

## The Integration and Innovation of Information Technology in Revolutionary Educational Strategies in the Digital Era

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**Abstract:** *This study aims to explore the integration and innovation of information technology within educational strategies in the digital era, focusing on its impact on student engagement and the challenges encountered during implementation. A mixed-methods approach was employed, combining quantitative surveys and qualitative interviews. Quantitative data were collected from 35 students and 10 faculty members, while qualitative data were obtained through in-depth interviews with 15 students and 5 faculty members. The findings reveal that 80% of respondents use technology in their learning almost daily, and 79% believe that technology is highly effective in enhancing their understanding of the material. Additionally, 83% of respondents feel more engaged when utilizing technology. However, barriers such as limited internet access (45%) and inadequate devices (33%) remain significant challenges. The conclusion of this research emphasizes that, although the integration of technology in education offers numerous benefits, existing challenges must be addressed to maximize the potential of technology in improving educational quality. Recommendations for decision-makers include enhancing technological infrastructure and providing training for educators to optimize the use of technology in the learning process. This study is expected to provide insights for the development of more effective and innovative educational strategies in the digital era.*

**Keywords:** technology innovation, educational strategies, technology integration, education quality

### Introduction

In the continuously evolving digital era, the integration and innovation of information technology (IT) have become pivotal in the transformation of education. According to Ade Onny Siagian (2021), Indonesia's Minister of Education, Culture, Research, and Technology, Nadiem Makarim, indicated that preliminary evaluations regarding the country's readiness to face the challenges of the 5.0 industrial revolution suggest that Indonesia possesses high potential. As noted by Siti Fatimah et al. (2023), digital technology facilitates easy access to learning resources, promotes interactive learning, and enhances student engagement in the educational process. The 5.0 industrial era, characterized by the adoption of advanced technologies, has the potential to bring significant changes across various sectors, including education. The utilization of digital technology in learning has become a primary focus at all levels of education. Technology not only transforms the delivery of content but also influences teaching methods and the interactions between students and educators. Research conducted by Rahman et al. (2021) demonstrates that the use of technology in education can

enhance student engagement and facilitate more interactive learning experiences. By leveraging various digital tools, educators can create a more engaging and responsive learning environment that caters to students' needs. According to Dewi et al. (2021), the development of digital technology in education must be supported by all educational stakeholders, including the government, school leaders, teachers, and the community. Educational policies must be adhered to by school personnel, including both administrators and teachers. Once the necessary infrastructure is in place, the most critical factor becomes human resources, particularly the role of teachers, who are essential to the success of educational initiatives. However, despite the increasing adoption of technology by many educational institutions, challenges to effective integration persist. As noted by Sari and Prabowo (2022), many schools face obstacles due to inadequate training for teachers and insufficient infrastructure. Therefore, it is crucial to formulate strategies that not only integrate technology but also support professional development for educators, enabling them to optimally utilize IT in the learning process.

The integration of IT in education also has the potential to support more personalized and adaptive learning experiences. Mira A. et al. (2022) highlight that the use of technology can provide significant opportunities to enhance students' learning experiences, such as through online learning platforms, mobile applications, and innovative learning software. Consequently, the phenomenon of the Educational Revolution in the Society 5.0 era entails a transformation in how students learn and interact with teachers and peers, necessitating an understanding and adjustment to these changes. A study by Widiastuti (2023) indicates that the use of AI-based learning platforms can assist in tailoring instructional materials to meet individual student needs, allowing them to learn at their own pace and receive the support necessary to achieve their academic goals.

Thus, the integration and innovation of information technology within educational strategies in the digital era extend beyond merely adopting new tools; they involve creating an inclusive and responsive educational ecosystem. An appropriate solution to address these challenges is to adapt learning content in alignment with contemporary developments, including instructional models, teaching approaches, media, and teaching aids, while also strengthening the role of educators. Collaboration among educators, decision-makers, and other stakeholders is essential to ensure that technology is effectively employed to enhance educational quality and prepare students to face future challenges.

## **Methods**

This study aims to explore the integration and innovation of information technology in educational strategies in the digital era. The methodology employed is a mixed methods approach, which combines both quantitative and qualitative methods to provide a more comprehensive understanding of the phenomenon under investigation.

### **1. Research Design**

The research design utilized is an explanatory sequential design. In this design, quantitative data is collected first through surveys, followed by the collection of qualitative data through in-depth interviews and focus group discussions. This design

allows the researcher to elucidate quantitative findings in greater depth through qualitative data.

