. <https://doi.org/10.36418/jiss.v3i1.525>
- Benavides, L. M. C., Tamayo Arias, J. A., Arango Serna, M. D., Branch Bedoya, J. W., & Burgos, D. (2020). Digital Transformation in Higher Education Institutions: A Systematic Literature Review. *Sensors*, 20(11), 3291. <https://doi.org/10.3390/s20113291>
- Campbell, D. T., & Stanley, J. C. (2015). *Experimental and Quasi-Experimental Designs for Research*. Ravenio Books.
- Conde-Caballero, D., Castillo-Sarmiento, C. A., Ballesteros-Yáñez, I., Rivero-Jiménez, B., & Mariano-Juárez, L. (2024). Microlearning Through TikTok in Higher Education: An Evaluation of Uses and Potentials. *Education and Information Technologies*, 29(2), 2365–2385. <https://doi.org/10.1007/s10639-023-11904-4>
- Cooper, B. R., Concilla, A., Albrecht, J. M., Bhukhan, A., Laughter, M. R., Anderson, J. B., ... & Presley, C. L. (2022). Social Media as a Medium for Dermatologic Education. *Current Dermatology Reports*, 11(2), 103–109. <https://doi.org/10.1007/s13671-022-00359-4>
- Csernoch, M., Biró, P., & Máth, J. (2021). Developing Computational Thinking Skills With Algorithm-Driven Spreadsheets. *IEEE Access*, 9, 153943–153959. <https://doi.org/10.1109/ACCESS.2021.3126757>





- DataReportal. (2023). *Digital 2023: Indonesia*. Retrieved from <https://datareportal.com/reports/digital-2023-indonesia>
- Dong, Y., Yin, H., Du, S., & Wang, A. (2021). The Effects of Flipped Classroom Characterized by Situational and Collaborative Learning in a Community Nursing Course: A Quasi-Experimental Design. *Nurse Education Today*, 105, Article 105037. <https://doi.org/10.1016/j.nedt.2021.105037>
- Fiorella, L., Stull, A. T., Kuhlmann, S., & Mayer, R. E. (2020). Fostering Generative Learning From Video Lessons: Benefits of Instructor-Generated Drawings and Learner-Generated Explanations. *Journal of Educational Psychology*, 112(5), 895–906. <https://doi.org/10.1037/edu0000408>
- García-Almeida, D. J., & Cabrera-Nuez, M. T. (2020). The Influence of Knowledge Recipients' Proactivity on Knowledge Construction in Cooperative Learning Experiences. *Active Learning in Higher Education*, 21(1), 79–92. <https://doi.org/10.1177/1469787418754569>
- Hamadi, M., El-Den, J., Azam, S., & Sriratanaviriyakul, N. (2022). Integrating Social Media as Cooperative Learning Tool in Higher Education Classrooms: An Empirical Study. *Journal of King Saud University-Computer and Information Sciences*, 34(6), 3722–3731. <https://doi.org/10.1016/j.jksuci.2020.12.007>
- Heyang, T., & Martin, R. (2024). Teaching Through TikTok: A Duoethnographic Exploration of Pedagogical Approaches Using TikTok in Higher Dance Education in China and Norway During a Global Pandemic. *Research in Dance Education*, 25(3), 343–358. <https://doi.org/10.1080/14647893.2022.2114446>
- Kang, H., & Bae, J. (2021). The Development and Effects of an Emotional Competency Promotion Program for Nursing Students: A Nonequivalent Control Group Pretest-Posttest Design. *The Journal of Korean Academic Society of Nursing Education*, 27(4), 369–380. <https://doi.org/10.5977/jkasne.2021.27.4.369>
- Kaye, D. B. V., Chen, X., & Zeng, J. (2021). The Co-Evolution of Two Chinese Mobile Short Video Apps: Parallel Platformization of Douyin and TikTok. *Mobile Media & Communication*, 9(2), 229–253. <https://doi.org/10.1177/2050157920952120>
- Kim, H. Y. (2019). Statistical Notes for Clinical Researchers: The Independent Samples T-Test. *Restorative Dentistry & Endodontics*, 44(3), Article e26. <https://doi.org/10.5395/rde.2019.44.e26>
- Kurni, M., & Saritha, K. (2021). Applying Collaborative Learning for Enhancing the Teaching-Learning Process in Online Learning Through Social Media. *International Journal of Emerging Technologies in Learning (iJET)*, 16(16), 251–259. <https://doi.org/10.3991/ijet.v16i16.23207>
- MacKinnon, K. R., Kia, H., & Lacombe-Duncan, A. (2021). Examining TikTok's Potential for Community-Engaged Digital Knowledge Mobilization With Equity-Seeking

