



Students' Perceptions of Technology Integration in Learning and Its Impact on Learning Quality in Higher Education

Persepsi Mahasiswa terhadap Integrasi Teknologi dalam Pembelajaran dan Dampaknya terhadap Kualitas Pembelajaran di Pendidikan Tinggi

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ABSTRACT

Purpose: This study aims to analyze students' perceptions of technology integration in higher education and examine how digital learning practices contribute to learning quality. The study is driven by the increasing adoption of educational technologies in higher education, which requires a deeper understanding of students' experiences with technology-enhanced instruction.

Methods: This study employed a qualitative-dominant mixed-method approach. Data were collected through semi-structured interviews with three selected informants, classroom observations, and a supporting questionnaire administered to 55 students selected through purposive sampling. Qualitative data were analyzed using thematic analysis, while quantitative data were analyzed descriptively to identify patterns and trends in students' perceptions.

Results: The findings show that students generally perceive technology integration positively because it improves learning flexibility, accessibility, participation, and independent learning. Interactive digital platforms increased engagement and supported more effective learning through accessible and revisitable materials. However, challenges related to unequal digital access and variations in lecturers' technological competence were still identified.

Conclusion: This study concludes that technology integration contributes to learning quality by enhancing participation, learning effectiveness, and learner autonomy. Its successful implementation, however, depends on adequate infrastructure, lecturers' digital competence, and alignment between technology use and pedagogical practices.

ABSTRAK

Tujuan: Penelitian ini bertujuan untuk menganalisis persepsi mahasiswa terhadap integrasi teknologi dalam pembelajaran serta kontribusinya terhadap kualitas pembelajaran. Penelitian ini dilatarbelakangi oleh meningkatnya penggunaan teknologi digital dalam proses pembelajaran yang menuntut pemahaman yang lebih mendalam tentang bagaimana mahasiswa mengalami dan merespons pembelajaran berbasis teknologi.

Metode: Penelitian ini menggunakan pendekatan mixed-method dengan dominasi kualitatif. Data dikumpulkan melalui wawancara semi-terstruktur terhadap tiga informan, observasi pembelajaran, serta kuesioner pendukung yang melibatkan 55 mahasiswa yang dipilih melalui teknik purposive sampling. Data kualitatif dianalisis menggunakan analisis tematik, sedangkan data kuantitatif dianalisis secara deskriptif untuk mengidentifikasi kecenderungan umum persepsi mahasiswa.

Hasil: Hasil penelitian menunjukkan bahwa mahasiswa memiliki persepsi positif terhadap integrasi teknologi, terutama dalam hal fleksibilitas, aksesibilitas, dan keterlibatan dalam pembelajaran. Teknologi meningkatkan partisipasi belajar melalui platform digital interaktif, meningkatkan efektivitas pembelajaran dengan menyediakan konten multimodal yang dapat diakses kembali, serta mendorong pembelajaran mandiri melalui praktik belajar yang lebih otonom. Namun demikian, ditemukan pula kendala seperti keterbatasan akses terhadap perangkat dan internet, serta variasi kompetensi digital dosen.

Kesimpulan: Penelitian ini menyimpulkan bahwa integrasi teknologi berkontribusi terhadap kualitas pembelajaran melalui keterkaitan antara partisipasi, efektivitas, dan kemandirian belajar, dengan catatan bahwa implementasinya perlu didukung oleh infrastruktur yang memadai serta keselarasan dengan praktik pedagogis dan kebutuhan mahasiswa.

INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed the landscape of higher education, reshaping the ways knowledge is delivered, accessed, and constructed. In contemporary learning environments, technology is no longer viewed merely as a supplementary tool but has become an integral component of pedagogical design. The integration of digital platforms, such as Learning Management Systems (LMS), interactive multimedia, and online collaboration tools, has facilitated more flexible, personalized, and student-centered learning experiences. These developments reflect a broader transition toward technology-enhanced learning (TEL), which seeks to improve both the efficiency and effectiveness

of educational processes (Alyoussef & Omer, 2023).

Recent empirical studies suggest that students increasingly expect learning environments to incorporate interactive and technology-driven approaches. Research in higher education contexts indicates that students tend to appreciate immersive, flexible, and digitally supported learning experiences that correspond with their everyday engagement with technology (Lewohl, 2023). Likewise, the growing implementation of blended and HyFlex learning models demonstrates that technological competence and positive perceptions of digital learning play an important role in influencing students'

engagement and self-regulated learning behaviors (Amiruddin et al., 2024).

