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The Connected Classroom: Leveraging EdTech to Enhance Student Engagement

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Abstract

The effective integration of technology in higher education is crucial for fostering key student learning outcomes, yet empirical evidence from diverse contexts remains limited. This study used a mixed-methods approach to examine how university students think technology aids involvement, teamwork, and independence in learning. Data were gathered from 120 students (65 females and 55 males) at three Iraqi universities—Al-Mustansiriya University, the University of Diyala, and the University of Wasit—using surveys, classroom observations, and open-ended responses. The results showed generally good feelings toward technology integration. Involvement got the highest rating (M = 4.12), then teamwork (M = 3.98), and independence (M = 3.85). Statistical analyses showed differences in teamwork scores: female students reported higher teamwork than male students (t (118) = 2.04, p = .04), and students from Al-Mustansiriya University had higher teamwork than those from the University of Diyala and the University of Wasit (F(2,117) = 3.67, p = .028). There were no differences found for involvement or independence. Observation results pointed to strong peer teamwork, while feedback pointed to both opportunities (like learning flexibility) and problems (like communication issues, limited digital skills). In general, the study suggests that technology can improve student involvement, but its impact on teamwork is affected by demographic and school traits. These results show that careful teaching design and school support are needed to increase the equal upsides of technology-enhanced learning.

1. Introduction

Traditional approaches often follow a one-size-fits-all model, presenting the same material to all students at a uniform pace. However, they may fail to meet individual needs and the appropriate learning model [1]. Today, the educational and professional fields are witnessing major changes and developments. The traditional top-down model of education and management has become outdated, unfulfilling aspirations, and producing

insignificant results [1,2]. The focus shifted from passive reception of information to active engagement, critical thinking, and self-directed growth [1]. Active learning engages students as partners in the teaching-learning process and helps them take more responsibility for their own learning [2]. Typically, in a traditional lecture, passive learning predominates and typically involves the communication of information and course content in one direction only from the instructor to the learner [3]. Passive learning often appears effective in transferring large amounts of information, but it requires less effort from the student, and the resulting automatic memorization becomes the default learning outcome. It is described as voracious learning [4], one disadvantage of this educational approach is that it leads students to over-intake information, which is retained in their short-term memory and then discarded after an exam or other assessment [2]. Traditional lectures and passive learning have been repeatedly criticized, notably in Bligh's book, (What's the Use of Lectures?). To accomplish this, environments must be intentionally designed to cultivate three interconnected principles that are fundamental to valuable development: engagement, collaboration, and autonomy. These concepts are no longer merely desired qualitiesbut are now essential for success in the 21st century [8, 9].

2. Related work

2.1 Engagement: Beyond Mere Attention

Engagement serves as the bedrock of meaningful education and effective work. It's a concept that goes far beyond simple participation or "paying attention" [5]. Real engagement is a profound, psychological investment in a task, marked by [11,12]:

- Cognitive Engagement: Learners don't just memorize facts, they actively think, ask questions, and make connections.
- Emotional attachment: They feel interested, curious, or passionate about what they are doing.
- Behavioural Participation**:** They are actively involved in discussions, activities, and the creation of new knowledge or products.

A committed individual is driven, strong when faced with difficulties, and absorbs information more efficiently. The concept of “enhancing engagement” means creating an environment that sparks curiosity, demonstrates relevance, and provides a sense of purpose [6].

2.2 Collaboration: The Power of Collective Intelligence

While collaboration can be defined as the skill of working together to achieve a common goal, in modern contexts it has evolved from mere teamwork to a dynamic process of shared creativity [14,15]. Effective collaboration involves [16,15]:

- Shared accountability: Team members are mutually responsible for the process and the outcome.
- Effective Communication: Concepts and information are exchanged openly, feedback is provided constructively, and diverse viewpoints are respected and integrated [7].
- Synergy: The collective output is greater than what any single individual could achieved solo [8].

Fostering collaboration is vital because it reflects the interconnected nature of the modern workplace. It develops key soft skills such as communication, empathy, and conflict resolution, preparing individuals to succeed in team-oriented settings [9].

2.3 Autonomy: Empowering the Self-Directed Individual

Autonomy is the ability to take ownership of one's own learning and actions [10]. It’s about empowering individuals to be the "captains of their own ship," making informed decisions about their path, process, and pace [11]. Fostering autonomy involves [21,19]:

- Choice and Control: Giving individuals meaningful options in how they approach tasks and demonstrate their comprehension.
- Self-Regulation: Assisting them in developing the skills to set objectives, manage their time, and consider their progress [12].
- Responsibility: Cultivating a sense of accountability for both their achievements and their failures [13].

