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Flipped Active Learning with Padlet: Developing Engagement and Metacognitive Skills

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ABSTRACT

This study examines the impact of integrating Padlet, a web-based collaborative tool, into flipped learning environments to enhance active engagement and metacognitive development among students. A mixed-methods design was employed, combining pre- and post-course surveys, focus group discussions, and classroom observations. Participants included 50 undergraduate students enrolled in an Educational Science course, where Padlet was used for in-class activities in a flipped classroom setting. Quantitative data were collected using adapted scales (NSSE for engagement, SRQ for motivation, MAI for metacognitive skills) and academic performance metrics. Qualitative data were gathered through semi-structured focus groups and structured classroom observations. Descriptive statistics, paired t-tests, and thematic analysis were used for data analysis. Results indicated significant improvements in engagement (mean increase from 3.6 to 4.1, $p = 0.02$), motivation (3.8 to 4.3, $p = 0.01$), and metacognitive skills (3.4 to 3.9, $p = 0.04$). Qualitative findings highlighted enhanced collaboration, self-regulation, and critical thinking. The study concludes that Padlet-enhanced flipped classrooms effectively support active learning and metacognition, recommending its integration for student-centered instructional design.

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INTRODUCTION

In an era of rapid technological advancements, educators and researchers are increasingly exploring the potential of digital tools to enhance teaching practices and improve student learning outcomes. Among these innovations, Padlet has emerged as a popular online collaborative platform that allows users to create, share, and organize

content in real time. With its user-friendly interface and interactive features, Padlet has garnered attention for its potential to transform traditional learning environments into dynamic, inclusive, and engaging spaces.

Educational psychology, as a field dedicated to understanding and optimizing the learning process, offers valuable insights into how tools like Padlet can be effectively integrated into teaching practices. By examining the interplay between technology and key constructs in learning, such as active engagement, metacognition, and critical thinking, researchers can identify strategies that foster positive educational experiences and outcomes for students.

This study aims to contribute to the existing body of knowledge by investigating the relationship between Padlet and students' active learning and metacognitive development in classrooms where flipped methods of teaching and pedagogy are practiced.

Previous Studies have investigated the use of Padlet in a flipped classroom setting and found that the platform facilitated student collaboration, enhanced metacognitive skills, and promoted self-regulated learning strategies such as El-Senousy & Alquda (2017), Öztürk & Çakıroğlu (2021), Rasheed et a. (2020). A study by Findlay-Thompson and Mombourquette (2014) examined the impact of flipped classrooms on student engagement and found that this approach increased active learning opportunities, leading to higher levels of motivation and academic performance.

Recent studies explore technology-enhanced language learning through two approaches. One examines digital transformation in TEFL, proposing frameworks to modernize traditional pedagogy through smarter learning environments (Roozafzai, 2024a). Another demonstrates the flipped classroom's effectiveness for Iranian EFL learners, showing significantly improved outcomes versus conventional instruction (Roozafzai, 2024b). Together, they offer theoretical and practical insights for advancing language education through technology integration.

There are also scholars who studied the role of metacognitive development in flipped classrooms explored the relationship between metacognitive skills and flipped classrooms, concluding that the approach fostered metacognitive development by encouraging students to take ownership of their learning process and engage in self-reflection. For example Van Vliet et al. (2015) found that flipped pedagogy enhanced critical thinking, task value, and peer learning, although these effects were not long-lasting. A meta-analysis by Shi et al. (2019) concluded that flipped classrooms positively influence college students' cognitive learning outcomes compared to traditional lectures, particularly when incorporating active and collaborative approaches.

A review by Bishop and Verleger (2013) analyzed flipped learning through the lens of educational psychology, emphasizing the importance of aligning instructional strategies with cognitive and metacognitive processes to optimize learning outcomes. A meta-analysis of 317 studies also revealed positive gains across academic,

intra/interpersonal, and satisfaction-related domains, with significant advantages of flipped over lecture-based instruction (Bredow et al., 2021).

In an article by Fulton (2012), the author provided guidelines for effectively implementing flipped classrooms, stressing the importance of intentional design, student-centered learning activities, and ongoing assessment and feedback.

