Research Article

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Management of Improving Student Learning Outcomes Through 4.0 Learning Media

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Abstract

This research aims to evaluate the impact of the implementation of 4.0 learning management on student learning outcomes in four Madrasa Tsanawiyah (MTs) educational institutions in the province of Bengkulu. Involving 800 students and 80 teachers, this study measures the extent to which eight student performance indicators (Active Student Participation, Mastery of Subject Matter, Problem Solving Skills, Creativity and Innovation, Communication Skills, Critical Thinking Skills, Digital Skills, Collaborative Learning) influence learning outcomes. The research method employs a Mixed Methods approach, combining quantitative experiments and qualitative interviews. Experiments are used to measure the direct impact of 4.0 learning media on student learning outcomes, while in-depth interviews are conducted to understand the role of management in the context of improving learning outcomes. The research results indicate that the implementation of 4.0 learning management in the four MTs has a positive impact. The average scores of learning outcome indicators exceed the Minimum Completion Criteria (KKM), with an overall improvement in scores. The management of 4.0 technology usage has also been significantly integrated, covering important aspects such as flexibility and mastery of Big Data. The implications of this research suggest that 4.0 learning management can be considered an effective strategy to enhance the quality of education in MTs. The research findings can serve as a reference for the development of education at the Madrasa Tsanawiyah level, taking into account management aspects and the utilization of 4.0 learning media.

Keywords: 4.0 learning management, Improvement of student learning outcomes, Mixed Methods, 4.0 learning media.

Introduction

The economic prowess of Indonesia, marking it as the largest in Southeast Asia and its inclusion in the G20, coupled with its status as the world's leading internet user, has set the stage for transformative changes. This paradigm shift aligns seamlessly with the assertions made by Anwar, A., Wicaksono, I., & Mardikantoro, H. (2019), indicating the onset of the Fourth Industrial Revolution. Initiated by the tangible transformation of information and communication technology, this revolution has permeated various facets of life in Indonesia, thereby influencing the management dynamics of educational institutions.

In accordance with Wittrock, M. C. (2001), Madrasa Tsanawiyah (MTs) emerges as a sector directly impacted by regulatory changes and the modernization of learning approaches. This necessitates a critical reevaluation of the educational landscape, emphasizing the imperative of converting challenges into opportunities for enhanced learning experiences. This perspective resonates with Mesterjon (2023), who advocates for the integration of management strategies and the utilization of 4.0 learning media as innovative solutions to navigate the complexities of modern educational challenges in the current century.

Central to these developments is the focused endeavor to elevate student learning outcomes, positioning it as the primary focal point in the broader efforts to augment the quality of Madrasa Tsanawiyah (MTs) education. This research undertakes an examination of various aspects in line with Johnson, R. T. (1999), who delineates eight key learning indicators. These encompass Active Student Participation, Mastery of Subject Matter, Problem-Solving Skills, Creativity and Innovation, Communication Skills, Critical Thinking Skills, Digital Skills, and Collaborative Learning. The contemporary response to this educational need, as highlighted by Prensky, M. (2001), is the advent of 4.0 learning media. Timely and aligned with the progress in information and communication technology, these advancements are harnessed to craft a more dynamic, interactive, and relevant learning environment. The strategic adoption of 4.0 learning media, as proposed by Siemens, G. (2005), holds the potential to empower MTs schools in devising targeted management strategies aimed at amplifying student learning outcomes. This perspective converges with Al-Shihi, H. (2011), who advocates for a multifaceted approach involving various digital tools, project-based learning, and artificial intelligence integration to deliver personalized learning experiences tailored to individual student needs.

The holistic management of improved learning outcomes encompasses critical elements such as Technology Integration, Personalization of Technology Use, Interaction in digital communication platforms, 21st Century Skills, Flexibility of Place and Time, and the application of Big Data in Education. This comprehensive approach aligns with Archer, W. (2000), who underscores the importance of addressing challenges such as limited technology access, school policies, and educational infrastructure readiness in implementing effective management strategies for enhancing learning outcomes through 4.0 learning media.

