



DIGITAL TRANSFORMATION TO IMPROVE TEACHERS' LEARNING MANAGEMENT AND STUDENTS' SCIENCE LIFE SKILLS

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ABSTRACT

This study aims to describe the quality of teachers' learning management based on digital transformation and improving students' science life skills. Paradigm change shifts in the context of learning based on textbooks to switching to learning accompanied by digital technology that has forced better teacher competence so that they can surf well in class. The sample in this study was 270 eighth-grade students in junior high and eight science study field teachers on the concept of the human circulatory system. This research used a mixed method with a sequential exploratory design, combining qualitative and quantitative data analysis. The study results show that digital transformation strategies can create teachers' learning management that is fun, meaningful, full of creativity, and effective in terms of time and cost. The findings in this study are (1) Digital transformation is one of the teachers' strategies to create better quality, fun, meaningful, creative, and effective learning management in class; (2) The implementation of digital transformation-based teachers' learning management can explore students' science life skills on the circulatory system. This research concludes that the application of digital transformation can improve the quality of teachers' learning management and students' science life skills in the Bireuen District.

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Keywords: digital transformation; science life skill; teachers' learning management

INTRODUCTION

Increasingly dynamic technological advances bring about various changes in human life, including education. According to Chaiyama and Kaewpila (2022), changes in education require a holistic development process so that students are reliable and skilled through teaching transformation that can facilitate the birth of students' active problem-solving, creative thinking, and communication skills in daily life. The demand for those skills in daily life is one indicator of students who are skilled at facing future challenges. This

phenomenon requires teachers' high innovation in learning, especially in science subjects. Science teachers' readiness can be called an urgency to develop teachers' skills in the 21st century. It cannot be denied that science teachers play a significant role in global developments that demand science learning to be well-packaged through digital-based learning so that it will support global competition through the attainment of students' high-level thinking skills, problem-solving, character-building, and social skills. Aspects of 21st-century skills, according to Paiwithayasiritham and Yanprechaset (2023), consist of creativity, critical thinking, problem-solving and metacognition, communication, collaboration, informati-

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on, and technological literacy. This 21st-century skill is an aspect that needs to be developed in students. Besides competency in the knowledge dimension, these aspects will also shape students' activities after graduation. Therefore, science subjects, which in context have much difficult material, need high innovation to synergize with students' 21st-century skills.

Therefore, teacher's competency or innovational ability in implementing digital-based learning management is one of the urgency in this research to produce graduates relevant to 21st-century competencies and demands in the world of work and industry. The innovational ability per technological developments is one of the characteristics of teachers who transformed into digital developments in learning. El-Sofany and El-Haggar (2020) mention technology as an effective way to improve students' skills, such as positive thinking, collaboration, and communication. It is considered a major part of innovations in many areas of e-learning research. The change of order to digital technology is called digital transformation, a phenomenon of change in all lifelines, including education. Rahiem (2020) states that the COVID-19 outbreak seems to be a significant change in education, where, in a relatively short time, all elements within the body of Indonesian education are forced to change and switch to digitalization. There are various challenges in the world of work in the present, and the future will also demand the ability to use technology for school and higher education graduates.

According to Amhag et al. (2019), Evens et al. (2017), and Rizal et al. (2020), teachers and students will enjoy various advantages of using technology in learning, including (a) Digital competence of teachers and students can be increased through the use of technology; (b) The time and place of implementation of learning can be more flexible; (c) The effectiveness of using technology can be in saving time and costs; (d) Using technology in learning follows the characteristics of 21st-century learning for Generation Z so that it is likely to facilitate learning for students, especially in science. Because science learning has a strong composition between knowledge and skills, it is very much in line with the nature of knowledge, which is a process of thinking, investigating, and interacting between technology and its environment (Haviz et al., 2018). Furthermore, Syefrinando et al. (2022) state that technology is a form of digital transformation that makes it easy for teachers to line up and transfer informa-

tion with various digital touches, such as using scrapbooks, e-learning, and other applications.

