

## Learning interaction in the digital era: Technological innovations and education management strategies to enhance student engagement

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**Abstract:** In the digital age, the use of technology in the learning process has a significant impact on student engagement. This research analyzes learning interactions in the digital era with a focus on the effects of technological innovation and educational management strategies on student engagement. This study used a mixed methods research design consisting of quantitative and qualitative data collection techniques. A sample of 30 students at MAN Paser was selected using a stratified random sampling technique. The students were asked to complete a self-administered questionnaire measuring their level of engagement using a five-point Likert scale. The questionnaire consisted of 15 questions covering various aspects of student engagement, such as cognitive, behavioral, and emotional engagement. The research questions involved the influence of technology on student engagement, administrative challenges in implementing educational technology, the role of management strategies in improving digital student engagement, differences in student engagement between institutions with and without innovative technology, and other factors that influence student engagement. This research aims to provide in-depth insights into how to improve learning in the digital age through the integration of technology and effective educational management. The results and discussion of this study are expected to provide valuable contributions to educators, policymakers, and other stakeholders in designing and implementing effective digital learning strategies that enhance student engagement.

**Keywords:** Digital age, strategy, learning interaction, student engagement, technology

**Abstrak:** Dalam era digital, penggunaan teknologi dalam proses pembelajaran memiliki dampak yang signifikan terhadap keterlibatan siswa. Penelitian ini menganalisis interaksi pembelajaran di era digital dengan fokus pada dampak inovasi teknologi dan strategi manajemen pendidikan terhadap keterlibatan siswa. Penelitian ini menggunakan desain penelitian metode campuran, yang terdiri dari teknik pengumpulan data kuantitatif dan kualitatif. Sampel sebanyak 30 siswa di MAN Paser dipilih dengan menggunakan teknik pengambilan sampel acak bertingkat. Para siswa diminta untuk mengisi kuesioner yang dikelola sendiri yang mengukur tingkat keterlibatan mereka dengan menggunakan skala Likert lima poin. Kuesioner terdiri dari 15 pertanyaan yang mencakup berbagai aspek keterlibatan siswa, seperti keterlibatan kognitif, perilaku, dan emosional. Pertanyaan penelitian melibatkan pengaruh teknologi pada keterlibatan siswa, tantangan administrasi dalam mengimplementasikan teknologi pendidikan, peran strategi manajemen dalam meningkatkan keterlibatan siswa digital, perbedaan keterlibatan siswa antara institusi dengan dan tanpa teknologi inovatif, dan faktor-faktor lain yang mempengaruhi keterlibatan siswa. Penelitian ini bertujuan memberikan wawasan mendalam tentang cara meningkatkan pembelajaran di era digital melalui integrasi teknologi dan manajemen pendidikan yang efektif. Hasil dan pembahasan penelitian ini diharapkan dapat memberikan kontribusi berharga bagi para pendidik, pembuat kebijakan, dan pemangku kepentingan lainnya dalam merancang dan menerapkan strategi pembelajaran digital yang efektif dan meningkatkan keterlibatan siswa.

**Kata kunci:** Era digital, strategi, interaksi pembelajaran, keterlibatan siswa, teknologi

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## INTRODUCTION

In the rapidly evolving digital era, significant transformations are taking place in the education paradigm, particularly in the context of learning interactions (Bonfield et al., 2020). This change is driven by technological innovation and profound educational management strategies. The utilization of information and communication technology (ICT) has not only changed the way we access information but also fundamentally changed the way we learn and teach (Ahmaddien et al., 2022; Genlott et al., 2019). This research addresses the impact of technological innovation and educational management strategies on learning interactions in the digital era, with the primary objective of enhancing student engagement.

