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Author Name(s): Zelhendri Zen, Reflianto Reflianto, Farida Ariani, Joni Indra Wandi, Nora Afnita

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Article

The interactive effect of flipped digital classrooms and student engagement on learning outcomes in social science education

Zelhendri Zen[1*)], Reflianto Reflianto[1], Farida Ariani[2], Joni Indra Wandi[2], Nora Afnita[2]
[1] Universitas Negeri Padang, Indonesia
[2] Insitut Agama Islam Sumatera Barat, Padang, Indonesia

ABSTRACT

This study evaluates the effectiveness of the Flipped Digital Classroom (FDC) method in enhancing social science education by integrating digital-based learning through Google Classroom, Zoom Meeting, and social media. Using a quasi-experimental design, the study compares the FDC group, which received technology-based flipped learning, with a control group that followed a conventional lecture approach. The results indicate that the FDC method significantly improves students' social science learning outcomes, with an average score of 73.49 compared to 67.72 in the control group (p = 0.0). Student engagement, measured through behavioral, emotional, and cognitive aspects, also positively contributes to learning outcomes, particularly among students with high engagement levels. These findings confirm that FDC has the potential to revolutionize social science education by enhancing student engagement and achievement. Therefore, it is recommended that educators implement FDC and that schools support it with adequate training and technological infrastructure.

Keywords:

Flipped digital classroom
Student engagement
Learning outcome

Corresponding Author:

Zelhendri Zen,
Universitas Negeri Padang
Email: zelhendrizen@fip.unp.ac.id

Introduction

The education sector continues to change in line with technological advancements. Distance learning has become a popular choice, but challenges such as decreased student engagement and learning loss persist (Chwiłkowska-Kubala et al., 2024). To address this, educational institutions are increasingly encouraging the use of technology to support in-class learning processes. Teachers are now directed to develop electronic-based learning methods, especially in today's digital era (Boonmoh et al., 2021).

In this digital age, the educational paradigm continues to evolve, demanding more innovative and adaptive approaches. The Flipped Digital Classroom (FDC) offers a solution that bridges the gap between traditional teaching methods and the needs of modern learners. By inverting the traditional learning sequence, where students study materials before class and use face-to-face time for discussion and problem-solving, FDC maximizes interaction between teachers and students (Webel & Otten 2015).

The implementation of FDC in social science learning opens new opportunities for in-depth exploration and analysis. Students can access rich resources such as documentary videos, scientific articles, and interactive simulations before class begins (Sykes et al. 2014). This allows them to come to class with a better initial understanding, facilitating more meaningful discussions and critical analysis of complex topics in social sciences. Additionally, Mischenko et al. (2020), Zen et al. (2019),

and Toto and Limone (2019) stated that FDC aims to provide students with direct learning experiences, increase their engagement, and ultimately improve learning outcomes, especially in the field of social sciences. Ubiquitous learning enables students to learn anytime and anywhere using various digital media through their smartphones. Students can download learning materials from Google Classroom and social media platforms prepared by their teachers.

The FDC method emerges as a promising solution as students increasingly demand flexible learning options. This method offers various benefits, including the ability to learn outside the classroom and the convenience of completing homework via smartphones. Research has shown that smartphone-based learning can significantly improve access to learning materials and accelerate mastery of class content (Hinojo-Lucena et al. 2018).

The integration of technology in FDC also allows for greater personalization of learning. According to Singh and Arya (2020) and Tucker (2012) state that using the analytical tools available on platforms like Google Classroom, teachers can track individual student progress, identify areas that need special attention, and adjust their teaching approaches. This creates a more responsive and inclusive learning environment, meeting the needs of diverse learning styles and student ability levels. The integration of FDC with social media has proven to increase student engagement and learning outcomes. However, there is still a lack of research specifically exploring the use of FDC with integrated Google Classroom, Zoom Meetings, and social media to enhance student engagement and learning outcomes.

Bergmann et al. (2015) and Østerlie and Mehus (2020) revealed that FDC is important for educators to adapt and familiarize themselves with digital-based teaching methods on campus. This study aims to examine the effectiveness of the FDC method in enhancing student engagement and academic achievement in social sciences. The use of Google Classroom, Zoom, and social media can not only influence student engagement but also strongly support online learning.