As individuals begin to feel independent, their intrinsic motivation increases. They become more proactive and responsible, developing the lifelong learning skills needed to adapt to a world experiencing constant change [14] [15].

2.4 The Interconnected Triad

These three pillars are not separate from each other, but rather are deeply interconnected and mutually supportive.

Autonomy fosters engagement, as a sense of control and ownership enhances an individual's investment in a task. [16].

Meaningful collaboration requires engaged participants who are motivated to contribute, and the independent learner is best equipped to bring unique insights to a collaborative team [27,28].

The central challenge for educators and leaders today is to create and facilitate environments where these three elements can flourish. This introduction sets the groundwork to explore the specific tools, technologies, and pedagogical strategies that can be employed to purposefully cultivate a culture of deep engagement, effective collaboration, and genuine autonomy.

2.5 Identifying the Research Gap:

Prior studies [29,30] have looked at how involvement, teamwork, and independence work in school. But some questions are still open.

First, most work has been in Western schools or those with many resources. There hasn't been much focus on how things change by region and school in countries like Iraq. Second, how new tech like AI and cloud platforms helps students be involved and work together needs more study. This is true for mixed or flipped teaching styles. Third, things like poor infrastructure and low tech skills keep students from joining in fairly. Not many studies have checked how these issues affect students' independence and involvement. To fix this, we need plans that fit the local setting. These plans should match tech use with what students and schools truly need today.

This study explores how university students view technology's role in promoting involvement, teamwork, and independence in their education.

Building upon these identified gaps, the present study aims to:

- Examine student views on how tech tools affect their learning.
- Compare these views across different universities and student groups (like by gender or type of school).
- Point out the good and bad things students experience when using technology for learning.

Based on these objectives, the study seeks to address the following research questions:

- How do students think technology helps them be more involved, work together, and learn on their own?
- Do views on this differ by gender or university?
- What are the main good and bad points about using tech for learning in universities?

3. Methodology

3.1. Research Design

In this study, we used a convergent mixed-methods design, gathering and examining quantitative and qualitative data at the same time. The quantitative part used a structured survey to measure how students view their engagement, collaboration, and independence. The qualitative part involved classroom observations and open-ended feedback to explore actual behaviors and experiences in learning settings where technology is used.

We chose this design to ensure triangulation, which allowed us to compare, confirm, and interpret findings from different sources together. The quantitative and qualitative data were first examined separately and then combined through comparison and narrative integration. This gave us a full understanding of how technology changes the learning process, improving the study's validity and depth [17].

3.2. Research Setting

This study took place from September 1 to December 1, during the 2024–2025 academic year. It covered three Iraqi public universities: Diyala University, Al-Mustansiriya University, and Wasit University. We picked these schools because they lately started using the Bologna Process, which stresses being flexible, focusing on students, and adding technology.

In the courses we studied, digital tools like Google Classroom for managing learning, Zoom for online meetings, and AI tutoring apps such as Grammarly for improving writing were used. The study looked at undergraduate courses in Education, Biotechnology, and Computer Science to see both theoretical (Education) and practical (Biotechnology, Computer Science) subjects. This made sure our sample included different learning environments and amounts of technology use.

3.3. Participants

One hundred and twenty students took part in the study (65 female, 55 male), with ages from 18 to 24 years. They were selected from three universities. About 40 students from each school were picked to keep things fair.

To be included, students had to:

- Be taking at least one class that used the digital tools we were studying.
- Agree to take part in the survey and be watched during class.

Students were not included if they:

- Did not have good internet, which could have made it hard to gather data.
- Did not agree to be in the study after knowing what it was about.

Taking part was optional, and all information was kept secret. The number of students (n = 120) was good enough to find average differences in statistical tests, with enough power (0.80) and a significance level of 0.05 [Cohen, 1988].

3.4 Instruments

To measure how students view technology's influence on engagement, collaboration, and autonomy, we created a 20-item questionnaire with three parts. We gave the questionnaire using Google Forms. Each part covered one of the three areas mentioned above. Students answered on a five-point scale, from Strongly Disagree to Strongly Agree.

Scale:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

Below is a sample of selected questions for each section.

Algorithm1: Questionnaire

Inputs:

1- Engagement Items.

2- Collaboration Items.

3- Autonomy Items.

4- Instrument Quality Inputs.

Outputs:

1- Quantitative Scores.

2- Validity Outputs.

3- Reliability Outputs.