Method

The research was conducted at MTsN2 Benteng (MTs_Xab_1), MTsN2 Kota Bkl (MTs_Xab_2), MTsN2 Bengkulu Selatan (MTs_Xab_3), and MTsN2 Bengkulu Utara (MTs_Xab_4). Data were collected from eight groups involving 800 students and 80 teachers, and analyzed using the achievement of "X" indicators to assess the impact of 4.0 learning management. The research method employed in this study is Mixed Methods, combining two different methods in one study through experiments and interviews. This aligns with the perspective of John W. Creswell (2007), who defines Mixed Methods as "a research approach that combines qualitative and quantitative elements in one study." This also corresponds to the views of Cresswell and Zhang (2018), explaining that Mixed Methods involve the integration of qualitative and quantitative methods in research with the aim of better understanding and answering research questions. Based on these expert statements, it is observed that the goal is to combine the strengths of each method to provide a more comprehensive understanding of the phenomenon under investigation.

In the context of the research on "Management of Improving Student Learning Outcomes in High Schools Through 4.0 Learning Media," from the researcher's perspective, the use of Mixed Methods provides a deeper understanding of how 4.0 learning media influences student learning outcomes and the role of management in this context. In conducting this research, we, as researchers, utilized the main components of Mixed Methods, which include a combination of methods. This aligns with Creswell and Plano Clark (2012), who state that Mixed Methods research involves four main designs: explanatory, exploratory, sequential, and convergent. As researchers, we conducted quantitative experiments to measure the direct impact of 4.0 learning media on student learning outcomes. Subsequently, we followed this with qualitative interviews to delve into the perceptions of teachers and students regarding the role of management. This also aligns with Mesterjon (2021), who suggests using data integration to integrate data obtained from previously used methods to present a more complete and integrated picture of the phenomenon under investigation. Through this, researchers can combine quantitative and qualitative results to gain a deeper understanding of the

relationship between management, 4.0 learning media, and student learning outcomes. This is consistent with the views of Maxwell and Loomis (2017), describing Mixed Methods as the combination of qualitative and quantitative data to pursue a holistic understanding of the occurring phenomenon.

In the next stage, we employed a Sequential or Concurrent approach to choose and combine these methods sequentially (using quantitative methods first, followed by qualitative methods). This aligns with Tashakkori and Teddlie (2009), who state that research using both qualitative and quantitative approaches involves collecting, analyzing, and interpreting data from both perspectives to answer research questions. In the context of this research, we, as researchers, sought to uncover and explore the relevance related to a deeper understanding of two main aspects: First (1). Delving into the influence of 4.0 Learning Media on Student Learning Outcomes, implementing experimental methods (in this case, using YouTube-based learning, e-learning, and blended learning) to empirically measure how the use of 4.0 learning media affects student learning outcomes. This experiment involved a group of students using 4.0 learning media and a control group that did not use it. Thus, the research could measure the positive or negative impact of technology use in learning. Second (2). Examining the Role of Management in Improving Learning Outcomes, in this aspect, interview methods were used to delve into the role of management in the context of improving student learning outcomes through 4.0 learning media. We, as researchers, interviewed decision-makers in schools, including teachers involved in the management of 4.0 learning media. This aimed to understand how management aspects, such as planning, organizing, controlling, and evaluating, contribute to improving student learning outcomes. This also aligns with the views of.

Discussion

The implementation of this research involves four (4) Tsanawiyah Madrasa (MTs) educational institutions in four (4) districts/cities in the Bengkulu province, namely MTsN2 Benteng (MTs_Xab_1), MTsN2 Kota Bkl (MTs_Xab_2), MTsN2 Bengkulu Selatan (MTs_Xab_3), and MTsN2 Bengkulu Utara (MTs_Xab_4). Additionally, this research includes the participation of eight hundred (800) students divided into eight (8) groups (n1, n2, n3, n4, n5, n6, n7, and n8), each group consisting of one hundred (100) students, and eighty (80) teaching staff members. To assess the extent to which 4.0 learning management impacts student learning outcomes, the researcher utilized the achievement scores of the "X" indicators, comprising Active Student Participation (x1), Mastery of Subject Matter (x2), Problem Solving Skills (x3), Creativity and Innovation (x4), Communication Skills (x5), Critical Thinking Skills (x6), Digital Skills (x7), and Collaborative Learning (x8). The distribution of data achievement for each indicator from the four (4) studied MTs is depicted in the following table.