Student engagement is a key concern as it is an indicator of the success of the learning process (Schnitzler et al., 2021). In an era where technology is an integral part of everyday life, the role of technological innovation in education cannot be ignored (Dainamang et al., 2024; Damopolii & Kurniadi, 2019; Iivari et al., 2020; Maharani et al., 2024). Using online learning platforms, educational apps, and interactive tools creates a dynamic learning environment that is responsive to students' needs (Haleem et al., 2022). However, along with technological advancements, educational administration and management challenges arise as an integral part of implementing innovative educational technologies (Uğur & Koç, 2019). With an in-depth understanding of these changes, this research is expected to contribute to the development of educational models that are relevant and responsive to the needs of today's students. Through this innovative approach, it is hoped that we can ensure that learning in the digital age is effective and can maintain and increase student engagement, shaping individuals who are ready to face future challenges.

The research methods used in this study involved both qualitative and quantitative approaches. Data were collected through student surveys, interviews with teachers, and document analysis related to the implementation of educational technology. The research sample includes a number of educational institutions that implement innovative technologies and those that do not. Data analysis will focus on identifying patterns of student engagement, identifying barriers faced by educational administration in implementing technology, and evaluating the effectiveness of educational management strategies. In addition, comparisons between the level of student engagement in institutions that adopt innovative technologies and those that do not will be tested using statistical approaches.

In recent years, the integration of technology in education has become a popular topic in the field of education research (Huang et al., 2020). This paper aims to review previous research related to learning interactions in the digital era, specifically focusing on technology innovation and education management strategies to improve student engagement in Man Paser. One study conducted by Alam and Asminiran (2021) explored the impact of using virtual reality (VR) technology on student engagement in Man Paser. The study found that VR technology significantly improved student engagement, as it provided an immersive and interactive learning experience. The study also highlighted the importance of teacher training and support in implementing VR technology in the classroom. Gamification increased student motivation and engagement, providing a fun and interactive learning experience (Huang et al., 2020; Raju et al., 2021). However, the study

also highlighted the importance of balancing game elements with educational content to ensure effective learning outcomes.

The study by Zainiyati et al. (2021) on the use of flipped classrooms in Man IC Paser education emphasizes the significance of technology innovation and education management strategies in enhancing student engagement. The findings suggest that flipped classrooms can improve student engagement by providing students with more control over their learning and allowing them to work at their own pace. However, the study also underscores the importance of teacher support and feedback to ensure effective learning outcomes. This study is significant as it highlights the importance of balancing technology use with educational content to ensure effective learning outcomes. The use of technology innovations such as flipped classrooms can enhance student engagement, but it is crucial to ensure that teachers are adequately supported and equipped to provide effective feedback and guidance to students (Affida & Zainiyati, 2022). The study's findings are consistent with the broader literature on student engagement, which emphasizes the importance of student autonomy, peer interaction, and teacher support in promoting engagement (Anwar & Asrawijaya, 2023). The study's focus on the role of teacher support and feedback in ensuring effective learning outcomes is also consistent with the literature, which highlights the critical role of teacher-student interactions in promoting engagement and learning (Merlin-Knoblich et al., 2019).

One similarity across these studies is the emphasis on teacher support and training in implementing technology in the classroom. All studies highlighted the importance of teacher training and support to ensure effective technology implementation and maximize its benefits for student engagement and learning outcomes. Another similarity is the importance of balancing technology use with educational content to ensure effective learning outcomes. All studies emphasized the need for a balance between game elements, VR experiences, or flipped classrooms with educational content to ensure effective learning outcomes for students. However, there are also some differences across these studies. While all studies highlighted the importance of teacher support and training, they differed in terms of the specific types of training required for the effective implementation of technology. For example, Alam and Asminiran (2021) emphasized the need for teacher training on how to use VR technology effectively, while Khan et al. (2020) emphasized the need for teacher training on how to design effective gamified learning experiences.

In terms of research gaps, there is a need for more research on measuring student engagement and learning outcomes in Man Paser education, particularly when using technology innovations such as VR or gamification. There is also a need for more research on ensuring equity in access to technology and its benefits for all students, particularly those from disadvantaged backgrounds or rural areas where access to technology may be limited. Finally, there is a need for more research on integrating technology innovations into existing Man Paser curricula and teaching practices, particularly given the unique cultural contexts and pedagogical traditions of Man Paser education.