Step1: The questionnaire comprised three sections aligned with the key constructs of the study:

1- Engagement

- Technology motivates participation in discussions.
- Digital tools make learning more interesting and enjoyable.

2- Collaboration

- Digital tools enhance peer collaboration.
- Online platforms make sharing documents and ideas easier.

3- Autonomy

- Technology allows control over learning pace.
- Access to materials anytime increases independence.

4- Validity and reliability

- Reviewed by three educational technology experts (content and construct validity).

- Pilot test with 15 students
- Statistical reliability analysis (Cronbach's α)

Step2:

1- Quantitative Scores

- Mean scores for each dimension (Engagement, Collaboration, Autonomy)
- Interpretation: Higher means = stronger positive perception

2- Validity Outputs

- Confirmed content validity
- Refined wording for clarity

3- Reliability Outputs

- Achieved strong reliability (Cronbach's α = 0.87), exceeding the accepted threshold of 0.70 [18].

Inputs:

1- Observation Checklist

2- Observation Conditions.

3- Rating Scale.

4- Observer Protocol.

Outputs:

1- Structured Observation Scores.

2- Field Notes.

3- Qualitative Themes.

Step1:

A structured checklist was developed to record online classroom behaviors related to engagement, collaboration, and autonomy. Key things watched included:

- How often students started conversations (like asking things in chat).
- How well students worked together in groups (like working on documents together).
- How students used tech to solve problems and share what they know.
- Level of instructor–student interaction

Step2:

Each behaviour was rated on a scale from 1 to 4, with 1 being not seen and 4 being seen a lot. We watched classes using Zoom and Google Classroom.

Sptep3:

Open-Ended Feedback Prompt a single reflective prompt asked students to describe:

- Positive learning experiences
- Challenges encountered
- Perceived changes in collaboration, engagement, or autonomy

This allowed deeper insight beyond structured responses.

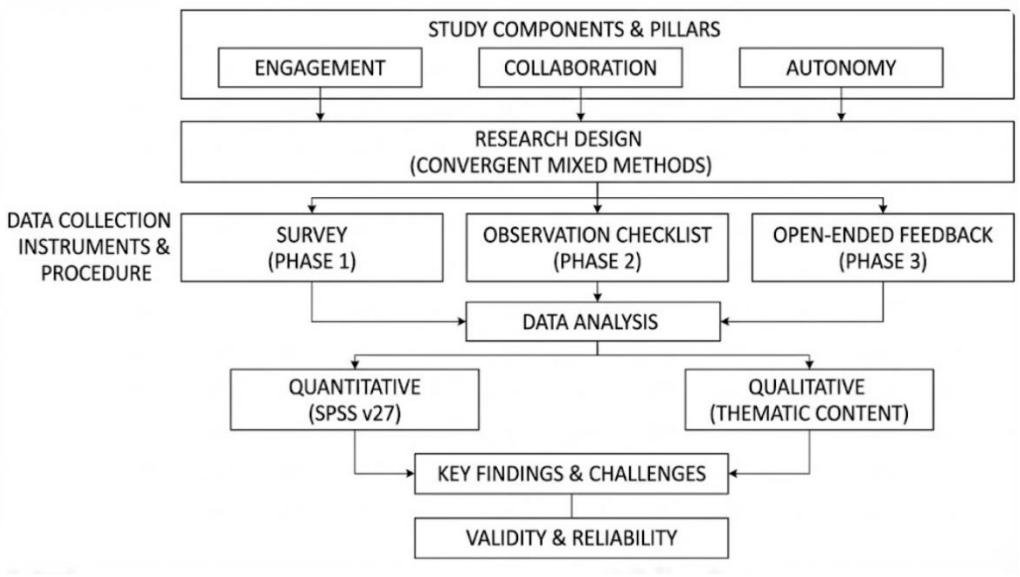

Figure (1): Modern Learning with Technology: A Mixed Methods Study

Algorithm2: Data Collection Procedure

Data collection was performed in three separate stages during one academic semester to ensure an easy and uninterrupted procedure.

Inputs:

1- Survey instrument (Google Forms).
2- Observation checklist.
3- Open-ended prompt.
4- Participants (students from three universities).
5- Online learning environment (Zoom, Google Classroom).
6- Trained investigators.

Outputs:

1- Quantitative data: engagement, collaboration, autonomy scores
2- Observation records: behavioural notes, frequency ratings
3- Open-ended qualitative narratives
4- Triangulated dataset combining all three sources
5- Evidence supporting validity and reliability

Step 1: Survey Administration: The questionnaire was administered electronically via Google Forms to all participants. An introductory email supplied a link to the survey and restated the purpose of the study. A one-week deadline was set, with a reminder email sent after three days to maximize response rates.