- Groups. *Journal of Medical Internet Research*, 23(12), Article e30315. <https://doi.org/10.2196/30315>
- Mayer, R. E. (2024). The Past, Present, and Future of the Cognitive Theory of Multimedia Learning. *Educational Psychology Review*, 36(1), Article 3. <https://doi.org/10.1007/s10648-023-09842-1>
- Meirbekov, A., Maslova, I., & Gallyamova, Z. (2022). Digital Education Tools for Critical Thinking Development. *Thinking Skills and Creativity*, 44, Article 101023. <https://doi.org/10.1016/j.tsc.2022.101023>
- Nur, D. R., Widodo, P., & Putro, N. H. P. S. (2023). Digital Natives Generation Enjoyment Using Online Resources as Virtual Learning Environment in Learning English Speaking. *International Journal of Language Education*, 7(4), 602–614. <https://doi.org/10.26858/ijole.v7i4.44573>
- Nurviantika, D. M., & Umam, N. K. (2023). The Effect of TikTok on the Use of Standard Language in Grade 4 Elementary School Children. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(2), 533–542. <https://doi.org/10.51276/edu.v4i2.397>
- Perguna, L., Apriyanti, N., & Kurniasih, D. (2021). Alternative Online Learning Using Social Media as a Panacea. *International Journal of Emerging Technologies in Learning (iJET)*, 16(7), 257–265. <https://doi.org/10.3991/ijet.v16i07.21209>
- Poza-Méndez, M., Fernández-Gutiérrez, M., Marín-Paz, A. J., Sánchez-Sánchez, E., & Bas-Sarmiento, P. (2024). TikTok as a Teaching and Learning Method for Nursing Students: A Quasi-Experimental Study. *Nurse Education Today*, 141, Article 106328. <https://doi.org/10.1016/j.nedt.2024.106328>
- Ramdani, N. S., Nugraha, H., & Hadiapurwa, A. (2021). Potensi Pemanfaatan Media Sosial Tiktok Sebagai Media Pembelajaran Dalam Pembelajaran Daring. *Akademika: Jurnal Teknologi Pendidikan*, 10(2), 425–436. <https://doi.org/10.34005/akademika.v10i02.1406>
- Rizal, A., Dwiyantri, A., & Burhan, B. (2024). Efektivitas Pemanfaatan Video TikTok Sebagai Media Pembelajaran Pendidikan Kewarganegaraan Untuk Meningkatkan Minat Belajar Mahasiswa. *JiIP-Jurnal Ilmiah Ilmu Pendidikan*, 7(9), 9545–9554. <https://doi.org/10.54371/jiip.v7i9.5959>
- Sari, D. E. (2019). Quizlet: Aplikasi Pembelajaran Berbasis Smartphone Era Generasi Milenial. *Jurnal Pendidikan Ilmu Sosial*, 29(1), 9–15. <https://doi.org/10.23917/jpis.v29i1.8150>
- Shen, Z., & Pritchard, M. J. (2022). Cognitive Engagement on Social Media: A Study of the Effects of Visual Cueing in Educational Videos. *Journal of the Association for Information Science and Technology*, 73(9), 1253–1267. <https://doi.org/10.1002/asi.24630>




- Siddig, B. (2020). Social Media in Teaching of Languages. *International Journal of Emerging Technologies in Learning (IJET)*, 15(12), 72–80. <https://doi.org/10.3991/ijet.v15i12.12645>
- Simkus, J. (2022, 7 September). *Cluster Sampling: Definition, Method and Examples*. Simply Psychology. <https://www.simplypsychology.org/cluster-sampling.html>
- Smith, E. E., Kahlke, R., & Judd, T. (2020). Not Just Digital Natives: Integrating Technologies in Professional Education Contexts. *Australasian Journal of Educational Technology*, 36(3), 1–14. <https://doi.org/10.14742/ajet.5658>
- Tan, A. J., Davies, J. L., Nicolson, R. I., & Karaminis, T. (2023). Learning Critical Thinking Skills Online: Can Precision Teaching Help? *Educational Technology Research and Development*, 71(3), 1275–1296. <https://doi.org/10.1007/s11423-023-10208-4>
- Tran, T., Ho, M. T., Pham, T. H., Nguyen, M. H., Nguyen, K. L. P., Vuong, T. T., ... & Vuong, Q. H. (2020). How Digital Natives Learn and Thrive in the Digital Age: Evidence From an Emerging Economy. *Sustainability*, 12(9), 3819. <https://doi.org/10.3390/su12093819>
- Vizcaíno-Verdú, A., & Abidin, C. (2023). TeachTok: Teachers of TikTok, Micro-Celebrification, and Fun Learning Communities. *Teaching and Teacher Education*, 123, Article 103978. <https://doi.org/10.1016/j.tate.2022.103978>
- Wang, X., Huang, L., & Lai, F. (2020). Impacts of cues on learning: Using eye-tracking evidence to examine the effectiveness of signaling in short instructional videos. *Computers in Human Behavior*, 107, 106269. <https://doi.org/10.1016/j.chb.2020.106269>
- Zaeriyah, S. (2023). Peningkatan Motivasi dan Hasil Belajar Siswa Menggunakan Model Project Based Learning (PjBL) Berbasis Tik-Tok. *Ideguru: Jurnal Karya Ilmiah Guru*, 8(1), 106–111. <https://doi.org/10.51169/ideguru.v8i1.458>
- Zhang, S., Liu, Q., & Wang, Q. (2022). How Does Online Social Interaction Promote Students' Engagement in Moocs? A Case Study Based on the Community of Inquiry Framework. *Journal of Computing in Higher Education*.

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