So in recent years, the flipped classroom approach has gained traction as an innovative pedagogical method that aims to increase student engagement and promote active learning. Simultaneously, the integration of digital tools such as Padlet has demonstrated potential in fostering collaborative learning environments and facilitating the development of metacognitive skills. Despite these advances, a gap remains in understanding how Padlet specifically supports metacognitive development in flipped learning environments. This study addresses this gap by employing a mixed-methods approach to examine Padlet's impact on both engagement and metacognitive skills, while also exploring student perceptions of its collaborative features. It examines the intersection of these two educational innovations, exploring how the use of Padlet in flipped classrooms can contribute to the enhancement of active learning and metacognitive development. By investigating the specific features of Padlet that promote engagement and collaboration, as well as the perceived impact on students' learning experiences, this research seeks to provide valuable insights into the effective design and implementation of Padlet-enhanced flipped classrooms. The findings will provide practical guidelines for educators implementing Padlet in flipped classrooms.

METHOD

This study employed a mixed-methods research design to examine the impact of Padlet-enhanced flipped classrooms on student engagement, motivation, and metacognitive development. The participants consisted of 50 undergraduate students (male and female) enrolled in an Educational Science course at a university in Isfahan, all of whom had elementary-level English proficiency. The course was taught using a flipped classroom approach, with Padlet serving as the primary collaborative tool for in-class activities.

Quantitative data were collected through pre- and post-course surveys using validated scales: the National Survey of Student Engagement (NSSE) for engagement, the Self-Regulation Questionnaire (SRQ) for motivation, and the Metacognitive Awareness Inventory (MAI) for metacognitive skills (citations for these scales should be added). Students' academic performance was assessed through grades on assignments, quizzes, and exams. Qualitative data included focus group discussions with a subset of participants and structured classroom observations to evaluate student interactions during Padlet-based activities. Ethical considerations, informed consents, were obtained prior to and while data collection.

For quantitative analysis, descriptive statistics and paired-samples t-tests were conducted using SPSS to compare pre- and post-course survey results and identify significant changes in engagement, motivation, and metacognitive skills. Academic performance data were analyzed descriptively to identify trends. Qualitative data from focus group transcripts and observation notes were thematically analyzed using NVivo to identify recurring patterns in students' experiences and perceptions.

Finally, the results of the quantitative and qualitative analyses were triangulated to provide a comprehensive understanding of Padlet's impact. This integration allowed for a robust interpretation of findings, which were then contextualized within existing literature to inform recommendations for implementing Padlet in flipped classrooms.

The findings from both quantitative and qualitative data analyses demonstrate significant improvements in students' engagement, motivation, and metacognitive skills, as well as their positive experiences with collaborative and interactive learning activities using Padlet. The study's implications highlight the importance of incorporating digital tools like Padlet in flipped classrooms to create supportive learning environments that cater to students' needs. This study provides valuable insights into the potential benefits of integrating Padlet in flipped classrooms for fostering active learning and metacognitive development among students. By designing engaging and metacognitively-oriented activities with Padlet, educators can promote active learning and enhance students' overall learning experiences. Future research can further explore the longitudinal effects of Padlet-enhanced flipped classrooms and investigate the impact of different learning activities on student outcomes.

RESULTS AND DISCUSSION

Results

Quantitative Findings

In recent years, the integration of technology in education has spurred innovative pedagogical approaches, such as the flipped classroom model. Flipped classrooms have demonstrated the potential to increase student engagement, motivation, and metacognitive skills. Additionally, online collaborative tools like Padlet have emerged as promising resources for supporting active learning environments. This study examines the impact of incorporating Padlet in flipped classrooms, focusing on the development of active learning strategies and metacognitive skills among undergraduate students in an Educational Technology course. By collecting and analyzing both quantitative (pre- and post-course surveys, academic performance) and qualitative data (focus group discussions, classroom observations), this research aims to contribute to the understanding of effective technology integration in higher education and offer insights for designing supportive learning environments.

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For quantitative analysis, descriptive statistics and paired-samples t-tests were conducted using SPSS to compare pre- and post-course survey results. The tables presenting these results were carefully designed to be informative with clear labeling. Effect sizes were calculated using Cohen's d, with values ranging from 0.40 to 0.50 indicating moderate practical significance - a nuance that should be noted when interpreting the pedagogical impact. All t-test results included degrees of freedom for statistical precision (e.g., engagement scores showed significant improvement: $t(49) = 2.5$, $p = 0.02$, $d = 0.45$). While these results demonstrate meaningful changes, the moderate effect sizes suggest the improvements should be interpreted as educationally relevant but not transformative. Academic performance data were analyzed descriptively to identify trends across different assessment types.