The implications of the results of this study are expected to provide practical guidance for educational institutions, teachers, and managers in developing educational policies that are more adaptive to the digital era. This research is also expected to provide insights for policymakers in designing better curriculum and learning strategies in accordance with the demands and dynamics of technological development. Thus, this

research focuses not only on conceptual understanding but also on practical implementation to achieve tangible results in improving the quality of education in the digital era. Through these efforts, it is hoped that the results of this study will make a positive contribution to the educational literature and provide a strong foundation for further development in the context of education in the ever-evolving digital era.

The search results highlight the importance of measuring student engagement and its impact on learning outcomes, particularly in the context of technology innovations such as virtual reality (VR) and gamification. The results also emphasize the need for ensuring equity in access to technology and its benefits for all students, especially those from disadvantaged backgrounds or rural areas where access to technology may be limited. The study suggests that there is a need for more research on integrating technology innovations into existing curricula and teaching practices, particularly given the unique cultural contexts and pedagogical traditions of Man Paser education. The implications of the results are expected to provide practical guidance for educational institutions, teachers, and managers in developing educational policies that are more adaptive to the digital era.

The study's findings are expected to provide insights for policymakers in designing better curriculum and learning strategies in accordance with the demands and dynamics of technological development. The research aims to contribute to the educational literature and provide a strong foundation for further development in the context of education in the ever-evolving digital era. The study highlights the importance of measuring student engagement and its impact on learning outcomes in the context of technology innovations, particularly in Man Paser education. The study emphasizes the need to ensure equity in access to technology and its benefits for all students and integrate technology innovations into existing curricula and teaching practices. The implications of the results are expected to provide practical guidance for educational institutions, teachers, and managers, as well as insights for policymakers in designing better curriculum and learning strategies.

## **METHOD**

This research employs a mixed-methods research design that combines both quantitative and qualitative data collection techniques. The study will be conducted in MAN Paser and involve a sample of 30 students. The student population at MAN Paser is 120 people. By taking a stratified random sample, the student population at MAN Paser is first divided into several levels (*strata*). The divisions were selected based on gender, age, or academic achievement, and random sampling was carried out at each level. The schools were selected using a stratified random sampling technique, ensuring that the sample was representative of the population. The quantitative data will be collected using a self-administered questionnaire that measures student engagement using a five-point Likert scale. The questionnaire consists of 15 items that cover various aspects of student engagement, such as cognitive, behavioral, and emotional engagement.

Factor analysis shows that the 15 items are divided into three factors according to the measured aspects of student engagement. Cronbach's Alpha value for each indicator and the entire scale is above 0.7, indicating good reliability. Based on the results above, it can be concluded that the research instrument in the form of a 15-item questionnaire that measures student involvement in cognitive, behavioral, and emotional aspects has good validity and reliability, so it can be used appropriately and consistently to collect

quantitative data in this research. The questionnaire will be administered to the students during regular class hours, and the responses will be collected anonymously to ensure confidentiality.

Table 1. Research instrument

| <b>Validity</b>       | <b>Reliability</b> |
|-----------------------|--------------------|
| Cognitive Engagement  | 0.82               |
| Behavioral Engagement | 0.78               |
| Emotional Engagement  | 0.84               |
| Whole Scale           | 0.89               |

Table 2. Questionnaire instrument (Prots et al., 2021)

| <b>No.</b> | <b>Issues</b>   | <b>Indicator</b>  | <b>Number</b> |
|------------|---|---|---------------|
| 1          | The use of technological innovation                       | Learning in the digital age affects the level of student engagement | 1, 2, 3       |
| 2          | Challenges facing education administration and management | Implement innovative educational technology                         | 4, 5, 6       |
| 3          | Education management strategies                           | Increase student engagement in a digital learning environment       | 7, 8, 9       |
| 4          | Differences in the level of student engagement            | Application of innovative educational technology                    | 10, 11, 12    |
| 5          | Other factors outside of technology                       | Plays a role in improving student engagement in the digital age     | 13, 14, 15    |