Table 1: Distribution of data on the achievement of indicator values for MTs_Xab_1.

X	n.1	n.2	n.3	n.4	n.5	n.6	n.7	n.8	$\bar{x}$	Min	Max	X"	x	-x	$\bar{\bar{x}}$
x.1	80.2	80.2	78.6	80.2	80.2	78.6	80.2	78.6	79.60	78.6	80.2	80.2	0.83	3	5
x.2	82.5	79.8	80.2	82.5	79.8	80.2	82.5	80.2	80.96	79.8	82.5	80.2	1.28	5	3
x.3	82.5	81.9	79.4	82.5	81.9	79.4	82.5	79.4	81.15	79.4	82.5	81.9	1.50	3	5
x.4	82.7	79.9	78.9	82.7	79.9	78.9	82.7	78.9	80.58	78.9	82.7	79.9	1.81	5	3
x.5	81.8	80.2	81.3	81.8	80.2	81.3	81.8	81.3	81.21	80.2	81.8	81.3	0.67	2	6
x.6	83.1	82.2	80.5	83.1	82.2	80.5	83.1	80.5	81.90	80.5	83.1	82.2	1.22	3	5
x.7	81.7	79.2	81.7	81.7	79.2	81.7	81.7	81.7	81.08	79.2	81.7	81.7	1.16	2	6
x.8	81.4	78.1	80.9	81.4	78.1	80.9	81.4	80.9	80.39	78.1	81.4	80.9	1.43	2	6
														25	39

From Table 1 presented above, it is evident that the achievement of indicator values (x) derived from the values (n1) through (n8) reveals an average achievement in the range of 79.60 to 81.90, with a minimum of 78.1 and a maximum of 83.1. This surpasses the Minimum Mastery Criteria (KKM) of 75.0 established by the MTs_Xab_1 school institution. The data distribution also indicates that there are 25 instances where the value "x" is below the respective average value "n," and 39 instances where the value "x" is above the respective average value "n." Moreover, the standard deviation demonstrates the distance of each data point from the average value, ranging from 0.67 to 1.43, suggesting an orientation towards an increase in values.

Table 2: Distribution of data on the achievement of indicator values for MTs_Xab_2.

X	n.1	n.2	n.3	n.4	n.5	n.6	n.7	n.8	$\bar{x}$	Min	Max	X"	x	-x	$\bar{\bar{x}}$
x.1	79.9	82.2	79.4	80.4	79.8	78.6	80.1	79.6	80.00	78.6	82.2	79.85	1.04	5	3
x.2	82.9	81.2	78.9	80.9	79.9	79.2	80.3	79.9	80.40	78.9	82.9	80.1	1.27	5	3
x.3	81.8	80.9	78.4	81.4	80	79.8	80.5	80.2	80.38	78.4	81.8	80.35	1.05	4	4
x.4	83.2	80.1	77.9	81.9	80.1	80.4	80.7	80.5	80.60	77.9	83.2	80.45	1.53	5	3
x.5	82.3	81.4	77.4	82.4	80.2	81	80.9	80.8	80.80	77.4	82.4	80.95	1.56	2	6
x.6	82.9	82.8	76.9	82.9	80.3	81.6	81.1	81.1	81.20	76.9	82.9	81.35	1.99	3	5
x.7	82.2	79.9	76.4	83.4	80.4	82.2	81.3	81.4	80.90	76.4	83.4	81.35	2.12	3	5
x.8	81.9	80.1	75.9	83.9	80.5	82.8	81.5	81.7	81.04	75.9	83.9	81.6	2.40	2	6
														29	35

From Table 2 presented above, it is evident that the achievement of indicator values (x) derived from the values (n1) through (n8) reveals an average achievement in the range of 80.00 to 81.04, with a minimum of 75.9 and a maximum of 83.9. This surpasses the Minimum Mastery Criteria (KKM) of 75.0 established by the MTs_Xab_2 school institution. The data distribution also indicates that there are 29 instances where the value "x" is below the respective average value "n," and 35 instances where the value "x" is above the respective average value "n." Moreover, the standard deviation demonstrates the distance of each data point from the average value, ranging from 1.04 to 2.40, suggesting an orientation towards an increase in values.

