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Interactive tools, engaged minds: The impact of ClassPoint and EdCafe on learning strategies

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ABSTRACT

Student engagement is a critical factor in academic success and enriching learning experiences in higher education. This study explores the impact of two interactive educational AI tools—ClassPoint and EdCafe—on enhancing engagement, participation, and content retention in a GS Psychology course. Using a quasi-experimental design, the study involved 70 undergraduate students. Participants were divided into control and experimental groups. The experimental group utilized ClassPoint (interactive quizzes and annotations) and EdCafe (interactive assignments and class activities), while the control group followed traditional instructional methods. Engagement surveys were the primary data collection method pre and post the intervention for both groups. Findings revealed that the experimental group exhibited significantly higher emotional, cognitive, and behavioral engagement, as well as better test performance, compared to the control group. Students in the experimental group also reported greater enjoyment, motivation, and responsiveness to interactive tasks. These results suggest that incorporating technology-based tools like ClassPoint and EdCafe enhances academic performance and fosters positive student attitudes toward learning. The integration of such platforms creates dynamic and engaging learning environments, promoting deeper comprehension and stronger content retention

KEYWORDS: engagement, technology-based approach, active learning, college students, psychology

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Introduction

Digital technology is now a fundamental component of higher education, shaping various aspects of student experience, such as learning environments, interaction methods, and assessment processes. Its integration is linked to increased behavioral, emotional, and cognitive engagement by promoting active participation and fostering emotional connections with course content. These factors significantly shape students' academic trajectories and future perspectives (Mohamed & Bendania, 2024; Abdelrheem & Bendania, 2022).

The growing emphasis on integrating technology in classrooms reflects its potential to transform traditional teaching into more dynamic and interactive learning experiences. Technology supports active learning by enabling real-time engagement through interactive quizzes, polls, and multimedia tools. Such features enhance comprehension and make learning experiences more engaging. Research indicates that active learning approaches enhanced by technology improve knowledge retention and academic performance. For example, Swang et al. (2017) examined the use of keypad response systems in large classrooms and found that these tools positively influenced engagement.

Similarly, Bergdahl et al. (2018) explored the effects of learning technologies on student engagement through observational data and student diaries. Their findings revealed that deliberate and thoughtful integration of technology into lessons can foster engagement, making learning processes more visible and accessible to instructors and students. Wang (2020) also emphasized the importance of integrating technology by using design-based research to investigate how technology-enhanced tools improve active learning and engagement. The study concluded that interactive response system tools not only improve individual retention but also enable students to achieve deeper, meaningful learning outcomes.

Technology-based tools in classrooms enhance students' attention and material retention during lessons. For instance, Kay and Lesage (2009) reported a 20% improvement in engagement when audience response systems were used, compared to traditional teaching methods. Tools such as smartboards, learning management systems (LMS), and applications like Kahoot engage students in real-time quizzes, polls, and collaborative discussions, making learning interactive and enjoyable (Licorish et al., 2018; Benhadj et al., 2019; Cameron & Bizo, 2019; Wang & Tahir, 2020). It seems that personalized learning technologies, further enhance outcomes (Pane et al., 2015). Collaborative digital tools also build teamwork skills and foster a sense of community, whether in-person or online (Cherbonnier et al., 2024).

One example about advanced technologies like augmented reality (AR), virtual reality (VR), and gamification introduce dynamism into education by maintaining attention and simplifying complex concepts (Pinchuk et al., 2019). Automated grading systems and online quizzes provide immediate feedback, allowing educators and students to identify and address learning gaps quickly (Spector et al., 2016). As technology integrates seamlessly into higher education, its ability to enhance active learning results in improved academic performance, higher engagement levels, and the development of essential skills. However, its effectiveness relies heavily on its purposeful and thoughtful application.

One example of these applications is Classspoint. ClassPoint, a technology integrated with Microsoft PowerPoint, exemplifies the role of interactive tools in improving student engagement. By allowing instructors to add real-time quizzes, polls, and other interactive features to their presentations, ClassPoint encourages active participation without requiring a shift to another platform (Abdelrady & Akram, 2022).Additionally, classpoint include Gamification features, such as rewarding students with stars for participation, create a competitive environment that boosts involvement. Studies have shown that over 80% of students and instructors believe that ClassPoint enhances class participation and engagement (Bong & Chatterjee, 2021). Moreover, its capabilities for handling complex inputs like sketches and math formulas address the limitations of traditional response systems. Although its use in psychology and social sciences requires further exploration, evidence supports its efficacy in improving engagement.