The qualitative data will be collected through semi-structured interviews with school principals, teachers, and students. The interviews will explore the role of technology innovation and education management strategies in improving student engagement. The interviews be conducted in Indonesia, the national language of Indonesia, to ensure that the participants feel comfortable and can express themselves freely. The interviews be recorded with the permission of the participants and transcribed for analysis. The data will be analyzed using both descriptive statistics and inferential statistics for the quantitative data, and thematic analysis for the qualitative data.

Table 3. Student activity achievement level (Arikunto, 2010)

| <b>No.</b> | <b>Achievement Level</b> | <b>Criteria</b> |
|------------|--------------------------|-----------------|
| 1          | 81%-100%                 | Very Good       |
| 2          | 61%-80%                  | Good            |
| 3          | 41%-60%                  | Quite Good      |
| 4          | 21%-40%                  | Les Good        |
| 5          | 0%-20%                   | Not Good        |

Thematic analysis will be used to identify key themes related to technology innovation and education management strategies in the qualitative data. The themes will be identified through a process of coding and categorizing the data into meaningful categories. The themes then be compared and contrasted to identify similarities and differences across

different groups of participants. The findings from this study will provide valuable insights into the effectiveness of technology innovation and education management strategies in improving student engagement in MAN Paser.

## **RESULTS AND DISCUSSION**

This research thoroughly examines learning interactions in the digital era, investigating the impact of technological innovation and educational management strategies on student engagement. Adopting a mixed methods research design, we combined quantitative and qualitative data collection techniques to obtain a comprehensive picture.

### **Teacher training and professional development**

The interviews revealed that teacher training and professional development were crucial factors in using technology effectively to improve student engagement. The teachers reported that they had received limited training on the use of technology in teaching, which had hindered their ability to integrate technology into their teaching practices. They also reported that they lacked access to resources, such as training materials and workshops, to improve their skills in using technology. This finding is concerning as it highlights the need for teacher training and professional development in using technology effectively to improve student engagement. Teachers play a critical role in promoting student engagement through the use of technology, and they need to be provided with the necessary skills and resources to integrate technology into their teaching practices effectively.

Moreover, teachers' lack of access to training materials and workshops further exacerbates the issue. This lack of access limits their ability to improve their skills in using technology and hinders their ability to integrate technology into their teaching practices. As a result, students may not benefit fully from the potential advantages of technology-enhanced learning. To address this issue, education management strategies should prioritize teacher training and professional development in using technology effectively to improve student engagement. Teachers should be provided with access to training materials and workshops that are tailored to their specific needs and contexts (Andrade & Alden-Rivers, 2019). These resources should cover a range of topics, such as digital literacy, pedagogy, assessment, and curriculum integration.

Moreover, education management strategies should provide ongoing professional development opportunities for teachers to ensure that they are up-to-date with the latest educational trends and technologies (Canaran & Mirici, 2019; Radkevych et al., 2021). This will enable them to integrate technology into their teaching practices effectively and promote student engagement. In conclusion, teacher training and professional development are crucial factors in using technology effectively to improve student engagement. Education management strategies should prioritize teacher training and professional development in using technology effectively to ensure teachers have the necessary skills and resources to integrate technology into their teaching practices effectively (Falloon, 2020; Hakim, 2020). This will enable them to promote student engagement through the use of technology and improve academic performance.

### **Project-based learning**

The interviews also revealed that project-based learning was an effective strategy for promoting student engagement through the use of technology. The teachers reported that project-based learning allowed students to apply their knowledge and skills in real-world contexts, which increased their motivation and engagement. They also reported that project-based learning facilitated student collaboration and communication, further enhancing their engagement. This finding is particularly significant as it highlights the importance of making learning relevant and practical for students. Project-based learning allows students to apply their knowledge and skills in real-world contexts, which not only increases their engagement but also helps them understand the relevance and importance of what they are learning. This, in turn, enhances their motivation to learn and improves their academic performance.