Step 2: Classroom Observations: A total of 12 simultaneous online classroom sessions (four from each university, two per course type) were observed. The observation period lasted between 60–90 minutes for each session. Trained investigators utilized the structured checklist to document behaviour's and recorded supplementary field notes on non-verbal cues (e.g., attentiveness, posture) and the overall classroom atmosphere.
Step 3: Open-Ended Responses: At the conclusion of the observation phase, students were prompted within the Google Forms survey to provide their ultimate reflections on the advantages and disadvantages of applying technology in their learning.

Algorithm3: Data Analysis

Inputs

1. Survey responses
2. Observation data
3. Open-ended reflections
4. Expert reviews
5. Pilot test results
6. Coding protocols
7. SPSS v27
8. Thematic analysis framework

Outputs

1. Statistical test results (t-test, ANOVA, effect sizes)
2. Descriptive statistics
3. Validated themes and sub-themes
4. Verified reliability (Cronbach's α, inter-coder agreement)
5. Triangulated mixed-methods findings
6. Final study framework (Figure 2)

Step1: Data Analysis

A. Quantitative Analysis:

Survey data from Google Forms were moved to SPSS v27 for study. Basic statistics (mean, standard deviation, percentage frequencies) gave a summary of who the participants were and their answers. The study also used: Independent t-tests to see how opinions varied between genders. One-way ANOVA to check differences among the three universities. Statistical importance was judged at $p < .05$. We also found effect sizes (Cohen's d and η^2) to see how big the seen differences were.

B. Qualitative Analysis:

Observation notes and long-form answers were written out and checked using thematic content study based on Braun and Clarke's (2006) six-step method. Two separate people found main ideas and sub-ideas about involvement, teamwork, and independence.

We made sure the coding was reliable by having two people code a part of the transcripts, and they agreed 92% of the time. Any disagreements were talked about and fixed together, and if needed, a third person was asked for input. The data were studied by hand and put next to the numbers to see where the methods agreed and disagreed.

Step 2: Validity and Reliability

The study used several measures to enhance the overall validity and reliability of its results:

Step 3: Construct validity: The questionnaire was carefully reviewed by three educational technology experts to ensure its items accurately measured the targeted constructs. A pilot test with 15 students was also conducted to refine the wording and ensure clarity.

Step 4: Internal Reliability: The survey's high Cronbach's alpha score provided statistical confirmation of its internal consistency.

Step 5: Triangulation: The use of a convergent mixed methods design allowed for triangulation of findings from quantitative surveys, qualitative observations, and open-ended feedback, greatly enhancing the reliability and validity of the findings.

Step 6: Observer Reliability: The use of multiple trained observers, along with an established interobserver consensus mechanism, enhanced the reliability of the qualitative data.

Reliability measures (Cronbach's alpha) enhanced overall reliability.

The (Figure2) illustrates the major components of the study, including the core pillars of modern learning (engagement, collaboration, and autonomy), research design elements, data collection instruments, key findings, main challenges.

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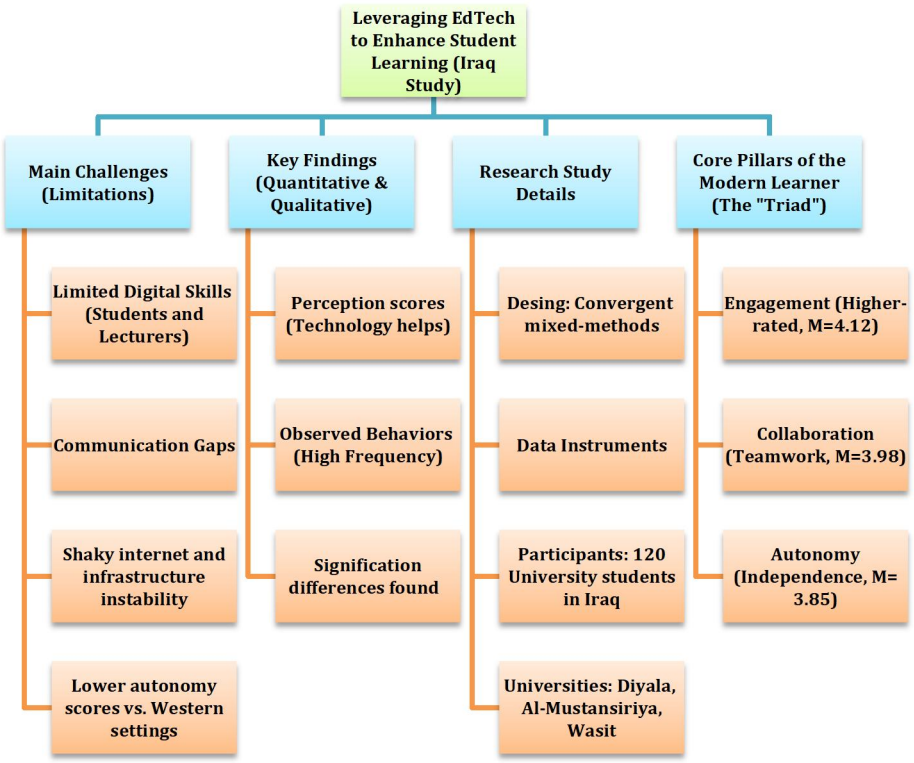