Table 1 presents the pre- and post-course survey results, highlighting changes in students' engagement, motivation, and metacognitive skills after implementing Padlet in flipped classrooms.

Table 1. Pre- and Post-Course Survey Results

Variable	Pre-Course Mean	Post-Course Mean	t-value	p-value	Cohen's d
Engagement	3.6	4.1	2.5	0.02	0.45
Motivation	3.8	4.3	2.9	0.01	0.50
Metacognitive Skills	3.4	3.9	2.2	0.04	0.40

The analysis of pre- and post-course survey data revealed consistent improvements across all measured variables following the implementation of Padlet in flipped classrooms. Mean scores showed statistically significant increases from baseline to post-intervention for engagement (3.6 to 4.1), motivation (3.8 to 4.3), and metacognitive skills (3.4 to 3.9). These improvements were confirmed through paired-samples t-tests, with all variables reaching statistical significance ($p < 0.05$): engagement ($t(49) = 2.5$, $p = 0.02$), motivation ($t(49) = 2.9$, $p = 0.01$), and metacognitive skills ($t(49) = 2.2$, $p = 0.04$). The effect sizes, as measured by Cohen's d, ranged from 0.40 to 0.50, indicating moderate practical significance. While these effect sizes fall within the medium range rather than large, they nevertheless suggest that Padlet integration had educationally meaningful impacts on student outcomes. The combination of statistical significance and moderate effect sizes provides robust evidence that the observed improvements were unlikely due to chance and represent substantive changes in learning experiences.

Table 2 showcases the students' academic performance in terms of mean grades and standard deviations for quizzes, exams, and assignments in the Padlet-enhanced flipped classroom environment.

Table 2. Students' Academic Performance

Assignment Type	Mean Grade	Standard Deviation
Quizzes	82	6.5
Exams	79	7.2
Assignments	86	5.8

The students' academic performance data reveals a relatively strong overall performance, with mean grades above 79 across all assignment types. The standard deviations for each assignment type are similar, indicating consistent performance within the group. This suggests that the students adapted well to the Padlet-enhanced flipped classroom environment, leading to successful academic outcomes.

Table 3 illustrates the correlations between students' engagement, motivation, metacognitive skills, and academic performance, reflecting the interconnected nature of these variables in the context of Padlet-enhanced flipped classrooms.

Table 3. Correlation between Engagement, Motivation, Metacognitive Skills, and Academic Performance

Variable	Engagement	Motivation	Metacognitive Skills	Academic Performance
Engagement	1	0.65	0.45	0.55
Motivation	0.65	1	0.50	0.60
Metacognitive Skills	0.45	0.50	1	0.40
Academic Performance	0.55	0.60	0.40	1

The correlation analysis revealed significant positive relationships among all studied variables. Engagement showed moderate correlations with motivation ($r = 0.65$), metacognitive skills ($r = 0.45$), and academic performance ($r = 0.55$), suggesting that more engaged students tended to exhibit greater motivation, stronger metacognitive abilities, and better academic outcomes. Similarly, motivation was moderately linked to both metacognitive skills ($r = 0.50$) and academic performance ($r = 0.60$), reinforcing the interconnected nature of these constructs. Notably, metacognitive skills also demonstrated a moderate association with academic performance ($r = 0.40$), though slightly weaker than other relationships. Together, these patterns highlight a consistent trend: students who scored higher in one domain (e.g., engagement or motivation) typically performed better in others, underscoring the synergistic role of these factors in flipped classroom settings enhanced by Padlet.

Overall, these correlations highlight the interconnected nature of engagement, motivation, metacognitive skills, and academic performance, emphasizing the importance of considering these variables in the context of Padlet-enhanced flipped classrooms.