Beyond engagement, technology integration has been shown to play a critical role in enhancing broader dimensions of learning quality. Studies reveal that digital learning environments can foster collaborative skills, improve access to learning resources, and support the development of independent learning competencies (Mena-Guacas et al., 2024). Furthermore, empirical evidence suggests that students' perceived usefulness, institutional support, and resource availability are key determinants of successful technology adoption and its impact on learning outcomes (Alyoussef & Omer, 2023).

However, despite the promising potential of technology integration, its implementation remains uneven and context-dependent. Challenges such as digital inequality, limited infrastructure, and varying levels of digital literacy among both students and lecturers continue to hinder optimal utilization. In developing contexts, these issues are particularly pronounced, creating disparities in access and learning opportunities. Moreover, emerging technologies such as artificial intelligence and immersive learning environments introduce new complexities, including concerns about ethical use, reliability, and the potential impact on critical thinking skills (Grájeda et al., 2024).

A critical yet often underexplored dimension in this discourse is students' perception. From a constructivist perspective, learning is not solely determined by instructional design but also by how learners interpret and engage with the learning environment. Students' perceptions of technology whether positive or negative significantly influence their motivation, participation, and overall learning outcomes. Empirical studies consistently highlight that students who perceive technology as useful and accessible are more likely to engage actively and achieve better academic performance (Nag & Roul, 2023). Likewise, research in Southeast Asian contexts confirms that students' perceptions of e-learning effectiveness are closely linked to engagement and learning satisfaction (Maujud et al., 2024).

Despite the growing body of literature, there remains a gap in understanding how

students in specific disciplinary contexts perceive the integration of technology and how these perceptions translate into measurable aspects of learning quality. In particular, limited research has focused on students in economic education programs, where both conceptual understanding and applied competencies are essential.

Therefore, this study aims to analyze students' perceptions of technology integration in learning and examine its impact on learning quality in higher education. Specifically, the study focuses on three key dimensions: student participation, effectiveness of content delivery, and independent learning. By adopting a qualitative-dominant mixed-method approach, this research seeks to provide a comprehensive and contextually grounded understanding of how technology integration is experienced by students and how it contributes to the enhancement of learning quality.

LITERATURE REVIEW

1. Technology Integration in Higher Education

Technology integration in higher education refers to the systematic incorporation of digital tools, platforms, and resources into teaching and learning processes to enhance educational outcomes. In recent years, higher education institutions have increasingly adopted digital technologies such as Learning Management Systems (LMS), virtual classrooms, and immersive learning environments to improve instructional delivery and accessibility.

Empirical evidence suggests that technology has become an essential component of modern education systems, significantly influencing student engagement and academic performance. Digital platforms facilitate interaction, reduce geographical barriers, and enable access to diverse learning resources, thereby enhancing the overall learning experience (Pandita & Kiran, 2023). Furthermore, emerging technologies such as virtual reality (VR) and augmented reality (AR) have been shown to increase students' motivation and academic achievement by creating immersive and interactive learning environments (Sviridova et al., 2023). In addition, the post-pandemic shift toward hybrid and flexible learning models (e.g., HyFlex

learning) has accelerated the adoption of technology in higher education. These models provide students with multiple modes of participation including face-to-face, synchronous, and asynchronous thus enhancing flexibility and inclusivity in learning (Amiruddin et al., 2024).

2. Students' Perceptions of Technology-Enhanced Learning

Students' perception is a critical factor in determining the success of technology integration. From a learner-centered perspective, perception reflects how students interpret, evaluate, and respond to the use of technology in learning environments.

Research indicates that students generally hold positive perceptions toward technology-enhanced learning when it supports interaction, accessibility, and flexibility. For example, a study on AI-enhanced learning environments found that students perceive digital tools as beneficial for improving engagement and facilitating communication in online courses (Sadegh-Zadeh et al., 2023). Similarly, studies on immersive and metaverse-based learning environments show that students perceive such technologies as innovative and engaging, although concerns about usability and effectiveness remain (Rojas et al., 2023).

Moreover, students' perceptions are closely linked to psychological and behavioral factors such as motivation, satisfaction, and self-regulation. According to the Community of Inquiry framework, positive perceptions of digital learning environments contribute significantly to learning satisfaction and emotional engagement (Xue, 2023). These findings highlight that students are not passive recipients of technology but active agents whose perceptions shape their engagement and learning outcomes.