EdCafe, another innovative tool, leverages artificial intelligence (AI) to foster collaboration and interaction in educational settings. With features such as smart lesson planning, personalized teaching resources, flashcards, and interactive quizzes, It tailors content to individual learning styles and academic levels. Its intelligent system adapts resources to students' progress, enhancing engagement and retention. Although EdCafe's AI-driven approach shows promise, empirical research on its effectiveness in diverse educational contexts remains limited. Further studies are necessary to evaluate its impact on engagement and academic performance, and how this

would affect the use of Multimedia learning.

The Cognitive Theory of Multimedia Learning (CTML), developed by Richard E. Mayer, provides insights into how technology enhances the learning experience (Mayer & Moreno, 1998). According to CTML, students learn better when information is presented using both visual and auditory channels, rather than relying solely on text. This theory, rooted in cognitive psychology, posits that humans process information through separate visual and auditory channels. Engaging both channels facilitates active processing and integration of new information into existing cognitive structures, promoting deeper understanding and retention (Mayer, 2024; Yue et al., 2023). Tools like ClassPoint and EdCafe align with CTML principles by offering quizzes, polls, and multimedia content that engage these cognitive channels. Educators can optimize learning by balancing cognitive load and actively engaging students, creating effective and engaging learning environments.

Therefore, the current study investigates the impact of ClassPoint and EdCafe on students' engagement and academic performance in a psychology course. It explores how these tools influence behavioral, cognitive, and emotional engagement, as well as overall academic outcomes such as grades and assignment completion. By examining the dimensions of engagement—behavioral (active participation), cognitive (mental effort and comprehension), and emotional (affect and motivation)—the study aims to provide a comprehensive understanding of these tools' contributions to learning.

The study hypothesizes that ClassPoint and EdCafe will significantly enhance students' engagement levels compared to traditional teaching methods (H1). Specifically, students in the experimental group are expected to show higher behavioral (H2), cognitive (H3), and emotional (H4) engagement scores after the intervention. Additionally, the experimental group is anticipated to demonstrate greater improvements in overall engagement scores from pre- to post-intervention (H5). Furthermore, the experimental group is predicted to experience larger increases in each dimension of engagement over time (H6). Finally, the levels of engagement are expected to significantly predict students' academic achievement in the experimental group (H7).

Method and Procedures

- **Ethics:** This study adhered to the ethical standards outlined by the American Psychological Association (APA) for conducting research involving human participants, and any relevant updates or ethical standards (World Medical Association, 2001). Prior to data collection, participants were informed about the study's purpose and procedures. Informed consent was obtained from all participants, who were given the option to either agree to participate ('Yes') or decline ('No'). This ensured that participants were fully aware of their involvement and had the opportunity to make an informed decision regarding their participation in the study.
- **Participants:** Data were collected from 70 undergraduate students, from King Fahd university for petroleum and Minerals. (Mean age =21.8 years, SD =1.2). participants were from different study levels (i.e., freshman, sophomores, Junior and senior), and their involvement took place during the summer term of academic year 2023-2024.
- **Method**: This study used a quasi-experimental design with the non-equivalent group's technique, employing randomization at the intervention level to resolve directionality by manipulating the independent variable. As a result, quasi-experimental research offers greater internal validity than non-experimental studies. The **experimental group** (n=35) utilized ClassPoint and Edcafe throughout the academic term. ClassPoint was used to enhance interaction during lectures through the integration of interactive quizzes and real-time annotations on presentation slides. Edcafe facilitated interactive assignments and classroom activities. The **control group** (n=35) received traditional lecture-based instruction, with no use of interactive tools.
- **Tools**: the current study used 2 main tools to assess the students Behavioral, cognitive and emotional engagement in the classroom that represented in:

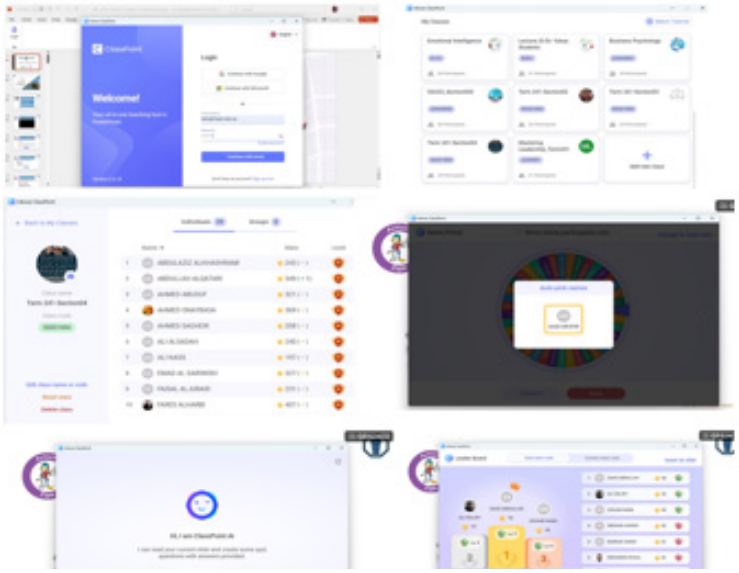

Figure 1. ClassPoint Screenshots Illustrating Various Tools and Their Functions

A- **ClassPoint.app**: ClassPoint is an add-on for Microsoft PowerPoint designed to enhance classroom engagement. It allows educators to create interactive elements such as multiple-choice questions, short-answer prompts, polls, and drawing activities directly within their PowerPoint slides. Teachers can collect and display student responses in real-time, making lessons more interactive. ClassPoint also includes features for annotating slides, organizing responses, and tracking participation, making it a valuable tool for both in-person and online teaching. It also includes an AI tool to generate quiz questions, summarizations, and insights, streamlining lesson preparation and boosting engagement (see figure 1).

B- **Edcafe platform**; Edcafe is an advanced AI toolkit tailored for educators to create and organize high-quality instructional content effortlessly. It stands out with features like custom chatbots, teaching resources, flashcards, interactive quizzes, and slide generators, addressing challenges other AI tools cannot. Additionally, Educators can upload their materials for analysis, enabling Edcafe to generate content perfectly aligned with their teaching objectives. The platform also supports personalized, interactive content creation, offering dynamic student engagement and detailed feedback. It is also connected with a Google Drive-like library, Edcafe fosters collaboration, allowing educators to efficiently create, share, and manage resources in a centralized space. Manage resources efficiently with fellow educators in one dedicated library (see figure 2).

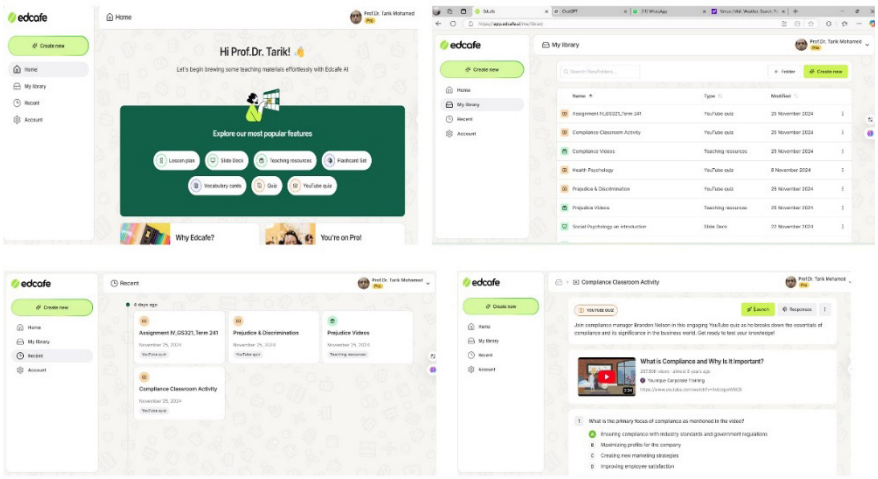

Figure 2. EdCafe Screenshots Illustrating Various Tools and Their Functions

C- **Students' engagement scale**: The Students' Engagement scale (SES) is a 30-item scale designed by the author to assess the multidimensional construct of student engagement, encompassing behavioral, cognitive, and emotional dimensions. Behavioral engagement focuses on students' participation and

effort in academic tasks, such as active involvement in discussions, persistence in completing assignments, and adherence to classroom norms. Cognitive engagement measures the depth of students' investment in learning by evaluating their use of strategies like critical thinking, organization, reflection, and problem-solving to understand and apply complex concepts. Emotional engagement captures students' affective connection to their learning environment, including positive feelings of interest, enthusiasm, and a sense of belonging, as well as the absence of negative emotions like boredom or frustration. Each item in the inventory is rated on a Likert scale, allowing educators and researchers to identify engagement levels and target specific areas for improvement. This tool serves as a valuable resource for understanding and enhancing students' academic and emotional experiences (see appendix 1). The Arabic version demonstrated good reliability (Cronbach's α = .896, McDonald's ω = .895), with interclass correlation reported in table (1). Additionally, Confirmatory Factor Analysis (CFA) was conducted to validate the proposed three-factor structure of the scale. The goodness-of-fit indices indicated an acceptable fit: $\chi 2$ = 158.57, p < .001 CMIN/DF. = 1.960; NFI = .963; CFI = .977; IFI = .945; TLI= .967 GFI= .968; RMSEA = .039. These findings highlight the psychometric goodness and validity of the Arabic version of the scale within the studied population.