Qualitative Findings

To gain a deeper understanding of students' experiences and perceptions of Padlet-enhanced flipped classrooms, qualitative data were gathered through four focus group discussions involving 6–8 participants each (28 students in total) and 12 classroom observations lasting 90 minutes each. Data saturation was reached when no new themes emerged in the final two focus groups and after analyzing 85% of the observation notes. The qualitative analysis aimed to identify key themes related to fostering active learning and metacognitive development. Triangulation with quantitative survey results provided a more comprehensive understanding of the impact of integrating Padlet in flipped classrooms.

The focus group findings revealed three central themes. The first was enhanced engagement, with students reporting higher motivation and participation resulting from the interactive and collaborative learning experiences afforded by

Padlet. One participant shared, "*Seeing everyone's ideas on Padlet before class made me feel prepared to contribute*" (Participant 14). Another added, "*We could build on each other's posts—it felt like a collective notebook*" (Participant 22). Observation data supported this theme, showing that 80% of sessions featured peer-to-peer referencing of Padlet posts, while instructors used the platform to provide real-time feedback and address misconceptions promptly.

The second theme was improved metacognitive skills, as students noted that Padlet activities encouraged self-reflection, planning, and self-regulation, ultimately enhancing their metacognitive development. As one participant explained, "*I started using Padlet to track my weekly goals—it became my learning diary*" (Participant 9). Observations further confirmed this, with students using Padlet's column feature to structure tasks and weekly reflection posts to monitor their progress.

The third theme was active learning opportunities, where students emphasized the benefits of in-class activities using Padlet to promote critical thinking, problem-solving, and collaboration. One student remarked, "*Instead of passive lectures, we solved problems together using Padlet*" (Participant 31).

Classroom observations enriched these findings by documenting patterns of collaborative learning, such as students actively building upon peers' posts in 83% of sessions and frequently using the "like" and comment features to validate contributions. Structured collaboration strategies also emerged, including color-coded posts to indicate knowledge levels and guide targeted support. Furthermore, Padlet contributed to effective use of class time, reducing group work setup by 40% compared to traditional methods and enabling differentiated instruction through private instructor comments. Notably, one shy student gained confidence by first engaging through written contributions on Padlet before speaking in class.

Finally, Padlet was found to facilitate metacognitive processes, with 78% of students beginning sessions by reviewing personal goal posts from previous weeks and 65% revising posts iteratively to track progress over time. As one student reflected during self-assessment, "*Look how my question evolved from Week 3 to now.*" These qualitative findings, in line with the quantitative results, demonstrate that Padlet-enhanced flipped classrooms foster engagement, collaboration, and metacognitive development, highlighting the platform's potential to optimize student learning outcomes.

Discussion

This study provides robust evidence that integrating Padlet into flipped classrooms significantly enhances student engagement, motivation, and metacognitive development. The quantitative results demonstrate meaningful improvements across all measured variables, with engagement showing a 14% increase ($d = 0.45$), motivation improving by 13% ($d = 0.50$), and metacognitive skills rising by 15% ($d = 0.40$). These findings gain deeper significance when examined through Zimmerman's (2002) self-regulated learning (SRL) framework. Padlet's interactive features effectively support all three phases of SRL: the planning phase through goal-setting boards, the performance phase via real-time collaboration, and the reflection phase through progress-tracking functionalities. So these findings gain theoretical significance through Zimmerman's (2002) self-

regulated learning framework, where Padlet's features uniquely support all SRL phases: goal-setting boards (forethought), real-time collaboration (performance), and progress tracking (reflection). This theoretical alignment explains why students reported stronger metacognitive awareness - the platform's structure naturally facilitates cyclical self-regulation processes. Unlike Hastomo et al.'s (2025) findings where tools like projectors and YouTube served isolated functions (e.g., displaying materials or playing videos), our study demonstrates how Padlet's integrated features systematically support metacognitive development through goal-setting, real-time collaboration, and progress tracking - creating a cohesive learning cycle that fragmented tools cannot replicate.

When contextualized within the broader literature, our results reveal Padlet's distinctive value. While Nawawi and Utami's (2024) Padlet Wall study found positive student perceptions in writing classes, it lacked measurable skill improvements - highlighting our advancement through rigorous mixed-methods assessment. Similarly, Reftyawati's (2024) Trello research demonstrated strong collaboration but narrower academic outcomes, suggesting Padlet's multifaceted design better supports holistic learning. These comparisons align with but extend Rasheed et al.'s (2020) social constructivism work by quantifying how specific platform features (color-coded posts, timelines) operationalize Vygotsky's (1978) ZPD. For instance, our observation that 78% of students built upon peers' posts surpasses Trello's collaboration rates (Reftyawati, 2024), likely due to Padlet's more intuitive interface for academic discourse.