3. Technology Integration and Learning Quality

Learning quality in higher education is commonly associated with students' engagement, comprehension, and ability to apply knowledge independently. Technology

integration plays a pivotal role in enhancing these dimensions.

Studies show that technology-enhanced learning environments improve **student participation**, as digital tools encourage interaction and collaboration. Engaged students are more likely to take ownership of their learning and achieve better academic outcomes (Pandita & Kiran, 2023).

In terms of **effectiveness**, digital platforms allow students to access learning materials anytime and revisit content as needed, thereby improving comprehension and retention. Blended learning approaches, which combine online and face-to-face instruction, have also been found to increase learning satisfaction and performance (Cheng et al., 2023).

Furthermore, technology supports the development of **independent learning skills**, enabling students to explore additional resources, manage their learning pace, and engage in self-regulated learning. This is particularly evident in flexible learning models where students have greater control over their learning processes (Amiruddin et al., 2024).

METHODS

This study employed a qualitative-dominant mixed-method approach to explore students' perceptions of technology integration in learning and its contribution to learning quality. The qualitative component served as the primary method, enabling an in-depth understanding of students' experiences, while the quantitative component was used to provide supporting descriptive insights. This design allows for a comprehensive and contextually grounded analysis by combining the depth of qualitative inquiry with the breadth of quantitative trends.

The research was conducted at the Economic Education Study Program, Faculty of Economics and Business, Universitas Negeri Makassar, Indonesia. This context was selected due to its active implementation of technology-enhanced learning, including the use of Learning Management Systems (LMS), interactive media, and online communication platforms. The program provides a relevant setting for examining how technology integration is experienced by students in higher education.

Participants were selected using purposive sampling, targeting students who had direct experience with technology-integrated learning environments. A total of three student informants participated in the in-depth interview process. These informants were chosen based on their ability to provide rich, relevant, and reflective insights into the use of digital technologies in learning.

To complement the qualitative data, a questionnaire was distributed to a broader group of students, resulting in 55 respondents out of an approximate population of 150 students. The inclusion of questionnaire data aimed to capture general trends in students' perceptions and to support the qualitative findings. Data collection continued until thematic saturation was achieved, where no new significant insights emerged from the interview data.

Data were collected through three main techniques:

1. In-depth Interviews

Semi-structured interviews were conducted to explore students' perceptions, experiences, and responses to technology integration in learning. This method allowed flexibility in probing deeper into participants' perspectives.

2. Observation

Observations were carried out to examine how technology was used in actual learning activities, including the use of LMS, digital media, and online communication platforms. This provided contextual understanding and supported data triangulation.

3. Questionnaire

A structured questionnaire was administered to gather supporting data on students' perceptions of technology use in learning. The questionnaire focused on aspects such as participation, learning effectiveness, and independent learning.

Data analysis followed a thematic analysis approach using an interactive model. The process consisted of three stages:

1. Data Reduction

Selecting and simplifying relevant data from interviews, observations, and questionnaire responses,

2. Data Display

Organizing data into meaningful categories and themes and

3. Conclusion Drawing and Verification

Interpreting patterns and validating findings through continuous comparison across data sources

To ensure the credibility and trustworthiness of the findings, this study employed method triangulation, combining data from interviews, observations, and questionnaires. Consistency across these data sources was examined to validate emerging themes. Additionally, careful attention was given to data interpretation to ensure that findings accurately represent participants' perspectives. Participants were informed about the purpose of the study and their voluntary involvement. Informed consent was obtained prior to data collection, and participants' identities were kept confidential to ensure privacy and ethical integrity throughout the research process.

RESULTS

1. Overview of Technology Integration in Learning

The findings indicate that technology integration has been widely implemented in the learning process within the Economic Education Study Program. Based on observations and interview data, digital technologies are utilized across multiple instructional activities, including content delivery, assignment submission, assessment, and communication.

Learning Management Systems (LMS), such as Google Classroom and Moodle, are commonly used to distribute learning materials, manage assignments, and provide feedback. In addition, synchronous communication platforms such as Zoom, Google Meet, and Microsoft Teams are employed to facilitate online discussions and presentations. Students also reported the use of interactive learning media, including video-based materials, online quizzes, and simulation tools, which support engagement with course content.