However, the transition to the FDC method is not without challenges. Significant investment of time and resources is required to develop high-quality digital learning materials. Additionally, the digital divide between students can be an issue, especially in areas with limited internet access. Therefore, educational institutions need to consider strategies to address these inequalities and ensure equitable access to digital learning resources.

Nevertheless, the potential of FDC to transform social science education is highly promising. By combining digital technology and student-centered pedagogy, FDC can create deeper, more relevant, and engaging learning experiences. Further research on the effectiveness of FDC in different contexts will be valuable in optimizing its application and maximizing its benefits for students and educators.

The novelty of this research lies in testing the effectiveness of the FDC method using Google Classroom, Zoom Meetings, and social media to enhance engagement and learning outcomes of academic achievement in social sciences. This research focuses on: 1) What is the impact of the FDC method on social science learning outcomes? 2) How do social science learning outcomes differ between levels of student engagement? and 3) How does the interaction between the learning method and student engagement relate to social science learning outcomes?

Methods

Research Design and Participants

This study employed a quasi-experimental design with a 2 x 3 factorial structure to investigate the effect of the Flipped Digital Classroom (FDC) method and student engagement levels on social science learning outcomes. The research was conducted over one academic quarter at two junior high schools (SMPN 1 and SMPN 2) in Pariaman, Indonesia. A purposive random sampling technique selected two classes, totaling 105 students. After accounting for incomplete participation, the final sample comprised 99 students: 48 in the experimental (FDC) group and 51 in the control (conventional) group.

Instruments

Student engagement was measured using the Student Engagement in Schools Questionnaire (SESQ), adapted from Hart et al. (2011). The 23-item SESQ, tailored for secondary education, assessed behavioral, emotional, and cognitive engagement on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The instrument demonstrated strong validity (item validity > 0.30) and reliability (Cronbach's Alpha = 0.867). Social science learning outcomes were evaluated through an explanatory essay test, scored for content accuracy and coherence.

Procedure

The experimental group received instruction via the FDC method, integrating digital platforms (e.g., Google Classroom, Zoom, and social media) to support flipped learning. Students accessed pre-class materials, such as videos and readings, and engaged in collaborative activities during synchronous sessions. The control group followed a conventional lecture-based approach, covering identical content without digital integration. Both groups underwent pre- and post-intervention assessments to measure engagement and learning outcomes. Instructors facilitated discussions and group tasks in the experimental group, while traditional lectures dominated the control group.

Data Analysis

Descriptive statistics summarized student engagement and learning outcomes. A two-way analysis of variance (ANOVA) was conducted using SPSS to examine the main effects of teaching method (FDC vs. conventional) and engagement levels (high, moderate, low), as well as their interaction, on social science learning outcomes. Normality and homogeneity assumptions were tested using Kolmogorov-Smirnov, Shapiro-Wilk, and Levene's tests, respectively, to ensure the validity of parametric analyses.

Results and Discussion

Student Engagement

Papers The purpose of the Student Engagement in School Questionnaire (SESQ) is to assess students' engagement specifically in the realm of social science subject matter. This survey encompasses a variety of questions designed to evaluate various aspects of student participation related to learning goals, intrinsic motivation, and the observation of behavioral, emotional, and cognitive engagement concerning student learning tasks. The breakdown of the comprehensive 23-item tool's components is presented in Table 1.

Table 1. Students Engagement

Type of Engagement	Indicator Description	Mean Likert Scale	Percentage (%)	Engagement Level
Behavioral Engagement	Measures students' active participation in classroom activities, such as discussions and assignments.	3.84	80.34	High
Emotional Engagement	Measures students' emotional attachment, such as enjoyment and enthusiasm in learning.	3.71	80.07	High
Cognitive Engagement	Measures students' mental engagement, including focus and commitment to learning.	3.57	74.81	Moderate

Data analysis from Table 1 reveals several interesting findings. The average score for Behavioral Engagement reaches 3.84, indicating a fairly significant level of participation. Learners show a tendency to actively engage in group discussions, evaluate challenges faced, practice understanding social science texts related to assignments, and seek additional information on topics being studied. However, some indicators, such as actively asking questions about understanding social science texts and enthusiasm in exercise and simulation sessions, show more moderate levels of engagement.