The qualitative data enrich these quantitative findings by revealing how these improvements manifest in practice. Students consistently described Padlet as creating a "shared workspace for collective knowledge building" (Participant 15), while instructors noted its ability to "make thinking processes visible" (Instructor observation, Session 8). These observations align with but go beyond previous studies of flipped classrooms by demonstrating how specific platform features (e.g., color-coded posts, timeline views) operationalize theoretical constructs like Vygotsky's (1978) zone of proximal development in tangible ways that resonate with today's digitally-native students.

However, several limitations warrant consideration. First, the 12-week intervention period, while sufficient to detect initial changes, cannot speak to the long-term sustainability of these improvements - a limitation also noted in van Vliet et al.'s (2015) research on flipped learning durability. Second, the sample's cultural specificity (Iranian undergraduates) raises questions about generalizability to other educational contexts, particularly in individualistic cultures where collaborative tools might yield different outcomes. Third, the observed technology disruptions in 17% of sessions echo Roozafzai's (2024a) findings about infrastructure dependencies in digital pedagogy. These limitations suggest fruitful directions for future research, including longitudinal studies across diverse cultural contexts and investigations of hybrid models combining Padlet's collaborative strengths with AI's personalization capabilities (cf. Roozafzai & Zaeri, 2024).

Practically, these findings offer actionable insights for educators and instructional designers. For instructors transitioning to flipped models, Padlet provides a structured yet flexible platform to maintain guidance during student-centered activities - addressing what Bredow et al. (2021) identified as the "support

gap" in flipped implementations. For developers, the strong positive response to features like real-time commenting and progress tracking suggests these elements should be prioritized in educational technology design. Perhaps most importantly, this study demonstrates that thoughtful technology integration, one that aligns with established learning theories while addressing contemporary students' needs, can create learning environments that are both pedagogically sound and authentically engaging.

CONCLUSION

This study underscores the transformative potential of Padlet as a collaborative tool in flipped classrooms, offering compelling evidence of its ability to enhance both engagement and metacognitive development. The findings reveal that students experienced measurable improvements in key learning dimensions, with engagement increasing by 14%, motivation by 13%, and metacognitive skills by 15%. These gains were not merely statistical but were reflected in students' active participation, deeper self-reflection, and more structured approaches to learning—qualities that align closely with Zimmerman's (2002) model of self-regulated learning.

Beyond confirming the effectiveness of Padlet, this research contributes to the broader discourse on technology-enhanced learning by illustrating how digital tools can operationalize theoretical frameworks in practice. Unlike conventional tools that serve isolated functions, Padlet's integrated features—such as real-time collaboration and progress tracking—create a cohesive environment that nurtures social constructivist learning (Vygotsky, 1978). This synergy between theory and tool design addresses a critical gap in flipped classroom research, where technology often fails to fully support metacognitive processes.

For educators, these insights translate into actionable strategies. The study highlights the importance of intentional tool selection, emphasizing platforms like Padlet that inherently promote interaction and reflection. It also suggests that structured activities, such as weekly goal-setting and peer feedback loops, can amplify the benefits of flipped learning. However, the findings also caution against overlooking practical challenges, such as technical disruptions, which were observed in 17% of sessions. Proactive training and contingency plans are essential to ensure smooth implementation.

Looking ahead, this study opens several avenues for future research. Longitudinal investigations could assess whether the observed benefits persist over time, while cross-cultural studies might explore how the approach adapts to different educational contexts. Additionally, the integration of emerging technologies—such as AI-driven personalization within collaborative platforms—warrants exploration, as it could further tailor learning experiences to individual needs. By pursuing these directions, researchers and practitioners can continue

refining flipped learning models to maximize their impact on student success.

In sum, this research not only validates Padlet's role in modern pedagogy but also provides a blueprint for leveraging technology to create more dynamic, student-centered learning environments. Its theoretical and practical contributions pave the way for innovations that bridge the gap between digital tools and transformative educational outcomes.

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