	95% confidence intervals			*F Test with True Value 0*	
	Intraclass Cor	*Lower Bound*	*Upper Bond*	*Value*	*significant*
Single	.301	.277	.327	7.463	.000
Average	.896	.852	.879	7.463	.000

Results

To test the hypothesis (H1) that the use of ClassPoint and EdCafe for experimental groups will significantly enhance students' engagement levels compared to the control group (H1), a Mann-Whitney U test was conducted. The results revealed that the experimental group reported significantly higher engagement (M = 128, SD = 8.42) compared to the control group (M =99.26, SD = 6.49), U = 56, p = .001. Descriptive statistics for both groups are presented in Table 2. These findings suggest that using ClassPoint during class and Edcafe for active assignments, activities and HomeWorks enhance students' behavioral engagement (see figure 3a).

Table 2. Descriptive statistics for engagement scale between experimental and control Groups.

	Mean	*SD*	*SEM*	*Median*	*Lower 95% CI*	*Upper 95%CI*
Experimental	128	8.42	2.09	130	123.7	132.2
Control	99.26	6.49	1.69	100	97.03	101.5

To test the hypothesis (H2) that students using ClassPoint and Edcafe would demonstrate significantly higher behavioral engagement than those who did not, a Mann-Whitney U test was conducted. The results revealed that the experimental group reported significantly higher behavioral engagement (M = 44.46, SD = 3.404) compared to the control group (M = 33.57, SD = 2.593), U = 30.0, p = .001. Descriptive statistics for both groups are presented in Table 3. These findings suggest that using ClassPoint during class and Edcafe for active assignments, activities and HomeWorks enhance students' behavioral engagement (see figure 3b).

Table 3. Descriptive statistics for Behavioral engagement scale between experimental Groups.

	Mean	*SD*	*SEM*	*Median*	*Lower 95% CI*	*Upper 95%CI*
Experimental	44.46	3.404	.5753	45	43.49	45.83
Control	33.57	2.593	.4383	35	32.68	34.46

To test the hypothesis (H3) that Students who use ClassPoint and Edcafe will exhibit significantly higher levels of cognitive engagement compared to students who do not use these tools, a Mann-Whitney U test was conducted. The results revealed that the experimental group reported significantly higher cognitive engagement (M = 42.34, SD = 5.36) compared to the control group (M = 31.11, SD = 1.96), U = 69, p = .001. Descriptive statistics for both groups are presented in Table 4. These findings suggest that using ClassPoint during class and Edcafe for active assignments, activities and HomeWorks enhance students' cognitive engagement (see figure 3c).

Table 4. Descriptive statistics for Cognitive engagement scale between experimental Groups.

	Mean	*SD*	*SEM*	*Median*	*Lower 95% CI*	*Upper 95%CI*
Expermental	42.34	5.363	.906	44	40.50	44.19
Control	31.11	1.966	.322	32	30.46	31.77

To test the hypothesis (H4) that Students who use ClassPoint and Edcafe will exhibit significantly higher levels of emotional engagement compared to students who do not use these tools, a Mann-Whitney U test was conducted. The results revealed that the experimental group reported significantly higher emotional engagement (M = 40.97, SD = 5.51) compared to the control group (M = 32.37, SD = 4.44), U = 142, p = .001. Descriptive statistics for both groups are presented in Table 5. These findings suggest that using ClassPoint during class and Edcafe for active assignments, activities and HomeWorks enhance students' emotional engagement (see figure 3d).

Table 4. Descriptive statistics for emotional engagement scale between experimental Groups.