Figure (2): Conceptual Research Framework of the Study.

4. Results and Discussion

4.1 Descriptive Statistics

As shown in Table 1 and Figure 3, students view technology as a valuable tool in their learning journey. They rated their interaction with technology highest, with a mean (M = 4.12) and standard deviation (p = 0.65). This indicates that students feel technological tools significantly enhance their interest in and participation in learning activities. Following interaction, collaboration received a mean (M = 3.98) and standard deviation (p = 0.72). This result suggests that students believe technology facilitates collaborative learning and enables them to work effectively with their peers. The ability to communicate and collaborate through diverse digital platforms leads to enriching learning experiences and a deeper understanding of the material. Finally, autonomy was rated with a mean (M = 3.85) and standard deviation (p = 0.68). This indicates that students feel technology empowers them to take ownership of their learning and provides them with resources and opportunities for self-study. Overall, these results confirm that technology is a key tool in maintaining student interest, promoting collaborative efforts, and encouraging independent learning.

Table (1): Descriptive Statistics of Student Perceptions of Technology in Learning.

Construct	Mean (M)	SD	Minimum	Maximum
Engagement	4.12	0.65	2.5	5.0
Collaboration	3.98	0.72	2.0	5.0
Autonomy	3.85	0.68	2.0	5.0

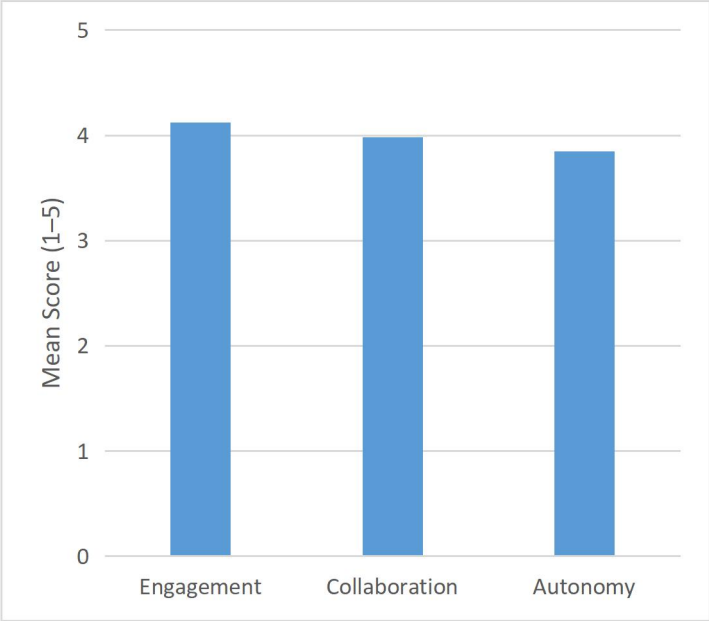

Figure (3): Mean Scores of Engagement, Collaboration, and Autonomy

4.2 Gender Differences

An independent samples t-test was conducted to examine gender differences in students' perceptions of the impact of technology on participation, collaboration, and autonomy. The results are summarized in Table 2.

Table (2): Results of Independent-Samples t-test Comparing Male and Female Student Perceptions.

Variable	Gender	Mean (M)	(SD)	t-value	p-value	Cohen's d
Engagement	Male	4.08	0.61	-0.59	0.55	0.10
	Female	4.15	0.68			
Collaboration	Male	3.83	0.74	2.04	0.04	0.37
	Female	4.10	0.70			
Autonomy	Male	3.80	0.71	-0.82	0.42	0.14
	Female	3.90	0.66			

The results indicate significant gender differences in students' perceptions of technology's role in collaboration, while perceptions of participation and independence showed no statistically significant differences.