## 2. Research Subjects

The research subjects consist of:

- a. Quantitative Respondents: 35 students and 10 lecturers from Bojonegoro District.
- b. Qualitative Respondents: 15 students and 5 lecturers selected purposively for interviews and focus group discussions.

## 3. Instruments

a. Quantitative Instrument: A questionnaire comprising 15 questions that cover:

- 1) The level of information technology usage in learning.
- 2) Perceptions of the effectiveness of technology in enhancing student engagement.
- 3) Barriers faced in the integration of technology.

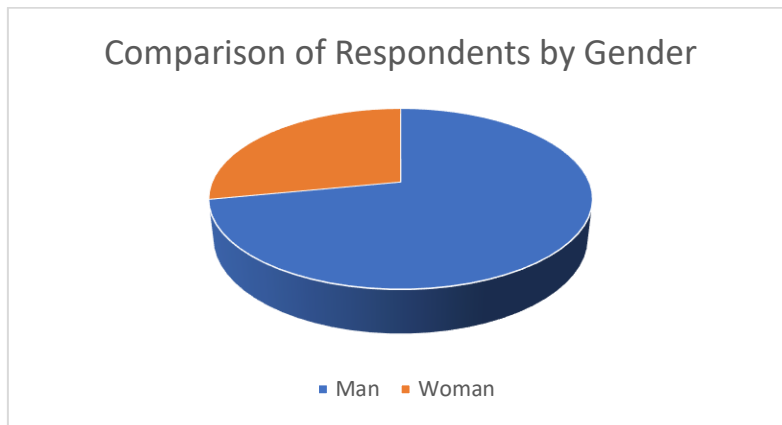
**Table 1.** Questionnaire Design for Quantitative Data Collection

No.	Questionnaire Materials	Answer Choices
Correspondent Information		
1	Gender	Man/Woman
2	Age	Under 15 years old / 15-18 years old / 19-22 years old / 23-30 years old / Over 30 years old
3	Education Level	Junior High School / Senior High School / University / Others
4	Statuses	Student / University Student / Educator / Lecturer
Use of Technology in Learning.		
1	How often do you use technology (computer, tablet, smartphone) in learning?	Very often (every day) / Often (several times a week) / Sometimes (once a week) / Rarely (once a month) / Never
2	What types of technology do you use in learning? (Select all that apply):	Computer / Laptop / Tablet / Smartphone / Projector / Learning Applications (e.g., Google Classroom, Zoom, etc.) / Other:
3.. etc.		
Perception of the effectiveness of technology.		
1	How often do you feel engaged in learning when using technology?	Very engaged / Engaged / Somewhat engaged / Less engaged / Not engaged
2	What benefits do you feel from the use of technology in learning? (Select all that apply):	Increases interest in learning / Facilitates access to information / Enhances interaction with teachers and peers / Supports independent learning / Other: _____
3.. etc.		
Obstacles faced in technology integration.		

1	What obstacles do you face in using technology for learning? (Select all that apply):	Limited internet access / Insufficient adequate devices / Lack of training to use technology / Difficulty in understanding how to use applications / Other: _____
2	Seberapa besar dukungan yang Anda terima dari sekolah dalam penggunaan teknologi untuk pembelajaran?	Sangat mendukung/Mendukung/Cukup mendukung/Kurang mendukung/Tidak mendukung
3.. etc.		
Others		
1.	Additional suggestions or comments regarding the use of technology in learning:	My own opinion: .....

- b. Qualitative Instrument: A semi-structured interview guide consisting of 10 open-ended questions designed to explore the experiences and perspectives of educators and students regarding the integration of technology in education.
- 4. Data Collection Procedures
  - a. Quantitative Data Collection:
    - 1) A questionnaire will be distributed online to respondents at the participating schools.
    - 2) Respondents will be asked to complete the questionnaire independently within a specified timeframe.
  - b. Qualitative Data Collection:
    - 1) In-depth interviews will be conducted with five educators either face-to-face or through online platforms.
    - 2) Focus group discussions will be held with fifteen students, where they will be invited to discuss their experiences using technology in learning.
- 5. Data Analysis
  - a. Quantitative Data Analysis:
    - 1) Quantitative data will be analysed using statistical software such as SPSS or R to produce descriptive analyses (frequency, mean, and percentage) and inferential analyses (t-tests, ANOVA) to test hypotheses.
  - b. Qualitative Data Analysis:
    - 1) Qualitative data will be analysed using a thematic analysis approach, where the researcher will identify themes emerging from the interviews and focus group discussions. This process will include transcription, coding, and theme grouping.