	Mean	*SD*	*SEM*	*Median*	*Lower 95% CI*	*Upper 95%CI*
Exper. Group	40.97	5.512	.931	42	39.08	42.86
Control	32.37	4.446	.751	33	30.89	33.90

To test Hypothesis (H5), which proposed that the experimental group would show a greater improvement in overall engagement score from pre- to post-intervention compared to the control group, a repeated measures ANOVA was conducted. The analysis included Time (pre- and post-intervention) as a within-subjects factor and Group (Experimental vs. Control) as a between-subjects factor. The results revealed a significant main effect of Time, $F(1, 34) = 108.11$, $p < .001$, $\eta^2p = .76$, indicating that engagement scores increased significantly from pre- to post-intervention. Additionally a significant main effect of Group was also found, $F(1, 34) = 138.86$, $p < .001$, $\eta^2p = .80$, demonstrating that the experimental group had higher engagement scores overall compared to the control group. furthermore, there was a significant interaction between Time and Group, $F(1, 34) = 82.41$, $p < .001$, $\eta^2p = .71$, suggesting that the increase in engagement scores from pre- to post-intervention was greater for the experimental group than for the control group (Figure 4c).

Post hoc Bonferroni analyses provided further insights. The analysis of the main effect of Time indicated that post-intervention scores were significantly higher than pre-intervention scores (mean difference = 5.54, p = .001; Figure 4a). The analysis of the main effect of Group showed that the experimental group had significantly higher engagement scores than the control group (mean difference = 5.69, p = .001). These findings support the hypothesis, demonstrating that the intervention was effective in increasing engagement, particularly for the experimental group.

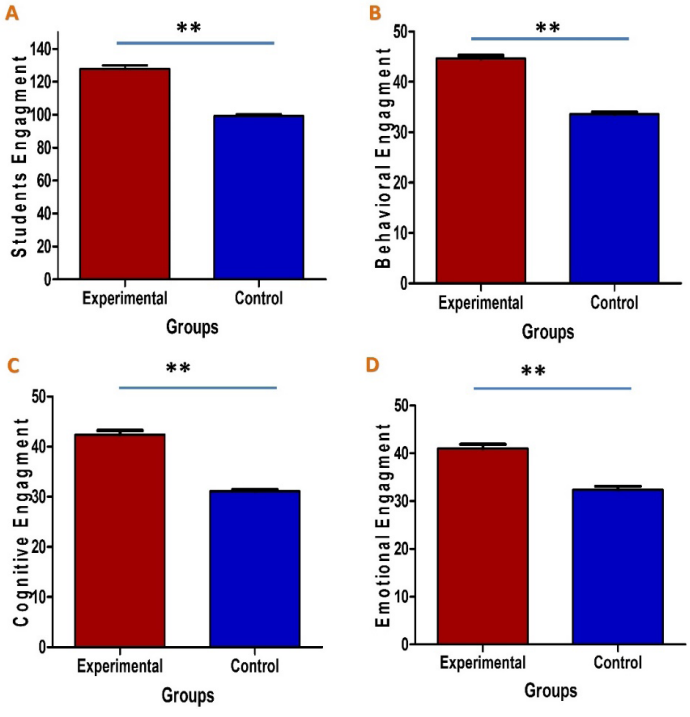

Figure 3. Differences Between the Experimental and Control Groups in Engagement Dimensions and Student

Grades in the Psychology course

To test Hypothesis (6), which stated that students in the experimental group are expected to show significant improvements in Behavioral engagement from pre- to post-intervention, surpassing any changes observed in the control group (H6). Repeated measure ANOVA with engagement types (3 Types), Group (Experimental vs. control) and Time (pre vs. post intervention). Results showed main effects of Engagement F (2, 68) = 93.73, $p < .001$, $\eta^2p = .734$, Groups F(1, 34) = 46.924, $p < .001$, $\eta^2p = .580$, in that experimental group show higher engagement than Control groups, and Time F(1, 34) = 148.141, $p < .001$, $\eta^2p = .879$, which showed higher engagement after the intervention than before the intervention. Additionally, two-way interactions were reported in in Engagement by groups, Engagement by time and Group by time (Figure 5). Finally, three-way interactions of engagement by Group by time.