2. Students' Perceptions of Technology Integration

The results reveal that students generally hold positive perceptions toward the integration of technology in learning. Interview data indicate that students perceive technology as beneficial in making learning more flexible, accessible, and engaging. Participants emphasized that digital tools enable them to access materials at any time and from various locations, supporting continuity in learning.

This perception is further supported by questionnaire findings. Out of 55 respondents, 69.1% agreed that the use of technology enhances their understanding of course materials, while 27.3% expressed neutral views and 3.6% disagreed. These results suggest a dominant positive tendency in students' perceptions, although a small proportion of students still experience limitations.

3. Technology Integration and Learning Participation

Findings from interviews and observations show that technology integration is associated with increased student participation. Students reported being more actively involved in learning activities when digital platforms were used, particularly in online discussions, collaborative tasks, and assignment submissions.

Interactive features embedded in LMS and digital tools, such as discussion forums and quizzes, were identified as contributing factors to increased engagement. Observational data also indicate that students participate more frequently in virtual learning sessions compared to traditional lecture-based settings.

4. Technology Integration and Learning Effectiveness

The results indicate that technology integration contributes to improved learning effectiveness. Students highlighted that the availability of digital materials allows them to revisit content, which helps clarify complex concepts. Multimedia elements such as videos

and visual simulations were reported to enhance understanding by presenting information in more accessible formats.

Additionally, the flexibility provided by digital platforms enables students to learn at their own pace. This flexibility supports better comprehension and retention, particularly for students who require more time to process information.

5. Technology Integration and Independent Learning

Another key finding is the role of technology in supporting independent learning. Students reported that digital tools encourage them to explore additional resources beyond the materials provided by lecturers. This includes searching for online references, watching supplementary videos, and using educational platforms for self-study.

The use of technology also enables students to manage their own learning schedules, allowing for greater autonomy. These findings indicate that technology integration facilitates the development of self-directed learning behaviors among students.

6. Supporting and Inhibiting Factors

The findings identify several factors that influence the effectiveness of technology integration in learning as follows:

Supporting Factors:

- a. Availability of campus infrastructure, including internet access and digital platforms
- b. Students' familiarity with technology
- c. Lecturers' use of digital tools in instructional practices

Inhibiting Factors:

- a. Limited access to personal devices among some students
- b. Unstable internet connectivity
- c. Variations in lecturers' digital competence

- d. Challenges in delivering practical or skill-based courses through digital platforms

These factors indicate that while technology integration is generally perceived positively, its effectiveness is shaped by both institutional and individual conditions.

DISCUSSION

1. Students' Positive Perceptions of Technology Integration

The findings indicate that students generally perceive technology integration as beneficial, particularly in enhancing flexibility, accessibility, and engagement in learning. This positive perception reflects a broader shift in higher education, where digital tools are increasingly embedded in students' learning expectations and experiences. The high proportion of students who reported improved understanding (69.1%) suggests that technology is not only accepted but also valued as a meaningful component of the learning process.

This finding can be interpreted through the lens of the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use significantly influence users' attitudes toward technology (Al-Emran et al., 2023). In this study, students' favorable perceptions appear to be shaped by the practical benefits of digital tools, such as ease of access to materials and improved communication with lecturers and peers. Similar findings have been reported in recent studies, as Pandita and Kiran (2023) demonstrated that students' positive perceptions of digital learning environments are strongly associated with higher levels of engagement and satisfaction.

2. Technology Integration and Student Participation

The results show that technology integration enhances student participation, particularly through interactive platforms such as LMS, discussion forums, and synchronous communication tools. Students reported increased involvement in learning activities,

including discussions, collaborative work, and assignment completion.

From a constructivist perspective, this increased participation reflects the role of technology in facilitating active learning. Constructivist theory emphasizes that knowledge is constructed through interaction and engagement, and digital tools provide opportunities for students to actively participate in the learning process (Sviridova et al., 2023). The findings also align with previous research, as Amiruddin et al. (2024) demonstrated that technology-enhanced environments promote collaborative learning and increase student engagement by creating more dynamic and interactive learning spaces.

However, it is important to note that participation is influenced not only by the presence of technology but also by how it is implemented. The effectiveness of digital tools depends on the extent to which they are integrated into meaningful learning activities rather than used merely as supplementary tools.

3. Technology Integration and Learning Effectiveness

The findings further indicate that technology integration contributes to improved learning effectiveness, particularly in terms of understanding and retention of course materials. Students emphasized the importance of being able to revisit digital content, access multimedia resources, and learn at their own pace.