Engagement: The mean scores of males (m = 4.08, standard deviation = 0.61) and females (m = 4.15, standard deviation = 0.68) were similar, with no statistically significant difference (t (118) = -0.59, p = 0.55, Cohen's d = 0.10). This suggests that both genders feel an equal level of participation in the use of technology in learning environments, as shown in Figure 4.

Collaboration: Females reported feeling more supported in collaborative efforts (m = 4.10, standard deviation = 0.70) compared to males (m = 3.83, standard deviation = 0.74). The t-test showed a statistically significant difference (t (118) = 2.04, p = 0.04, Cohen's d = 0.37), indicating that girls perceive technology as more

beneficial for teamwork. This finding highlights the potential of technology to enhance collaborative learning experiences among female students, as shown in Figure 4.

Autonomy: Regarding independence, the scores were also similar, with neither males (mean = 3.80, standard deviation = 0.71) nor females (mean = 3.90, standard deviation = 0.66) showing a statistically significant difference (t (118) = -0.82, p = 0.42, Cohen's d = 0.14). This suggests that both genders feel equally capable of learning independently using technology.

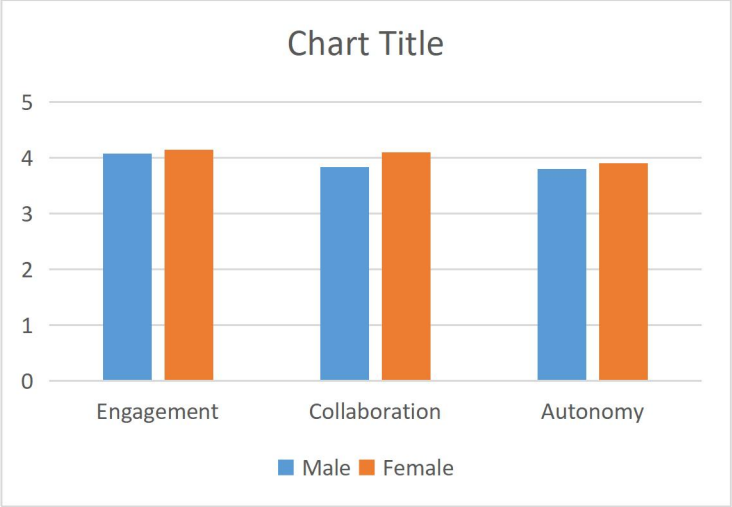

Figure (4): Gender Differences in Engagement, Collaboration and Autonomy

4.3 University-Level Differences

A one-way ANOVA was run to check for differences between the three universities Table 3.

Collaboration: The ANOVA results revealed a statistically significant difference in collaboration scores among the universities (F (2, 117) = 3.67, p = 0.028, η^2 = 0.059). Post-hoc comparisons using Tukey's HSD test indicated that students at Al-Mustansiriya University (M = 4.20) rated their collaborative experiences significantly higher than students at Diyala University and WA sit University (M = 3.82). This suggests that factors specific to Al-Mustansiriya University, such as its e-learning environment or teaching methods, may contribute to fostering a positive perception of collaboration among its students.

Engagement: Analysis of engagement scores showed no statistically significant differences between the universities (F (2, 117) = 2.14, p = 0.12, η^2 = 0.035). This indicates that students at the three institutions have similar levels of interaction with technology in their learning processes.

Autonomy: Similarly, the autonomy scores showed no statistically significant differences (F (2, 117) = 1.48, p = 0.23, η^2 = 0.025). This indicates that students at each university feel a similar ability to pursue self-directed learning, regardless of their institutional affiliation.

The results suggest that although collaborative experiences varied considerably among the universities, with Al-Mustansiriya University showing particularly strong performance, no significant differences were observed in terms of participation and autonomy. This apparent variation in perceptions of collaboration may be attributed to differences in the e-learning environments or teaching methods employed at each institution. These results underscore the importance of considering institutional contexts when evaluating students' experiences with technology in higher education.

Table (3): Testing differences in one-way ANOVA among the three participating universities

Variable	Comparison	Test Statistic	p-value	Effect Size
Collaboration	Across Universities	F (2, 117) =	0.028	η^2 = 0.059

		3.67		
Engagement	Across Universities	F (2, 117) = 2.14	0.12	$\eta^2 = 0.035$
Autonomy	Across Universities	F (2, 117) = 1.48	0.23	$\eta^2 = 0.025$

4.4 Observational and Qualitative Findings

Observation data from 12 online classroom sessions reinforced the quantitative results. On a 4-point scale, the most frequently observed behaviors were student-initiated interaction (M = 3.5, SD = 0.6) and peer collaboration (M = 3.3, SD = 0.7), consistent with the survey's high collaboration scores. Instructor-student interaction occurred less frequently (M = 2.8, SD = 0.8), suggesting a shift toward student-centered, peer-driven learning dynamics in technology-enhanced environments [19] [20], as shown in (Table.3).