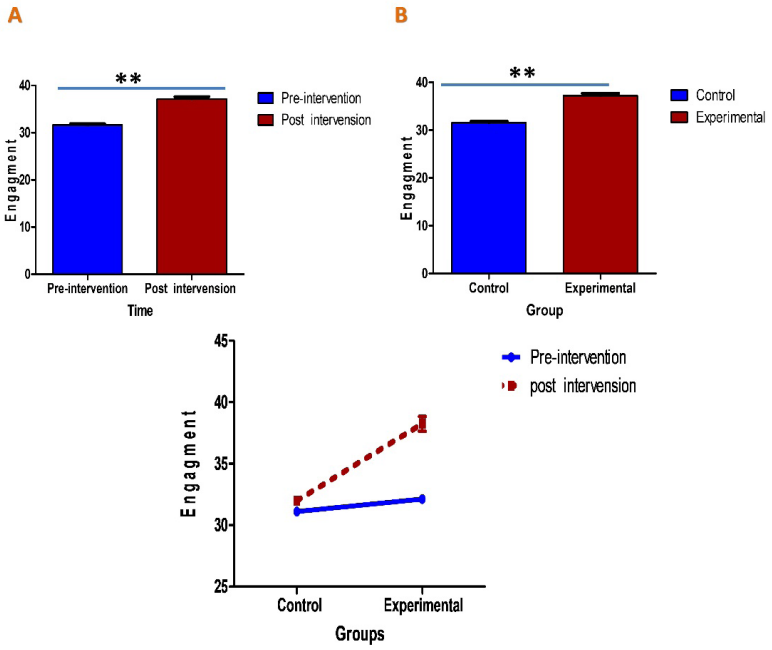

Figure 4. Repeated Measure ANOVA main effects and interactions

Post hoc Bonferroni analyses were conducted to examine the main effects on engagement. The results indicated significant differences between behavioral and cognitive engagement, with students demonstrating higher behavioral engagement than cognitive engagement (Mdiff = 3.336). Significant differences were also found between emotional engagement and both behavioral and cognitive engagement (Mdiff = 4.779). However, no significant difference was observed between behavioral and emotional engagement (Mdiff = 1.043). For group differences, the experimental group demonstrated significantly higher engagement scores compared to the control group (Mdiff = 1.652). Regarding time, post-hoc analysis revealed that engagement levels significantly increased post-intervention compared to pre-intervention.

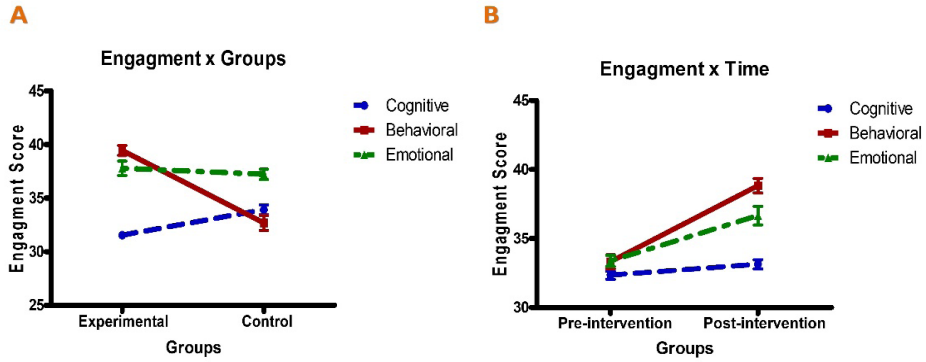

Figure 5. Interaction between Engagement and Groups (A), and between Time and Engagement (B).

To test Hypothesis 7 (H7), which predicted that behavioral, cognitive, and emotional engagement would significantly predict students' achievement in the psychology course after using ClassPoint and EdCafe, a multiple linear regression analysis was performed. The results showed that only behavioral engagement significantly predicted academic performance, while cognitive and emotional engagement had no significant effect (figure 6).

Table 5. Multilinear Regression of different types of Engagement on Students Academic Achievement

	B	*SEM*	*Significant*	*VIF*
Constant	42.202	6.437	.001	
BE	.984	.156	.001	2.963
CE	.137	.151	.370	2.946
EE	.171	.165	.308	1.348
R2		.773		
M.Sign		.001		

To assess the reliability of the outcomes derived from multiple regressions, correlation analyses, and tests for multicollinearity were conducted. Significant correlations between the variables can lead to a type II error, resulting in failure to reject a false null hypothesis. Given the observed correlations among engagment sub-factors, Variance Inflation Factor (VIF) values were calculated for all independent variables in the regression to address multicollinearity concerns (Table 5). Notably, none of the VIF values exceeded the commonly accepted threshold of 3; indicating that multicollinearity was not a significant issue.