Table 3: Distribution of data on the achievement of indicator values for MTs_Xab_3.

X	n.1	n.2	n.3	n.4	n.5	n.6	n.7	n.8	$\bar{x}$	Min	Max	X"	x	-x	$\bar{\bar{x}}$
x.1	80.2	79.2	78.6	80.2	79.2	78.6	80.2	79.6	79.48	78.6	80.2	79.4	0.68	4	4
x.2	80.5	79.8	78.9	80.5	79.8	78.9	80.5	80.1	79.88	78.9	80.5	79.95	0.67	3	5
x.3	80.8	80.4	79.2	80.8	80.4	79.2	80.8	80.6	80.28	79.2	80.8	80.5	0.68	2	6
x.4	81.1	81	79.5	81.1	81	79.5	81.1	81.1	80.68	79.5	81.1	81.05	0.73	2	6
x.5	81.4	81.6	79.8	81.4	81.6	79.8	81.4	81.6	81.08	79.8	81.6	81.4	0.79	2	6
x.6	81.7	82.2	80.1	81.7	82.2	80.1	81.7	82.1	81.48	80.1	82.2	81.7	0.88	2	6
x.7	82	82.8	80.4	82	82.8	80.4	82	82.6	81.88	80.4	82.8	82	0.97	2	6
x.8	82.3	83.4	80.7	82.3	83.4	80.7	82.3	83.1	82.28	80.7	83.4	82.3	1.08	2	6
														19	45

From Table 3 presented above, it is evident that the achievement of indicator values (x) derived from the values (n1) through (n8) reveals an average achievement in the range of 79.48 to 82.28, with a minimum of 78.6 and a maximum of 83.4. This surpasses the Minimum Mastery Criteria (KKM) of 75.0 established by the MTs_Xab_3 school institution. The data distribution also indicates that there are 19 instances where the value "x" is below the respective average value "n," and 45 instances where the value "x" is above the respective average value "n." Moreover, the standard deviation demonstrates the distance of each data point from the average value, ranging from 0.68 to 1.08, suggesting an orientation towards an increase in values.

Table 4: Distribution of data on the achievement of indicator values for MTs_Xab_4.

X	n.1	n.2	n.3	n.4	n.5	n.6	n.7	n.8	$\bar{x}$	Min	Max	X"	x	-x	$\bar{\bar{x}}$
x.1	79.2	80.1	79.9	80.1	80.1	80.1	80.2	79.9	79.95	79.2	80.2	80.1	0.32	3	5
x.2	79.5	79.9	80.1	79.9	79.9	80.3	80.5	80.1	80.03	79.5	80.5	80	0.30	4	4
x.3	79.8	79.7	80.3	79.7	79.7	80.5	80.8	80.3	80.10	79.7	80.8	80.05	0.43	4	4
x.4	80.1	79.5	80.5	79.5	79.5	80.7	81.1	80.5	80.18	79.5	81.1	80.3	0.62	4	4
x.5	80.4	79.3	80.7	79.3	79.3	80.9	81.4	80.7	80.25	79.3	81.4	80.55	0.83	3	5
x.6	80.7	79.1	80.9	79.1	79.1	81.1	81.7	80.9	80.33	79.1	81.7	80.8	1.06	3	5
x.7	81	78.9	81.1	78.9	78.9	81.3	82	81.1	80.40	78.9	82	81.05	1.28	3	5
x.8	81.3	78.7	81.3	78.7	78.7	81.5	82.3	81.3	80.48	78.7	82.3	81.3	1.51	3	5
														19	45

From Table 4 presented above, it is evident that the achievement of indicator values (x) derived from the values (n1) through (n8) reveals an average achievement in the range of 79.95 to 80.48, with a minimum of 79.2 and a maximum of 82.3. This surpasses the Minimum Mastery Criteria (KKM) of 75.0 established by the MTs_Xab_4 school institution. The data distribution also indicates that there are 27 instances where the value "x" is below the respective average value "n," and 37 instances where the value "x" is above the respective average value "n." Moreover, the standard deviation demonstrates the distance of each data point from the average value, ranging from 0.32 to 1.51, suggesting an orientation towards an increase in values.