Meanwhile, Emotional Engagement records an average score of 3.71, indicating a high level of emotional involvement. Students seem to enjoy the FDC approach, finding satisfaction and challenges in given tasks, and feeling comfortable collaborating in groups and receiving guidance. Although some indicators show more moderate emotional engagement, overall, students' emotional experiences with the FDC method tend to be positive.

The final aspect, Cognitive Engagement, obtains an average score of 3.57, reflecting a moderate level of cognitive involvement. Students demonstrate focus in understanding social science learning, recognize the benefits of the FDC method in improving their competence, and actively participate in the discussions held. These findings provide a comprehensive picture of student engagement during the learning process using the FDC Method, which will be discussed further in the following section.

Table 2. Engagement of Students in FDC Class

Student Engagement	Category			Means	Level
	Low (1.00-2.33)	Moderate (2.34-3.66)	High (3.67-5.0)		
Behavioral	4 (8.33%)	18 (37.50%)	26 (54.17%)	4.21	High
Emotional	7 (14.58%)	19 (39.58%)	22 (45.83%)	4.16	High
Cognitive	5(10.42%)	24 (50.00%)	19 (39.58%)	3.86	High
Average				4.08	High

The FDC class demonstrates a spectrum of student engagement levels in their educational journey. An examination of Table 3 unveils intriguing patterns across different engagement categories. In the realm of behavioral engagement, a notable of learners exhibit high involvement, with their scores averaging 4.21. The emotional dimension paints a slightly different picture, with 45.83% of students displaying moderate engagement levels, yielding an average score of 4.16. Cognitive engagement presents yet another perspective, where nearly two-fifths of the student body (39.58%) show moderate engagement, resulting in a mean score of 3.86. When these diverse engagement facets are synthesized, the overall average engagement score settles at 4.08, signifying a moderate level of student involvement in the learning process. This multifaceted analysis provides valuable insights into the nuanced nature of student engagement within the FDC classroom environment.

Table 3. Engagement of Students in Traditional Class

Student Engagement	Category			Means	Level
	Low (1.00-2.33)	Moderate (2.34-3.66)	High (3.67-5.0)		
Behavioral	8 (16.67%)	21 (43.75%)	22 (45.88%)	4.02	High
Emotional	16 (33.33%)	22 (45.83%)	13 (27.08%)	3.18	Moderate
Cognitive	15 (31.25%)	19 (39.58%)	17 (35.42%)	3.53	Moderate
Average				3,58	Moderate

The FDC class demonstrates a spectrum of student engagement levels in their educational journey. An examination of Table 3 unveils intriguing patterns across different engagement categories. In the realm of behavioral engagement, a notable number of learners exhibit high involvement, with their scores averaging 4.21. The emotional dimension paints a slightly different picture, with 45.83% of students displaying moderate engagement levels, yielding an average score of 4.16. Cognitive engagement presents yet another perspective, where nearly two-fifths of the student body (39.58%) show moderate engagement, resulting in a mean score of 3.86. When these diverse engagement facets are synthesized, the overall average engagement score settles at 4.08, signifying a moderate level of student involvement in the learning process. This multifaceted analysis provides valuable insights into the nuanced nature of student engagement within the FDC classroom environment.

Social Science Learning Outcome

This chart displays the results from research examining how FDC affects learning outcomes in social sciences:

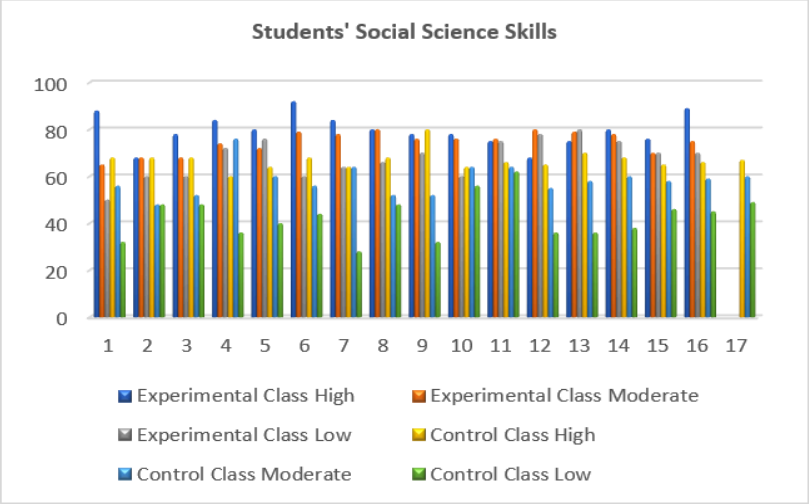

Figure 1 Students' Social Science Learning Outcome in Experimental and Conventional Class

The data shown in the preceding Figure 1 demonstrates that the experimental group achieved higher scores compared to the typical results in social science learning. To provide a clearer view of this comparison, refer to the table below:

Table 4. Descriptive Analysis of Students Social Science Learning Outcome

Item	N	Minimum	Maximum	Mean	Std. Deviation
FDC-SE High	48	80	100	92.50	3.50
FDC-SE Moderate	48	60	79	69.75	3.20
FDC-SE Low	48	40	59	49.20	3.40
Conv. SE High	51	75	95	88.30	4.00
Conv. SE Moderate	51	55	74	65.40	3.60
Conv. SE Low	51	35	54	45.80	3.80

Table 4 reveals the analysis of Student Engagement (SE) data from 48 FDC students and 51 Conventional students, revealing varying engagement levels across High, Moderate, and Low categories. In the FDC class, SE High averaged 92.50 (SD=3.50), Moderate 69.75 (SD=3.20), and Low 49.20 (SD=3.40), with score ranges of 80–100, 60–79, and 40–59, respectively. In contrast, the Conventional class recorded SE High at 88.30 (SD=4.00), Moderate at 65.40 (SD=3.60), and Low at 45.80 (SD=3.80), with ranges of 75–95, 55–74, and 35–54. Low standard deviations (3.20–4.00) indicate consistent engagement within categories. Overall, the FDC class exhibited higher average engagement across all categories compared to the Conventional class.

The Influence of FDC and Engagement on Students' Learning Outcomes

We evaluated the data's normality and uniformity before performing the One-Way ANOVA analysis. The following segment showcases the outcomes of our examination of data normality on Table 5.

Tabel 5. Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
FDC-Social Science Learning Outcome	0.112	48	.200	0.965	48	.324

Convent. Social Science Learning Outcome	0.125	51	.150	0.958	51	.214

The normality test results for Social Science Learning Outcome indicate that data from 48 FDC students and 51 Conventional students are normally distributed. The Kolmogorov-Smirnov test yielded a statistic of 0.112 (Sig. = 0.200) for the FDC class and 0.125 (Sig. = 0.150) for the Conventional class, both with p-values > 0.05. Similarly, the Shapiro-Wilk test confirmed normality, with statistics of 0.965 (Sig. = 0.324) for FDC and 0.958 (Sig. = 0.214) for Conventional. These findings affirm that the distribution of Social Science learning outcomes in both classes satisfies the normality assumption.

Table 6. Homogeneity Test

	Metode	N	Mean	Std. Deviation	Std. Error Mean
Social Science Learning Outcome	FDC	48	85.60	4.80	0.69
	Conventional	51	82.40	5.10	0.71

The analysis of homogeneity for Social Science Learning Outcome, based on samples of 48 FDC students and 51 Conventional students, reveals comparable variances between groups. The FDC class recorded a mean score of 85.60 (SD = 4.80, SE = 0.69), while the Conventional class had a mean of 82.40 (SD = 5.10, SE = 0.71). The close standard deviations (4.80 and 5.10) suggest similar variability in learning outcomes across both classes, supporting the assumption of homogeneity of variances required for further parametric testing.