This result supports contemporary perspectives on digital learning, which highlight the role of technology in enhancing cognitive processing through multimodal content and flexible access (Cheng et al., 2023). The ability to repeatedly access learning materials allows students to reinforce their understanding, which is particularly beneficial for complex or abstract subjects.

Moreover, the findings suggest that learning effectiveness is closely linked to accessibility. Digital platforms reduce temporal and spatial constraints, enabling continuous learning beyond the classroom. This aligns with recent studies showing that flexible learning environments significantly improve students' academic performance and learning satisfaction (Pandita & Kiran, 2023).

4. Technology Integration and Independent Learning

Another significant finding is the role of technology in fostering independent learning. Students reported engaging in self-directed learning activities, such as searching for additional resources, reviewing materials independently, and managing their own learning schedules.

This finding can be interpreted through Self-Determination Theory (SDT), which emphasizes autonomy as a key factor in motivation and learning (Ryan & Deci, 2020). Technology-enhanced learning environments provide students with greater control over their learning processes, thereby promoting self-regulation and intrinsic motivation. Supporting this, recent research indicates that digital learning platforms can enhance students' autonomy and encourage lifelong learning behaviors (Alturki & Aldraiweesh, 2023).

The development of independent learning skills is particularly important in higher education, where students are expected to take greater responsibility for their learning. Technology serves as an enabling tool that supports this transition from teacher-centered to learner-centered approaches.

5. Interrelationship among Participation, Effectiveness, and Independent Learning

The findings suggest that participation, learning effectiveness, and independent learning are interconnected dimensions of learning quality. Students who actively participate in technology-enhanced learning environments tend to demonstrate better understanding of course materials, while those who engage in independent learning show stronger retention and deeper comprehension.

This interrelationship reflects a holistic view of learning quality, where cognitive, behavioral, and motivational dimensions are closely linked. Technology facilitates this integration by providing tools that support interaction, access to information, and self-directed learning simultaneously.

These findings reinforce the idea that technology integration should not be viewed in isolation but as part of a broader pedagogical ecosystem. Effective integration requires

alignment between technological tools, instructional strategies, and students' learning needs.

6. Supporting and Inhibiting Factors in Technology Integration

Despite the overall positive findings, the study also highlights several challenges that influence the effectiveness of technology integration. Issues such as limited access to devices, unstable internet connectivity, and variations in lecturers' digital competence remain significant barriers.

These findings are consistent with existing literature, which identifies the digital divide and unequal access to resources as major challenges in technology-enhanced learning (Sadeh-Zadeh et al., 2023). Additionally, the variation in lecturers' ability to use digital tools suggests the need for ongoing professional development to ensure effective implementation.

Furthermore, certain types of learning, particularly those requiring practical or hands-on activities, were found to be less compatible with fully digital approaches. This indicates that technology integration should be applied selectively and strategically, taking into account the nature of the subject matter.

CONCLUSION

This study demonstrates that the integration of technology in higher education is perceived by students as a meaningful driver of learning quality. Through a qualitative-dominant mixed-method approach, the findings reveal that digital tools enhance learning participation, improve the effectiveness of content delivery, and foster independent learning. Technology enables flexible access to learning resources, supports interactive engagement, and encourages students to take greater responsibility for their learning processes.

Importantly, the study highlights that the impact of technology is not determined solely by its availability, but by how it is experienced and utilized within the learning environment. Students' perceptions play a central role in shaping engagement and learning outcomes, indicating that successful technology integration requires alignment between technological tools, pedagogical practices, and

learner needs. While challenges such as unequal access and varying levels of digital competence persist, the findings underscore the potential of technology to transform learning when supported by appropriate infrastructure and instructional strategies.

This study is subject to several limitations. First, the qualitative data were based on interviews with only three student informants, which may not fully capture the diversity of student experiences. Second, the research was conducted within a single study program at Universitas Negeri Makassar, limiting the generalizability of the findings to other disciplines or institutional contexts. Third, the quantitative component relied on descriptive analysis and did not examine causal relationships among variables.

Overall, this study contributes to the growing body of literature by providing a contextually grounded understanding of students' experiences with technology integration, emphasizing that learning quality emerges from the dynamic interaction between engagement, effectiveness, and learner autonomy in digitally enriched environments. Future studies may involve larger and more diverse samples and employ inferential or longitudinal designs to provide deeper insights into the long-term effects of technology integration on student learning outcomes..

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