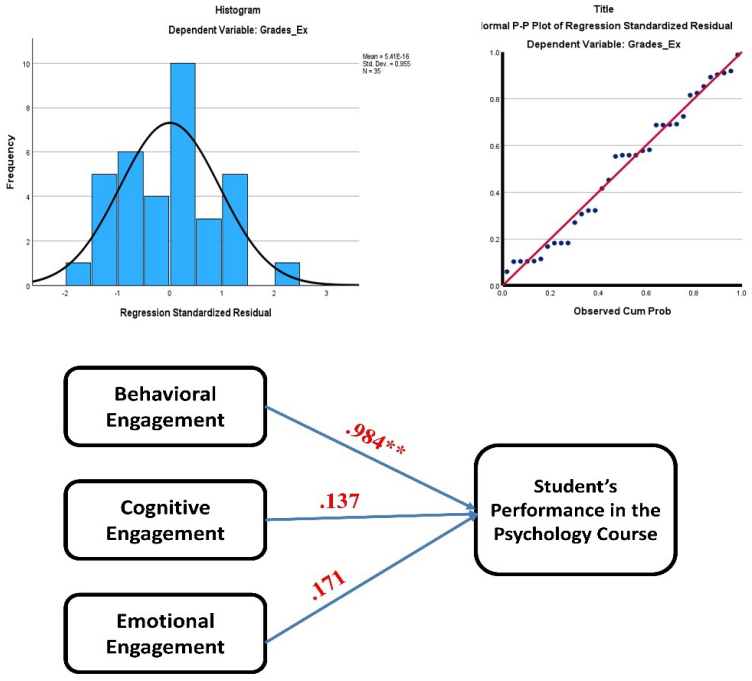

Figure 6. Multilinear regression analysis of different types of Engagement on students' academic Achievement on psychology GS course

Discussion

This study examined how integrating ClassPoint and EdCafe into a psychology course impacted students' emotional, behavioral, and cognitive engagement. Using a quasi-experimental design, the study compared the effects of these AI-enhanced tools with traditional teaching methods to assess their ability to enhance engagement and foster a more interactive and supportive learning environment.

The results for the first hypothesis showed that the experimental group, which used ClassPoint and EdCafe, achieved significantly higher overall engagement compared to the control group. These findings highlight the effectiveness of technology-enhanced tools in creating an interactive and engaging learning environment.

Research by Bond and Bedenlier (2019) and Qureshi et al. (2021) supports this, demonstrating that tools enabling real-time participation and feedback enhance engagement by actively involving students in the learning process. Similarly, Menzer et al. (2024) found that online platforms promoting active and personalized learning boost student motivation and participation (e.g. Hyflex). In this study, ClassPoint and EdCafe likely created a dynamic environment that motivated students to actively participate and engage with course materials, leading to higher overall engagement.

The results of the second hypothesis revealed a significant improvement in behavioral engagement for students in the experimental group. Behavioral engagement involves active participation in learning activities, such as answering questions, completing assignments, and collaborating with peers. Integrating features of ClassPoint and EdCafe into the learning process positively impacted students' active participation in class. These findings are supported by research showing that technology-enhanced learning environments foster greater engagement by making learning more interactive and student-centered (Oktadela et al., 2024; Healey, 2018).

These results align with Constructivist Learning Theory (Bada & Olusegun, 2015), which emphasizes the importance of interaction in building knowledge. Tools like EdCafe, with its interactive quizzes and flashcards, complemented active learning by making classroom activities more dynamic and participatory. These findings are consistent with studies by Oktadela et al. (2024) and Healey (2018), which showed that interactive, student-centered tools significantly enhance behavioral engagement. Additionally, research by Murillo-Zamorano et al. (2021) highlights that digital platforms promoting active and collaborative learning environments enhance behavioral engagement.

The results of the third hypothesis demonstrated higher cognitive engagement for the experimental group compared to the control group. Cognitive engagement reflects the mental effort students put into understanding and mastering material (Rotgans & Schmidt, 2011). The findings suggest that ClassPoint and EdCafe supported deeper learning by encouraging critical thinking, problem-solving, and reflection. ClassPoint's real-time interaction features, such as quizzes and immediate feedback, likely helped students focus on applying and analyzing the material during class, consistent with Active Learning Theory (Mizokami, 2018; Bonwell & Eison, 1991). Similarly, EdCafe provided a platform for reflective learning, allowing students to engage deeply with course content through YouTube quizzes, flashcards, and study cards. Research by Qiao et al. (2018) and Beckmann and Weber (2016) support these findings, showing that reflective tools foster cognitive presence and meaningful engagement. These results align with Social Constructivist Theory, which emphasizes the role of interaction and collaboration in promoting cognitive development.