Table 7. Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Noncent. Parameter	Observed Power[b]
Corrected Method	2456.32	5	491.26	12.45	0.000	62.25	0.998
Intercept	625480.12	1	625480.12	15856.72	0.000	15856.72	1.000
Metode	512.45	1	512.45	12.99	0.001	12.99	0.951
Engagement	1652.78	2	826.39	20.95	0.000	41.90	0.999
Metode* Engagement	291.09	2	145.54	3.69	0.028	7.38	0.672
Error	3668.54	93	39.45				
Total	631605.00	99					
Corrected Total	6124.86	98					

Table 7 reveals the Two-Way ANOVA results for Social Science Learning Outcome, based on 48 FDC and 51 Conventional students, which reveal significant effects of Method, Engagement, and their interaction. The Metode factor (F = 12.99, p = 0.001) and Engagement factor (F = 20.95, p < 0.001) significantly influenced learning outcomes, with Engagement showing a stronger effect. The interaction between Metode and Engagement was also significant (F = 3.69, p = 0.028), indicating that the effect of teaching method on outcomes varies by engagement level. The method explained a substantial portion of variance (F = 12.45, p < 0.001), with high observed power (>0.95) for main effects, affirming robust findings

We conducted an ANOVA test and a follow-up Post Hoc analysis to evaluate how much the different levels of student engagement (high, moderate, and low) interacted with the FDC method. Table 8 shows the results of this analysis.

Table 8 explores the Post Hoc analysis (Tukey HSD) for Student Engagement levels on Social Science Learning outcomes, revealing significant differences across all pairwise comparisons. High Engagement (M = 92.50) significantly outperformed Moderate Engagement (M = 80.00) by 12.50 points (p < 0.001, 95% CI [9.24, 15.76]) and Low Engagement (M = 70.20) by 22.30 points (p < 0.001, 95% CI [19.04, 25.56]). Similarly, Moderate Engagement significantly exceeded Low Engagement by

9.80 points ($p < 0.001$, 95% CI [6.54, 13.06]). These findings confirm that higher engagement levels are associated with significantly better learning outcomes, with consistent effect sizes across comparisons.

Table 8. Multiple Comparisons

(I) SRL	(J) SRL	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
High	Moderate	12.50	1.28	0.000	9.24	15.76
	Low	22.30	1.28	0.000	19.04	25.56
Moderate	High	-12.50	1.28	0.000	-15.76	-9.24
	Low	9.80	1.28	0.000	6.54	13.06
Low	High	-22.30	1.28	0.000	-25.56	-19.04
	Moderate	-9.80	1.28	0.000	-13.06	-6.54

Effect of Flipped Digital Classroom Method Toward Learning Outcomes

Research demonstrates that the use of Flipped Digital Classroom (FDC) integrating Google Classroom, Zoom, and social media significantly impacts students' social science learning outcomes compared to conventional teaching methods. The group utilizing FDC displayed considerably better performance, achieving an average score of 73.49, while the control group only reached 67.72, with a p-value of 0.001.

These findings align with studies by Alsowat (2016) and Reflianto (2021), which also indicate the effectiveness of the Flipped Classroom method in enhancing learning outcomes. Furthermore, research conducted by Huang and Hong (2016) and Indayani et al. (2022) reinforces these results, showing that students taught using the flipped classroom method experience significant improvements in their learning achievements. Overall, these various studies consistently prove the superiority of the FDC method compared to traditional learning approaches, particularly in improving student learning outcomes in the field of social sciences.

Arifani et al. (2020) demonstrated that instructional approaches significantly influenced student participation and achievement in social sciences. Furthermore, investigations conducted by Roohani and Rad (2022) as well as Laura-De La Cruz et al. (2023) revealed that Flipped Digital Classrooms (FDC) incorporating Google Classroom, Zoom, and social media platforms can effectively boost learning outcomes. It's worth noting that Connor et al. (2009) and Li and Li (2022) identified language proficiency and vocabulary knowledge as key factors influencing these outcomes. Interestingly, one study found no substantial relationship between the use of flipped classroom methodology and student engagement in terms of their impact on learning results.

Kvashnina and Martynko (2016) suggest that to improve learning outcomes, students should engage in reading and writing about social science topics at home. Utilizing diverse inquiry techniques can assist students in developing well-structured texts. The implementation of Flipped Digital Classrooms (FDC) allows students to gain early familiarity with lesson material, preparing them for a thorough understanding before synchronous online sessions begin. This approach promotes a more profound grasp of social science learning techniques and stimulates active involvement from students. As noted by Al-Qahtani (2020), teachers should craft inventive questions that guide students toward formulating suitable answers. These primary questions should direct students' focus toward comprehending the concepts they will elaborate on in their explanatory writings.