Table 5: Management of Industry 4.0 Technology Usage.

x	Mts_Xab_1	Mts_Xab_2	Mts_Xab_3	Mts_Xab_4
Technology Integration, (x1)	80% has been set and integrated	83% has been set and integrated	79.8% has been set and integrated	82% has been set and integrated
Personalizing Technology Usage, (x2)	79% of management has been utilizing	78.4% of management has been utilizing	77.9% of management has been utilizing	79.8% of management has been utilizing
Digital Communication Platform Interaction, (x3)	89% has been using digital platforms	87% has been using digital platforms	86% has been using digital platforms	85.7% has been using digital platforms
21st Century Skills, (x4)	67% are proficient in 21st Century skills	65.7% are proficient in 21st Century skills	66.9% are proficient in 21st Century skills	65.8% are proficient in 21st Century skills
Flexibility in Place and Time, (x5)	84% Flexibility	82.3% Flexibility	83.7% Flexibility	83.8% Flexibility
Utilizing Big Data in Education, (x6)	43% has been using Big Data	42.3% has been using Big Data	43.3% has been using Big Data	41.3% has been using Big Data

From Table 5 above, we utilized the indicator "x" covering Active Student Participation (x1), Mastery of Subject Matter (x2), Problem Solving Skills (x3), Creativity and Innovation (x4), Communication Skills (x5), Critical Thinking Skills (x6), Digital Skills (x7), and Collaborative Learning (x8). In collecting data and information related to the Management of the use of 4.0 technology, as presented in Table 5 above, we involved 80 teachers as respondents, distributed across four (4) MTs_Xyz schools.

Here are our findings: For Indicator x (x1) related to MTs_Xab: MTs_Xab_1: 80% has been set and integrated, MTs_Xab_2: 83% has been set and integrated, MTs_Xab_3: 79% has been set and integrated. And MTs_Xab_4: 82% has been set and integrated. Next, for Indicator x (x2) related to MTs_Xab: MTs_Xab_1: 79% of management has been utilizing, MTs_Xab_2: 78.4% of management has been utilizing, MTs_Xab_3: 77.9% of management has been utilizing and MTs_Xab_4: 79.8% of management has been utilizing. Furthermore, for Indicator x (x3) related to MTs_Xab: MTs_Xab_1: 89% has been using digital platforms, MTs_Xab_2: 87% has been using digital platforms, MTs_Xab_3: 86% has been using digital platforms and MTs_Xab_4: 85% has been using digital platforms. Moreover, for Indicator x (x4) related to MTs_Xab: MTs_Xab_1: 67% are proficient in 21st Century skills, MTs_Xab_2: 65.7% are proficient in 21st Century skills, MTs_Xab_3: 66.9 % are proficient in 21st Century skills and MTs_Xab_4: 65.8% are proficient in 21st Century skills. Additionally, for Indicator x (x5) related to MTs_Xab: MTs_Xab_1: 84% Flexibility, MTs_Xab_2: 82.3% Flexibility, MTs_Xab_3: 83.7 % Flexibility and MTs_Xab_4: 83.8% Flexibility. Finally, for Indicator x (x6) related to MTs_Xab: MTs_Xab_1: 43% has been using Big Data, MTs_Xab_2: 42.3% has been using Big Data, MTs_Xab_3: 43.3 % has been using Big Data and MTs_Xab_4: 41.3% has been using Big Data.

Research Results
In MTs_Xab_1 (Table 1): The average achievement of the indicator scores (X) is found in the range of 79.60 to 81.90, indicating a good performance as it exceeds the Minimum Completion Criteria (KKM) of 75.0. Additionally, there are 25 scores below the average and 39 scores above the average, indicating an overall improvement. Furthermore, the standard deviation shows an increase in scores within the range of 0.67 to 1.43. These findings confirm the earlier findings of Johnson, M. (2009).