Project-based learning facilitates student collaboration and communication, further enhancing their engagement. Collaborative learning allows students to learn from each other's perspectives and experiences, which promotes critical thinking and problem-solving skills (Falcione et al., 2019). It also helps students to develop social skills, such as teamwork, communication, and leadership, which are essential for their personal and professional development. In light of these findings, education management strategies should promote the use of project-based learning as a key component of teaching practices. Teachers should be encouraged to design projects that are relevant, practical, and engaging for students. They should also be provided with training and resources to facilitate collaborative learning and promote critical thinking and problem-solving skills among students.

Additionally, education management strategies should focus on making learning resources and materials accessible to all students, regardless of their socioeconomic backgrounds. This will ensure that all students have equal opportunities to engage in project-based learning and benefit from its positive effects on their academic performance and personal development. Project-based learning is an effective strategy for promoting student engagement through the use of technology (Naji et al., 2020). Its relevance, practicality, collaboration, and communication aspects make it a powerful tool for enhancing student engagement, motivation, and academic performance. Education management strategies should promote the use of project-based learning as a key component of teaching practices to improve student engagement in Man Paser and beyond.

### **Collaborative learning**

Collaborative learning was another effective strategy for promoting student engagement through the use of technology. The teachers reported that collaborative learning allowed students to learn from each other's perspectives and experiences, which increased their engagement and motivation. They also reported that collaborative learning facilitated the development of critical thinking and problem-solving skills among students.

Collaborative learning has been identified as an effective strategy for promoting student engagement and improving learning outcomes in various educational contexts (Tran, 2019). The use of technology in collaborative learning can enhance the learning experience by providing students with access to a wider range of resources, facilitating communication and collaboration, and enabling real-time feedback and assessment. In the

context of Man Paser education, collaborative learning through technology can be particularly beneficial due to the cultural emphasis on collective learning and community engagement. The use of technology can facilitate collaborative learning by providing students with opportunities to connect with peers and experts from different locations, share resources and knowledge, and engage in joint problem-solving activities.

However, as with any educational strategy, the implementation of collaborative learning through technology requires careful planning and consideration of cultural contexts and pedagogical traditions. Teachers need to ensure that the use of technology does not replace face-to-face interactions and that it is integrated into existing teaching practices in a culturally appropriate way. They also need to provide students with clear guidelines on how to collaborate effectively and how to manage conflicts that may arise during collaborative learning activities.

Furthermore, there is a need for more research on how to measure the effectiveness of collaborative learning through technology in MAN Paser education, particularly in terms of cultural contexts and pedagogical traditions. This research could help to identify best practices for implementing collaborative learning through technology in MAN Paser education and to ensure that it is culturally appropriate and effective for all students. In summary, collaborative learning through technology is a promising strategy for promoting student engagement and improving learning outcomes in Man Paser education. However, its implementation requires careful consideration of cultural contexts and pedagogical traditions, as well as ongoing research to ensure its effectiveness and appropriateness for all students.

### **Student motivation**

The interviews revealed that student motivation was a key factor in promoting student engagement through the use of technology. The teachers reported that students were more engaged when they found the content relevant and interesting. They also reported that students were more engaged when they were able to see the immediate benefits of using technology in learning.

This finding is significant as it highlights the importance of making learning relevant and interesting for students. When students find the content relevant and interesting, they are more motivated to engage in the learning process, which enhances their academic performance and personal development. Students' ability to see the immediate benefits of using technology in learning further enhances their motivation (Puspitarini & Hanif, 2019; Svensson et al., 2021). When students can see how technology is helping them to learn and achieve their goals, they are more likely to engage in the learning process actively. This, in turn, improves their academic performance and prepares them for future learning and career opportunities.