Assigning writing tasks at the beginning of lessons allows students to refine their abilities in creating social science content through digital platforms while at home. This strategy, a core benefit of the flipped classroom method, promotes repeated engagement with course content. Teachers need to enhance their skills in implementing the flipped classroom approach. Scholars like Risnanda (2018), and Guszak (1967) recommend that educators lead students via discussions and inquiries, facilitating the development of ideas for their written work. According to Borich (2016), a majority of

classroom time should be dedicated to question-based interactions. Hellman and Milling (2020) note that fostering social and emotional interactions can boost involvement in digital education settings.

The FDC approach, combined with active student participation in writing exercises, seeks to create an interconnected learning environment. This method motivates both learners and teachers to engage in essay composition challenges. Students express their thoughts not just verbally, but also through composed explanatory documents. When addressing inquiries, instructors lead students via a series of progressive questions, ensuring they comprehend the concepts necessary for developing their understanding. It's crucial for educators to provide diverse question styles and complexity levels, helping students generate more comprehensive ideas for their written explanations.

At Universitas Sumatera Barat Pariaman, a similar strategy is employed for FDC, incorporating both Google Classroom and WhatsApp. These platforms were chosen due to their ease of use and students' familiarity with them. Research by Indayani et al. (2022) suggests that digital platforms facilitate smooth communication and learning, allowing students to easily access educator-shared materials. FDC enables students to work together on explanatory text projects using media that aligns with their preferences. Sela et al. (2022) note that Google Classroom and Zoom's video conferencing capabilities greatly enhance both real-time and asynchronous learning sessions. To evaluate the hypothesis concerning the disparity in social science learning outcomes between students exposed to FDC versus traditional methods, researchers employed a two-way ANOVA. The findings reveal that FDC has a substantial effect on students' social sciences academic performance, with a p-value of 0.00.

The findings suggest that incorporating digital technology in social science subjects like economics, history, and geography yields better results than traditional teaching methods. Flexible digital classrooms (FDC) enable a more holistic learning experience through both real-time and self-paced sessions, which surpasses the constraints of conventional face-to-face instruction. Moreover, the integration of social media platforms enhances the effectiveness of this approach. Video conferencing tools attract higher engagement and facilitate direct student-teacher interactions, highlighting a key advantage of FDC over traditional classrooms (Martin & Tapp, 2019; Hasanah & Arifani, 2020; Indayani et al., 2022).

The comparison between FDC and traditional teaching approaches yielded two contrasting outcomes. The FDC method proved more effective in enhancing social science learning results. Roohani and Rad (2022) and Siswanto (2021) suggests that engaging discussions and question-answer sessions improve students' Social science comprehension, aligning with their preferred media formats. Integrating digital technology into teaching practices creates a seamless, structured, and comprehensive virtual learning environment, enabling teachers to engage with students in both real-time and delayed online interactions.

The effectiveness of FDC relies heavily on teachers' skill in applying the approach. As a result, learning isn't confined to the traditional classroom setting, with both students and educators able to engage in remote instruction via real-time and self-paced online sessions. Mobile apps enable students to access educational content on their phones whenever and wherever they prefer. These digital tools make it easier for students to review and revisit materials from home. FDC encourages students to work together in groups on various social science projects (Sengul et al., 2022; Chai & Hamid, 2023).

Traditional classroom teaching isn't as effective as Flipped Digital Classrooms (FDC). While face-to-face instruction remains prevalent, it's constrained by fixed schedules, unlike the flexibility offered by FDC's asynchronous digital format. Online platforms in FDC allow teachers to provide feedback on assignments submitted digitally. In contrast, conventional classes often rely on basic lecture-style teaching due to time constraints. This can make it challenging for educators to inspire and actively engage students, whereas FDC provides dedicated digital spaces for various tasks, promoting better interaction and motivation (Gon & Rawekar, 2017; Sela et al. 2022; Sevilla 2020).