Figure 1: Distribution of Respondents by Gender



**Figure 1.** Student Satisfaction Level with the Use of Technology in Learning

No.	Kategori	Number of Student	Percentage (%)
1	Very Satisfied	20	57,1%
2	Satisfied	9	25,7%
3	Somewhat Satisfied	3	8,57%
4	Dissatisfied	3	8,57%
5	Very Dissatisfied	0	0

#### 6. Triangulation of Data

To enhance the validity of the research findings, data triangulation will be conducted by comparing the results of both quantitative and qualitative data. This approach allows the researcher to ensure the consistency of the findings and provide a more holistic understanding of the integration and innovation of information technology in education.

#### 7. Interpretation of Results

The results of the analysis will be interpreted to provide practical recommendations for educators and decision-makers in developing more effective and innovative educational strategies in the digital era. The researcher will discuss the implications of the findings and offer suggestions for further research.

### Results and Discussion

#### 1. Research Findings

This study aims to explore the integration and innovation of information technology in educational strategies in the digital era. Data obtained from questionnaires and in-depth interviews provide valuable insights into how technology is utilized in the learning process and the challenges faced. The following are the main findings of this research:

##### a. Technology Use in Learning

- 1) Frequency of Use: The majority of respondents (80%) reported using technology in learning almost every day, with computers and smartphones being the most commonly used devices.

- 2) Effectiveness of Technology: 79% of respondents felt that the use of technology was highly effective in enhancing their understanding of the subject matter, while 25% considered it moderately effective.
  - 3) Level of Engagement: 83% of respondents felt very engaged when using technology in learning, indicating that technology can enhance student interaction and participation.
- b. Benefits and Barriers
- 1) Benefits: Respondents identified several benefits of using technology, including increased interest in learning (78%), ease of access to information (84%), and improved interaction with teachers and peers (80%).
  - 2) Barriers: Limited internet access (45%) and a lack of adequate devices (33%) were identified as the main barriers faced by respondents.
2. Discussion of Research Results
- a. Technology Use and Student Engagement
- The research findings indicate that the use of technology in learning contributes to increased student engagement. This aligns with the Student Engagement Theory, which posits that technology can create more interactive and engaging learning experiences (Fredricks, Blumenfeld, & Paris, 2004). Previous research by Hidayat and Sari (2022) also found that the integration of information technology in education can enhance student motivation and involvement. Educators have a responsibility to equip students with the skills necessary for the future, particularly as the digital revolution emphasizes technological advancements, including the digital economy, artificial intelligence, big data, and robotics.
- b. Effectiveness of Technology in Learning
- The majority of respondents believe that technology is highly effective in enhancing material comprehension. This supports the findings of Rahman and Sari (2021), which indicate that technology can facilitate more personalized and adaptive learning experiences. With access to various online resources, students can learn at their own pace and access materials tailored to their individual needs. Consistent with this perspective, the implementation of technology in Indonesian language instruction can assist teachers in achieving educational objectives more effectively. Numerous technological tools are available for teachers to support Indonesian language learning (Mahyudi, A., 2023).
3. Perceived Benefits
- The findings regarding the benefits of technology use in learning, such as increased interest in learning and ease of access to information, align with research by Prabowo and Widiastuti (2023), which shows that technology integration can enrich students' learning experiences. This study also indicates that technology can assist students in developing critical and collaborative skills.
4. Barriers to Technology Integration
- Despite the numerous benefits, this research also identifies significant barriers to technology integration, including limited internet access and a lack of adequate devices. These findings are consistent with research by Setiawan and Lestari (2024), which shows

that inadequate technological infrastructure can hinder the effective use of technology in education. Therefore, it is crucial to address these barriers to ensure the effective integration of technology into educational strategies.

#### 5. Comparison with Theory and Similar Research

The results of this study align with various educational theories and similar research. Constructivist theory, which emphasizes that learning is an active process where students build their own knowledge, can be applied in the context of information technology use. Technology enables students to collaborate, share information, and engage in more interactive learning (Piaget, 1976). Research by Widiastuti (2023) also indicates that technology use in education can enhance learning effectiveness. Thus, the findings of this research underscore the importance of integrating and innovating information technology in educational strategies to create more effective and engaging learning environments.

### Conclusion

From the results of this study, it can be concluded that the integration and innovation of information technology in education have a significant positive impact on student engagement and understanding. Although there are several barriers that need to be addressed, the benefits derived from using technology in learning are substantial. This research provides recommendations for decision-makers in education to pay greater attention to technological infrastructure and training for educators to ensure effective technology integration in educational strategies in the digital era.

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