The results of the fourth hypothesis demonstrated that students in the experimental group experienced significantly higher emotional engagement. Emotional engagement involves feelings of interest, enjoyment, and enthusiasm for learning, which are critical for creating a positive and motivating environment. ClassPoint's interactive features likely made lessons more engaging, while EdCafe encouraged connections through collaborative assignments, fostering a sense of community and shared purpose among students. These outcomes align with Self-Determination Theory (Ryan & Deci, 2000), which states that students feel more emotionally invested when their learning environment supports autonomy, competence, and relatedness. Previous research by Fredricks et al. (2013) highlights the importance of emotional engagement in sustaining student motivation and interest in learning.

The results of the fifth hypothesis confirmed a significant increase in engagement scores from pre- to post-intervention, with a greater improvement observed in the experimental group. These findings suggest that the integration of ClassPoint and EdCafe was particularly effective in sustaining engagement over time. These findings align with previous studies on active learning techniques (Prince, 2004), which demonstrated that interventions designed to increase engagement have significant effects on student involvement.

The interaction effect between time and group further highlights that the experimental group benefited more from the intervention compared to the control group. Research by Chi and Wylie (2014) and Michael (2006) supports the conclusion that participatory and interactive methodologies have a stronger impact on engagement than traditional teaching methods. These findings align with theories of active engagement (Fredricks et al., 2004) and empirical evidence on the effectiveness of participatory learning environments. The large effect sizes further highlight the practical significance of the intervention.

The results for the sixth hypothesis revealed significant main effects for engagement type, group, and time, along with significant interaction effects, highlights the intervention's effectiveness in enhancing student engagement. The substantial variance explained by the model (η^2p = .734) highlights the strong influence of technology and digital tools in fostering multidimensional engagement, encompassing behavioral, cognitive, and emotional dimensions. These results align with prior research indicating that active learning interventions significantly enhance student engagement in educational settings (Fredricks et al., 2004).

The significant difference in engagement between the experimental and control groups (η^2p = .580) further supports the effectiveness of tools like ClassPoint and EdCafe in fostering higher levels of engagement. This finding aligns with studies demonstrating that interactive tools enhance classroom participation and maintain student attention (Sailer et al., 2024). Additionally, the substantial main effect of time (η^2p = .879) highlights the marked increase in engagement following the intervention, consistent with learning engagement theories that emphasize the cumulative benefits of innovative pedagogical practices over time (Connell & Welborn, 1991). These main effects were further substantiated by two-way and three-way interaction effects, which provided additional evidence for the intervention's impact across different engagement dimensions and overtime. These findings suggest that integrating interactive tools like ClassPoint and EdCafe into instructional settings not only enhances engagement but also sustains it over time.

The results of the seventh hypothesis showed that behavioral engagement significantly predicted academic performance (table 5), emphasizing the importance of observable, action-oriented behaviors (e.g., participation, attendance, and on-task activities) in driving academic outcomes. This finding aligns with prior research (Fredricks et al., 2004), which identified behavioral engagement as the most immediate and measurable form of engagement linked to academic success. However, cognitive and emotional engagement did not significantly predict academic performance. This suggests that while these dimensions may contribute to deeper learning processes, their effects might not translate directly into measurable outcomes like grades or standardized test scores. These findings highlight the need for further investigation into how cognitive and emotional engagement influence academic outcomes, potentially through mediating factors such as intrinsic motivation or self-regulation.

Conclusion

The study demonstrated that integrating ClassPoint and EdCafe into instructional settings significantly enhances multidimensional student engagement (behavioral, cognitive, and emotional) and sustains it over time. The findings highlight the efficacy of technology-enhanced tools in fostering interactive, student-centered learning environments, with behavioral engagement emerging as a key predictor of academic performance. These results contribute to the evidence supporting innovative pedagogical approaches and underscore the practical value of digital tools in modern education.

Limitations of the current study

This study has several limitations that should be acknowledged. First, the sample size was relatively small and lacked diversity, which may limit the generalizability of the findings to broader populations or more varied educational contexts. Second, the study assessed engagement over a short period, leaving the long-term effects of the intervention unexplored. Finally, the findings are specific to psychology courses, which may limit their applicability to other academic disciplines or instructional settings.

Declarations

Ethics Approval and Consent to Participate: This study was approved by the Research Committee of the Department of Global Studies, King Fahd University of Petroleum and Minerals (KFUPM). All participants provided informed consent prior to their participation.

Availability of Data and Materials: The supporting data for this study is accessible at the following link:

Competing Interests: The authors declares no competing interests.

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