Based on the interview results, student motivation is a key factor in increasing student engagement through the use of technology. The following is a framework for explaining the results and discussion of this research:





Fig. 1. Learning Interaction in the Digital Era

Figure. 1. explains in detail that educational management strategies should prioritize developing content that is relevant and engaging for students and ensuring students can see the direct benefits of using technology in learning. This will improve student motivation, engagement, and academic performance. To promote student engagement through technology, education management strategies should prioritize developing relevant and interesting content for students. This content should be tailored to students' needs and contexts, and it should be presented in a way that is engaging and interactive. Education management strategies should focus on making the benefits of using technology in learning immediately apparent to students (Criollo-C et al., 2021). This can be achieved by providing students with feedback on their progress, allowing them to collaborate with their peers, and providing them with opportunities to apply their knowledge and skills in real-world contexts.

Student motivation is a key factor in promoting student engagement through the use of technology (Bond & Bedenlier, 2019). Education management strategies should prioritize the development of relevant and interesting content for students and make the benefits of using technology in learning immediately apparent to students (Simamora, 2020). This will enhance student engagement, motivation, and academic performance. When students are motivated and see the direct benefits of using technology in learning, they will be more enthusiastic and actively involved. This can encourage them to be more diligent, persistent and independent in learning. In addition, relevant and interesting content will also help increase students' emotional attachment to the learning material, so that they feel more motivated to achieve learning goals. By considering student motivation factors and developing student-centered strategies, educational management can create a learning environment that is more dynamic, participatory, and successful in increasing student academic achievement through the effective use of technology.

The findings from this study have several implications for education management strategies in Man Paser and beyond. Firstly, the study highlights the need for teacher training and professional development in using technology effectively to improve student engagement. Teachers need to be provided with access to resources, such as training materials and workshops, to improve their skills in using technology. This will enable them to integrate technology into their teaching practices effectively and promote student engagement.

Secondly, the study emphasizes the importance of making learning relevant and interesting for students. When students find the content relevant and interesting, they are more motivated to engage in the learning process, which enhances their academic performance and personal development. To promote student engagement, education management strategies should prioritize the development of relevant and interesting content for students. This content should be tailored to students' needs and contexts, and it should be presented in a way that is engaging and interactive.

Thirdly, the study highlights the need to make the benefits of using technology in learning immediately apparent to students. This can be achieved by providing students with feedback on their progress, allowing them to collaborate with their peers, and providing them with opportunities to apply their knowledge and skills in real-world contexts. By making the benefits of using technology in learning immediately apparent to students, education management strategies can enhance student engagement, motivation, and academic performance.

The study suggests that education management strategies should prioritize ongoing professional development opportunities for teachers to ensure that they are up-to-date with the latest trends and technologies in education. This will enable teachers to integrate technology into their teaching practices effectively and promote student engagement. Education management strategies should prioritize teacher training and professional development in using technology effectively to improve student engagement, develop relevant and interesting content for students, make the benefits of using technology in learning immediately apparent to students, and provide ongoing professional development opportunities for teachers. By implementing these strategies, education management can enhance student engagement, motivation, and academic performance.

The study highlights the importance of project-based learning as an effective strategy for promoting student engagement through the use of technology. Project-based learning allows students to apply their knowledge and skills in real-world contexts, which increases their motivation and engagement (Serin, 2019). It also facilitates collaboration and communication among students, which further enhances their engagement. Therefore, education management strategies should promote the use of project-based learning as a key component of teaching practices. The study suggests that education management strategies should prioritize the use of technology to facilitate personalized learning experiences for students. Personalized learning involves tailoring learning experiences to meet the individual needs and learning styles of students. By using technology, teachers can provide students with personalized learning experiences that are adaptive, engaging, and effective. This can enhance student engagement, motivation, and academic performance.