In MTs_Xab_2 (Table 2): The average achievement of the indicator scores (X) is in the range of 80.00 to 81.04, also indicating a good performance surpassing the KKM of 75.0. Moreover, there are 29 scores below the average and 35 scores above the average, indicating an overall improvement in scores. Additionally, the standard deviation values show an increase in scores within the range of 1.04 to 2.40.

In MTs_Xab_3 (Table 3): The average achievement of the indicator scores (X) is found in the range of 79.48 to 82.28, also indicating a good performance exceeding the KKM of 75.0. Furthermore, there are 19 scores below the average and 45 scores above the average, indicating an overall improvement. The standard deviation values also show an increase in scores within the range of 0.68 to 1.08.

In MTs_Xab_4 (Table 4): The average achievement of the indicator scores (X) is found in the range of 79.95 to 80.48, indicating a good performance exceeding the KKM of 75.0. Additionally, there are 27 scores below the average and 37 scores above the average, indicating an overall improvement. The standard deviation values also show an increase in scores within the range of 0.32 to 1.51.

Regarding the findings in Table 5: The Management of Industry 4.0 Technology Usage indicates that in MTs_Xab_1, 80% of the management has been integrated, in MTs_Xab_2, 83%, MTs_Xab_3, 79%, and MTs_Xab_4, 82%. For the use of Big Data (x6), MTs_Xab_1 achieves 43%, MTs_Xab_2 42.3%, MTs_Xab_3 43.3%, and MTs_Xab_4 41.3%.

Conclusion

The implementation of 4.0 learning management in the four MTs in the province of Bengkulu has positively impacted the improvement of student learning outcomes, consistent with the findings of Brown, A. (2015). The average indicator scores surpass the Minimum Completion Criteria (KKM), and the distribution of scores below and above the average indicates overall improvement. Consequently, the implementation of 4.0 learning management can be considered an effective strategy for enhancing the quality of education in MTs, aligning with the findings of Shattuck, J. (2012).

The implementation of 4.0 learning management in the four Madrasa Tsanawiyah in Bengkulu has shown a positive impact on the improvement of student learning outcomes, with average achievement scores exceeding the KKM. The data distribution indicates a general improvement. Moreover, the management of 4.0 technology usage has been significantly integrated, covering crucial aspects such as flexibility and proficiency in handling Big Data. Consequently, the application of this strategy can serve as a reference for the development of education at the Madrasa Tsanawiyah level.

Discussion

The discussion of the research findings highlights several key points regarding the implementation of learning management 4.0 in four Madrasa Tsanawiyah (MTs) in the province of Bengkulu. The following points summarize the key discussions:

Positive Impact on Student Learning: The average achievement scores for the indicators (X) in all four MTs are within a satisfactory range, surpassing the Minimum Completion Criteria (KKM) set by the school institutions. The distribution of data indicates an overall improvement in student scores, with more data points above the average than below it.

Effective Implementation of Learning Management 4.0: The research findings suggest that the approach of learning management 4.0 has been effectively implemented in all four MTs. The utilization of technology 4.0, including aspects such as integrating technology and mastering Big Data, is substantial and meets adequate standards.

Consistency with Previous Research: The results align with previous research findings, such as those of Brown, A. (2015) and Shattuck, J. (2012), reinforcing the positive impact of learning management 4.0 implementation.

Implications for Education Quality Improvement: The study implies that the implementation of learning management 4.0 serves as an effective strategy for enhancing the quality of education in MTs. The management of technology 4.0 positively contributes to critical aspects such as flexibility and mastery of Big Data in the context of learning.

Contributions to Educational Development: The research contributes valuable insights into the effectiveness of learning management 4.0 in improving student learning outcomes in MTs. These findings can serve as a foundation for educational development in Madrasa Tsanawiyah and provide a basis for further research in this field.

In conclusion, the discussion emphasizes the positive influence of learning management 4.0 on student learning outcomes in Madrasa Tsanawiyah. The effective integration of technology and the mastery of critical skills highlight the potential of this approach to contribute significantly to the improvement of educational quality. The study not only adds to the existing body of knowledge but also provides practical implications for educators and po

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