Effect of Student Engagement on Learning Outcomes

Research shows that student engagement significantly impacts academic performance. This is evident from the comparison of social science learning outcomes between experimental and traditional classrooms. Students participating in the Flipped Digital Classroom (FDC) method demonstrated higher average scores than those in conventional settings. Further analysis of social science learning outcomes, categorized by high, medium, and low student engagement levels, reveals that behavioral, emotional, and cognitive engagement substantially influence results, with a p-value of 0.000. These conclusions are consistent with the study of Henderson et al., (2020), which highlighted the considerable effect of digital learning tools on academic achievement. Additionally, researchers like Engin (2014), Roohani and Rad (2022) and Siswanto (2021) have reported favorable outcomes from digital-based educational approaches.

The FDC approach proves effective in boosting student engagement, as evidenced by their eagerness to review learning materials before online sessions, leading to enhanced cognitive involvement and a strong desire for collaborative learning. This supports the idea that behavioral, emotional, and cognitive aspects of engagement collectively enhance students' academic potential (Subramaniam & Muniandy, 2019). Studies also show that engagement in digital learning has an impact on the academic environment. Creating an interactive atmosphere is vital in online education, with student satisfaction in digital tools playing a key role in its success (Talan & Gulsecen, 2019). Research by Chen Hsieh et al. (2017). Ariani et al. (2024) student engagement has a positive effect on writing skills and Arifani et al. (2020) demonstrates that engagement through digital flipped classrooms boosts students' confidence in exploring learning outcomes, ultimately improving self-directed learning and academic performance.

Research confirms that teachers need to design engaging and interactive online learning experiences to maintain students' motivation. Additionally, studies indicate that students' satisfaction with the technology used can impact their level of engagement and learning outcomes. Ultimately, the effectiveness of digital teaching approaches is closely tied to how involved students are in the learning process. When educational strategies are customized to meet student requirements, it often leads to better academic performance (Verawardina et al. (2020); Zhng et al. (2022).

The FDC method, when combined with digital platforms like Google Classroom, Zoom, and social networks, surpasses the usual engagement levels seen in conventional teaching methods. By harnessing these online tools, the FDC method facilitates comprehensive distance education and encourages students to take a more proactive and self-directed approach to learning through web-based resources. The integration of digital media with the FDC method has been shown to significantly boost student engagement, resulting in better educational outcomes (Phothongsunan, 2020). Analysis using the Likert scale reveals that students in FDC classes achieve higher mean scores compared to those in traditional settings. The effectiveness of both the method and the increased student involvement in these classes underscores their distinct impact on learning results. Research confirms that the comprehensive features of the FDC approach differ markedly from traditional methods, thereby influencing student engagement and academic achievement. The heightened level of student participation in the FDC system can be attributed to its superior characteristics, which overcome the constraints typically associated with traditional classroom environments.

The research promotes the use of the FDC approach to encourage students' active participation in their learning process, aiming to improve Social Science outcomes (Indayani et al., 2022). It notes that social media platforms have limitations in their feedback features, which hinder interaction among learning groups. This aspect significantly impacts student involvement in online education when compared to traditional classroom settings (Henderson et al., 2020). Traditional classrooms face challenges in providing prompt feedback on assignments, which can hinder academic progress. This stands in sharp contrast to experimental class environments. Furthermore, conventional teaching methods often fail to optimize study time, negatively affecting both student and teacher performance. The traditional approach tends to prioritize lecture-style teaching over interactive discussions and writing exercises, which hampers the effectiveness of self-directed learning.

Research consistently shows that digital learning approaches are most effective when they align with students' needs and promote engagement. The flipped classroom method, leveraging digital tools, has gained recognition for its flexibility and accessibility. This approach allows students to access learning materials at their convenience, without the constraints of physical classrooms. Given these advantages, the digitally-supported flipped classroom method stands out as a promising strategy for improving social science education outcomes in the coming years (Gilboy et al., 2014; Zheng et al. 2022; Indayani et al., 2022).

Research by Reflianto (2021) and Qader and Yalcin Arslan (2019) highlights the benefits of flipped learning, which gives students the freedom to access course content when it suits them best. This adaptable approach is advantageous for both learners and educators, as it allows for self-paced learning. In summary, this research demonstrates that employing FDC through a combination of Google Classroom, Zoom, and appropriate social media platforms enhances student participation, leading to better academic performance in social science subjects.