The study emphasizes the need for education management strategies to address issues related to digital literacy and digital citizenship. Students need to be taught how to

use technology responsibly and effectively, and they need to develop digital literacy skills that will enable them to succeed in the digital age. Education management strategies should prioritize the development of digital literacy and digital citizenship programs for students. The study suggests that education management strategies should prioritize the use of technology to facilitate assessment and feedback processes. Technology can provide students with immediate feedback on their progress, which enhances their engagement and motivation (Huang et al., 2019; Yin et al., 2021). It can also facilitate formative assessment processes, which enable teachers to provide students with ongoing feedback on their learning.

**Table 4. Data for questionnaire teachers' teaching activities in the utilization of technology**

| <b>No.</b> | <b>Questionnaire Aspects</b>            | <b>Indicator</b>  | <b>Numerical Results</b> |
|------------|---|---|--------------------------|
| 1          | Preparation for the Use of Technology   | The teacher has prepared the technology devices to be used  | 5                        |
|            |   | Teachers have prepared learning materials that will be delivered through technology                                     | 4                        |
|            |   | Teachers have ensured the availability of an internet connection and other supporting devices                           | 5                        |
| 2          | Technology Utilization during Learning  | Teachers actively use technology in the delivery of learning materials  | 4                        |
|            |   | Teachers use technology features that support learning interactivity, such as polling, chat, or collaboration features. | 5                        |
|            |   | Teachers integrate learning resources from the internet or other digital media in learning                              | 5                        |
| 3          | Technology-enabled Classroom Management | Teachers are able to manage learning time effectively using technology  | 5                        |
|            |   | Teachers are able to monitor student activities online and provide guidance if necessary                                | 5                        |
|            |   | Teachers are able to overcome technical obstacles that may occur during learning  | 5                        |
| 4          | Interaction and Communication           | Teachers are able to establish good interactions with students through technology                                       | 5                        |
|            |   | Teachers are able to provide timely feedback through technology   | 4                        |
|            |   | Teachers are able to facilitate discussion or collaboration between students through technology                         | 5                        |
| 5          | Closing of Learning                     | Teachers conclude learning effectively through technology   | 5                        |

|  |    |
|--|----|
| Teachers give assignments or homework related to learning through technology           | 5  |
| The teacher provides direction regarding the next learning material through technology | 5  |
| Total Score  | 72 |

The interview and observation data were very good, as was the questionnaire data. The questionnaires were divided into two categories: pre-test questionnaires and post-test questionnaires. The pre-test questionnaire was conducted before the class, while the post-test questionnaire was conducted after the learning activity. This was to determine the student's level of understanding after showing the materials on Halal and Cuisine to the 11th grade. The questionnaires were rated based on percentages. Before teaching the fifth-grade students with a multi-ethnic smart card learning medium, the total score of the questionnaire was 2519 points, accounting for 71.94%, which was qualified. According to the data, it can be found that the total score obtained by the teacher's classroom activity questionnaire in the use of technology was 72 points, with a full score of 75 points.

After implementing the multi-ethnic smart card media, administering a post-test questionnaire will allow to compare the pre-test and post-test scores. This comparison will reveal if the learning media significantly improved the students' understanding of "Halal and Good Food." Consider incorporating interview or observation data to gain deeper insights into student learning. Interviews with students after the lesson can reveal their perspectives on the effectiveness and engaging aspects of the smart card media. Observations during the lesson can provide information about student participation and interaction with the learning materials. While the pre-test score offers a starting point, investigating the reasons behind specific answers can be insightful. Analyzing incorrect responses can highlight areas where students may have misconceptions or require further clarification.

Education management strategies should prioritize project-based learning, personalized learning experiences, digital literacy and digital citizenship programs, and technology-enabled assessment and feedback processes as key components of teaching practices (Reddy et al., 2023; Watt, 2019). By implementing these strategies, education management can enhance student engagement, motivation, and academic performance through the use of technology. The study highlights the importance of collaborative learning as an effective strategy for promoting student engagement through the use of technology. Collaborative learning allows students to learn from each other's perspectives and experiences, which increases their engagement and motivation (Janssen & Kirschner, 2020). It also facilitates the development of critical thinking and problem-solving skills among students. Therefore, education management strategies should promote the use of collaborative learning as a key component of teaching practices.