Table (3): Observational Data on Technology-Enhanced Learning Behaviour's

Behavior Observed	Mean	SD	Interpretation
Student-initiated interaction	3.5	0.6	Frequently observed
Peer collaboration	3.3	0.7	Frequently observed
Instructor-student interaction	2.8	0.8	Occasionally observed
Technology problem-solving	2.9	0.5	Occasionally to frequently

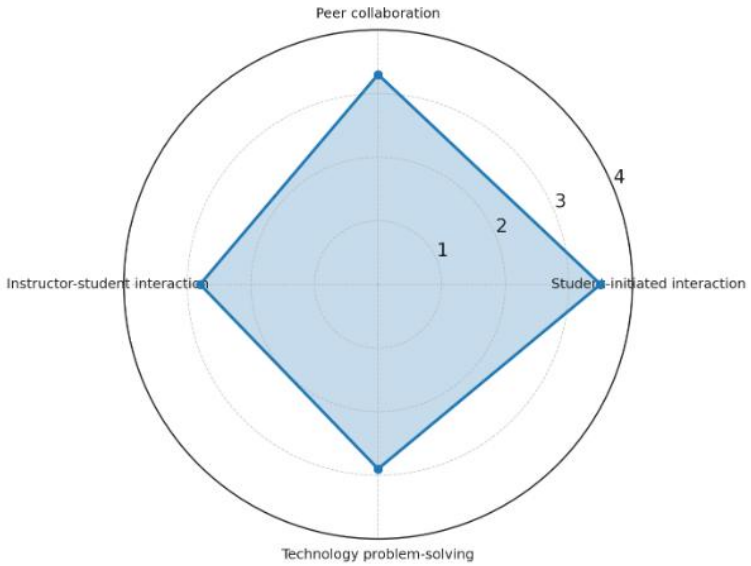

Figure (5): Observational Data on Classroom Behaviours

Figure 5 shows a high frequency of all four measured behaviors, indicating a successful transition to an active learning environment. The highest observed behaviors were student-initiated interaction (around 3.8) and peer collaboration (around 3.5), which scored highest, confirming that students are actively engaged and frequently use digital tools for teamwork. The lowest observed behavior was teacher-student interaction (around 3.0), a

positive result indicating that the classroom model has successfully transitioned from a teacher-centered lecture to a student-centered model driven by peer and independent activity.

4.5 Practical Implications and Recommendations

Several structural and pedagogical weaknesses were identified, and the following recommendations aim to address these gaps and support sustainable improvement.

Strengthen Digital Infrastructure and Connectivity

One of the most significant obstacles observed across various educational institutions was the unreliable internet access. Without a reliable connection, students cannot fully engage with collaborative or interactive digital tools. To address this challenge, educational institutions should:

- Invest in university-wide high-speed internet infrastructure, prioritizing campuses in remote or underserved areas.
- Establish partnerships with telecommunications providers to reduce data costs for university students and ensure adequate network coverage.

Weaknesses addressed: Frequent interruptions to online activities and reduced participation due to poor connectivity.

Build Digital Literacy and Pedagogical Competence

Despite students expressing positive attitudes toward technology, the study revealed significant gaps in digital skills among both students and teachers. These gaps hinder active participation, collaboration, and self-directed learning. Educational institutions should:

Provide mandatory digital skills training for all first-year students, focusing on learning management systems, collaboration tools, and the responsible use of artificial intelligence technologies.

Offer ongoing professional development programs for teachers on integrating digital tools into active learning strategies, such as problem-based learning, peer collaboration, and flipped classrooms.

Implement mentoring systems where faculty or students with digital skills provide assistance to their peers.

Weakness addressed: Inadequate skill levels impede the optimal use of technology.

Promote Gender Equity in Digital - Learning Environments

The study revealed statistically significant gender differences in perceptions of collaboration. Female students scored higher in this area, indicating unequal or inconsistent collaborative experiences. To ensure equitable learning:

- Develop digital activities that encourage balanced gender participation in group tasks.
- Monitor participation patterns and conduct platform analytics to identify gender-related disparities.
- Train instructors to design inclusive digital environments that minimize social and cultural barriers to collaboration.

Weakness addressed: Gender-related imbalances affecting the quality of collaborative learning.