Interaction Between Method and Student Engagement Toward Learning Outcome

The study uncovered a strong link between the FDC (Forum, Discussion, and Clarification) approach and student participation in grasping social sciences concepts, which significantly impacts academic performance. Results showed that employing the FDC technique effectively creates a dynamic and constructive learning atmosphere, particularly enhancing student involvement. This research revealed a substantial interplay (significance level = 0.000) between the FDC methodology and learner engagement regarding social science academic achievements. The findings suggest that this interaction is rooted in the distinct personal traits of highly motivated students. Those who display high levels of engagement typically demonstrate superior abilities in self-regulation to improve their academic results.

Students who are deeply involved in their studies are more capable of generating concepts, leading to better performance on essay exams. When combined with media that's customized to meet student requirements, the FDC approach demonstrates superior efficacy and efficiency compared to traditional teaching methods for comprehending social science materials. The enhanced success of the FDC technique can be linked to several elements, such as the capacity to establish learning goals, identify optimal timing for implementation alongside suitable media integration, and evaluate the method's impact on student learning (Fan, 2022).

The correlation between the two factors suggests that the selected teaching approach effectively enhances students' academic performance. Highly engaged students typically achieve better results in social science compared to those with moderate or low engagement levels. This is evident from the slight difference in mean engagement scores between test and control groups. Notably, when comparing students with moderate and low engagement in online classes, substantial variations in social science performance were found, with a significance level of 0.028. Similarly, the comparison between high and low engagement levels revealed a significance of 0.008, indicating clear differences in social science achievement.

This study supports previous findings that show a positive link between digital flipped classrooms and traditional settings in enhancing various language skills, including speaking (Alsowat, 2016), reading (Reflianto, 2021), and writing in social sciences (Roohani & Rad, 2022). The research also emphasizes the mutual influence of digital media usage in flipped classrooms and social engagement on learning outcomes (Zen et al., 2019). Additionally, Arifani et al. (2020) and Indayani et al. (2022) notes the relationship between the flipped classroom approach and student participation, particularly among highly and moderately engaged students who demonstrate effective self-regulation, leading to improved comprehension of social science topics. When a digital-based flipped classroom method is tailored to student needs, it is expected to yield better results. The compatibility between the teaching approach and student engagement levels is likely to result in higher academic performance in social sciences.

Conclusion

This study provides compelling evidence that the Flipped Digital Classroom (FDC) method significantly enhances learning outcomes in social science education compared to traditional lecture-based approaches. Through a quasi-experimental design involving 99 junior high school students, the research demonstrates that students in the FDC group achieved higher average scores (73.49) than those in the control group (67.72), with a statistically significant difference ($p = 0.001$). Furthermore, student engagement—encompassing behavioral, emotional, and cognitive dimensions—was found to play a critical role in shaping academic performance. Students with high engagement levels consistently outperformed their peers with moderate or low engagement, particularly in the FDC setting. The interaction between the teaching method and engagement levels also significantly influenced learning outcomes ($p = 0.028$), underscoring the synergistic effect of FDC and high student engagement.

These findings carry important implications for educators and policymakers. The FDC method, by leveraging digital tools like Google Classroom, Zoom, and social media, not only improves access to learning materials but also fosters a more interactive and student-centered learning environment. This approach is especially beneficial in social science education, where critical thinking and deep analysis are essential. However, the study also acknowledges limitations, such as the short duration of the intervention (one academic quarter) and the specific context of junior high schools in Pariaman, which may limit the generalizability of the results. Additionally, the reliance on self-reported engagement data introduces potential bias, as students' perceptions may not fully capture their actual engagement levels.

Future research should address these limitations by conducting longitudinal studies across diverse educational settings and incorporating objective measures of engagement, such as observational data or digital analytics. Exploring the impact of FDC on other subjects and educational levels would also provide a more comprehensive understanding of its effectiveness. Despite these limitations, this study contributes valuable insights to the growing body of literature on technology-enhanced learning, highlighting the potential of FDC to transform social science education in the digital age.

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