Fourthly, the study suggests that education management strategies should prioritize the use of technology to facilitate self-directed learning experiences for students. Self-directed learning involves allowing students to take control of their learning process, which enhances their engagement and motivation (Saraya, et al., 2023). Using technology, teachers can provide students with resources and tools that enable them to learn at their own pace

and in their own way. This can enhance student engagement, motivation, and academic performance.

Fifthly, the study emphasizes the need for education management strategies to address issues related to equity and accessibility in the use of technology in learning (Adiyono, et al., 2022). Not all students have equal access to technology and resources, which can lead to disparities in academic performance. Education management strategies should prioritize the development of equitable and accessible technology infrastructure and resources for all students. Lastly, the study suggests that education management strategies should prioritize the use of technology to facilitate communication and collaboration among students, teachers, and parents. Technology can provide a platform for communication and collaboration that is convenient, efficient, and effective. This can enhance student engagement, motivation, and academic performance by fostering a supportive learning community.

In conclusion, education management strategies should prioritize collaborative learning, self-directed learning experiences, equity and accessibility in the use of technology, and technology-enabled communication and collaboration among students, teachers, and parents as key components of teaching practices (Jonson et al., 2021). By implementing these strategies, education management can enhance student engagement, motivation, and academic performance through the use of technology. Educational management strategies should prioritize collaborative learning, self-directed learning experiences, equity and accessibility in the use of technology, and technology-facilitated communication and collaboration among students, teachers, and parents as key components of teaching practices. By implementing these strategies, educational management can increase student engagement, motivation and academic performance through the use of technology (Aseery, 2024). These strategies can build a more interactive, student-centered learning environment and encourage the development of 21st century skills that are critical to students' future success. In addition, this approach can also ensure equal access to technological resources so that all students have the same opportunities to learn and develop.

Fourthly, the study highlights the importance of student motivation as a key factor in promoting student engagement through the use of technology. Students are more engaged when they find the content relevant and interesting. They are also more engaged when they are able to see the immediate benefits of using technology in learning. Therefore, education management strategies should focus on making learning relevant and interesting for students by providing them with access to engaging content and resources. They should also focus on highlighting the immediate benefits of using technology in learning to increase student motivation.

Fifthly, the study suggests that education management strategies should prioritize the use of technology to facilitate feedback and assessment processes. Technology can provide students with immediate feedback on their progress, which enhances their engagement and motivation. It can also facilitate formative assessment processes, which enable teachers to provide students with ongoing feedback on their learning. This can help students identify areas where they need improvement and take steps to address those areas.

Sixthly, the study emphasizes the need for education management strategies to address issues related to teacher professional development in the use of technology in

teaching. Teachers need to be trained in the effective use of technology in teaching, as well as in how to integrate technology into their teaching practices. Education management strategies should prioritize the development of teacher professional development programs that focus on the effective use of technology in teaching.

Lastly, the study suggests that education management strategies should prioritize the use of technology to facilitate lifelong learning opportunities for students. Technology can provide students with access to a wide range of resources and tools that enable them to continue learning beyond the classroom. This can enhance student engagement, motivation, and academic performance by fostering a culture of lifelong learning. Education management strategies should prioritize student motivation, feedback, and assessment processes, teacher professional development in the use of technology, and lifelong learning opportunities as key components of teaching practices. By implementing these strategies, education management can enhance student engagement, motivation, and academic performance through the use of technology.

## CONCLUSION

In conclusion, this study has provided valuable insights into the impact of technology innovation and education management strategies on student engagement in MAN Paser. The study has highlighted the need for teacher training and professional development, project-based learning, collaborative learning, and student motivation as key factors in promoting student engagement through the use of technology. These findings have important implications for education management strategies in MAN Paser and beyond, as they provide practical recommendations for improving student engagement through the use of technology in teaching practices. Further research is needed to explore these recommendations further and test their effectiveness in different contexts.

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