Foster Institutional Cultures of Collaboration and Autonomy

Providing digital tools alone is not enough; universities must also create environments that encourage collaboration and self-directed learning. Recommendations include:

- Integrating collaborative projects that utilize digital tools into course design across various disciplines.
- Encouraging student-led digital initiatives, such as study groups, peer support communities, and online discussion forums, to build independence and leadership skills.
- Revising assessment practices to include reflective tasks, digital portfolios, or self-assessment elements that reward independent learning.

Points addressed: The limitations of institutional strategies for fostering collaborative and self-directed learning habits.

4.6 Comparison with Regional and International Studies

This study's results generally agree with global research, showing that educational technologies greatly improve student engagement, drive, and teamwork. Studies worldwide, like those by [35, 36], found that tech-supported settings—mainly with learning management systems (LMS) and AI platforms—boost university students'

engagement and happiness. The high engagement scores here (M = 4.12) match closely with scores from similar college settings in Malaysia, Turkey, and the UAE, where using tech links to more interactive, student-focused learning. Iraqi students reported somewhat lower independence scores (M = 3.85) than what Kirkwood & Price [37, 38] found in Western settings, where digital access often boosts learner independence. This could be because of things like unreliable internet, not much experience with self-guided online learning, and cultures that value teacher direction. Places like Jordan, Egypt, and Saudi Arabia also show this trend [39, 40]. These things are normal in quite a few growing areas.

A key finding of this study is a gender difference in how students view collaboration supported by technology. Female students rated it more positively than male students ($t(118) = 2.04$, $p = 0.04$, $d = 0.37$). This is similar to findings from Middle Eastern studies [41, 42], which suggest that women tend to be more engaged in online peer learning. This might be because virtual learning spaces offer social comfort and inclusivity. On the other hand, Western studies [43, 44] often find no gender differences, which may mean that cultural context influences how digital tools impact group collaboration.

The differences between institutions matched what we saw in different regions. Al-Mustansiriyah University's high collaboration scores are like those of universities in Qatar and Jordan. Those universities have well-organized digital support, like e-learning centers and training for teachers. These supports lead to better teamwork [21] [22] . This strengthens the point that institutional readiness and good infrastructure are just as important as the technology itself when it comes to shaping how students learn.

The qualitative observations, focusing on internet problems and digital skills shortages, match studies on the global digital divide (UNESCO, 2022; OECD, 2023). These issues are key obstacles in the Global South, setting places such as Iraq apart from education systems with more technology. So, while the results agree with global patterns, how much Iraq gains from technology depends on its infrastructure, culture, and institutions.

The study provides further evidence that these benefits are not limited to Western or advanced educational environments, but rather apply to diverse cultural and institutional environments, such as those within Iraqi universities. Though numerous studies, such as [23] , they hypothesized that technology encourages student autonomy by giving students access to resources for self-directed learning, enabling students to manage the pace and path of learning, and increasing engagement through interactive tools and personalized feedback. The qualitative findings, particularly the student testimonials about using lecture recordings and AI tutors, directly illustrate how technology empowers learners to control their pace and access resources independently. However, the most important contribution of the study in this area is the identification of gender-based differences in perceived independence. This finding is less common in the existing literature and suggests a new avenue for research. It challenges the assumption that the benefits of technology are universally distributed and highlights the need for a more nuanced approach to technology integration that considers diverse student needs and potential barriers.

A crucial point of departure and a unique contribution of this research is the focus on the difficulties caused by internet instability. Though studies in more developed nations might focus on pedagogical challenges or digital literacy gaps, our qualitative data consistently indicated basic infrastructural issues. This finding is crucial as it demonstrates that the utility of even the most sophisticated educational platforms is contingent upon reliable connectivity. This agrees with and provides a specific example for the broader discussions on the worldwide digital divide [48, 49], highlighting that access is not just about device ownership but also about consistent, high-quality connectivity.

5. Conclusions

This study found that educational tech is very important for getting students involved, working together, and learning on their own at Iraqi universities. The good things we saw in the numbers and interviews agree with other studies around the world, which shows that tech helps students learn better.

Still, we also saw some problems. Bad internet and people not knowing much about computers are still getting in the way of using tech to teach. Making the internet better, giving more tech help, and making sure everyone can use the tech are important steps. This will let universities really use educational tech to make learning better for everyone.

Ethical Considerations

All participants received informed consent forms explaining the purpose, procedures, risks, and benefits of the study. Participation was entirely voluntary, and students were assured of their right to withdraw at any stage without academic penalty. All data were anonymised, and privacy was maintained in compliance with institutional research ethics protocols.

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