Digital literacy is also part of digital transformation, which can facilitate information delivery, finding something, assessing it, and using data in the learning process (Syefrinando et al., 2022). Park et al. (2021) define digital literacy as a multidisciplinary field covering literacy, ICT, internet, computer skills proficiency, science, nursing, health, and education. Digital literacy practitioners range from elementary school students to professionals, and the writing clusters related to digital literacy vary according to each country. Marnita et al. (2020) and Syefrinando et al. (2022) argue that digital media provides opportunities to transfer information and data to be accessed more quickly with a broader range. Students with good digital literacy skills are believed to be able to search, find, apply, and evaluate various information or knowledge to support the implementation of learning (Albena et al., 2020; Liesa-Orús et al., 2020). It shows that digital literacy has a good impact on students. What about teachers? Teachers are a profession whose competencies must constantly be developed and aligned with teaching and learning styles in the 21st century, which are based on digital literacy.

The teaching profession requires the ability with all the teacher competencies. Competent teachers usually carry out all their duties in a professional manner. Teacher competence generally consists of pedagogical, personal, social, and professional competence (Muspawi et al., 2020; Masry-Herzalah & Dor-Haim, 2022). Teacher pedagogical competence is the teacher's ability to carry out learning management in the classroom well to have a good impact on students' learning outcomes (Muspawi et al., 2020). It makes teachers' learning management the most crucial thing in the learning process because it is related to achieving indicators and learning objectives (Saputra, 2020). Teachers' learning management can be defined as the skill to plan, lead, implement, and evaluate a meaningful and effective learning process for students. Thus, so that classroom learning can follow the demands of 21st-century skills and activate and delight students, a teacher must have relevant pedagogical competencies to act as a professional teacher. According to García-Ruiz et al. (2023) and Garzón-Artacho et al. (2021), one of the challenges in teachers' professionalism is the ability to teach teachers based on digital competence, which must be met by teaching staff and must incorporate these skills into practice their profession.

The teacher's ability to innovate with digital competence will give birth to 21st-century skills in students, including constructing knowledge, solving real-world problems, and having the skills to communicate, collaborate, and use information technology (Stehle & Peters-Burton, 2019). Lavi et al. (2021) and Liesa-Orús et al. (2020) mention that 21st-century skills for science, technology, engineering, and mathematics students are challenging for teachers to adapt. Teacher pedagogic competence, one of the levels of teacher professionalism, is hoped that students will understand, design, carry out, and evaluate learning and develop students to actualize their various potentials or master learning management in class competently (Yazon et al., 2019; Tejedor et al., 2020; Audrin & Audrin, 2022). However, changes in the world of education and changes in the character of students who have been digitally transformed have provided the broadest possible opportunity for students to get all kinds of information or abundant knowledge quickly by surfing Google or Chrome or others. This is undoubtedly the biggest challenge for teachers, especially those who cannot adapt to change. The degradation of teacher competence in 21st-century competency-based learning has become a trending topic, with various opinions developing among education experts. Therefore, it is broadly the responsibility of all parties to upgrade teacher pedagogical competencies in the 21st-century learning era. The consensus results show that teachers are vital in integrating technology into learning (Kirschner, 2015; Guggemos & Seufert, 2021).

Teachers can abandon old habits in teaching, which are only based on teacher notes or textbooks, and switch to digitalization or digital transformation. Teachers' learning management and the teacher's ability to switch to digital transformation will change simultaneously. Choroso-va et al. (2020), García-Ruiz et al. (2023), Iivari et al. (2020), and Yazon et al. (2019) explain that the application of ICT in Education systems can facilitate and expand access to educational networks, increase educational equity and learning quality, increase teacher professionalism, and create more effective and efficient learning management and governance (Bond et al., 2018; Profit, 2019). Thus, digital transformation can be a strategy to improve teachers' learning management. The concept of digital literacy, or more narrowly called the use of ICT in learning, essentially has a role as learning media such as PowerPoint slides,

learning animations, and learning videos, independent learning media such as LMS (Learning System Management) or e-learning (Choroso-va et al., 2020; Junindra et al., 2021; Saputro et al., 2021). Junindra et al. (2021) state that students can obtain fun, creative, and innovative learning experiences through teachers' learning management based on ICT Literacy (Information and Communication Technology). Teachers must design learning concepts based on digital media because this is the lifestyle of Generation Z students in their current daily lives (Istiyowati et al., 2021; Saputro et al., 2021). Teachers should use technology in their teaching in a way that is conducive to achieving meaningful pedagogical goals (Frailon et al., 2020; Guggemos & Seufert, 2021). On the other hand, teachers must also integrate new content into learning by changing teaching focus based on digital transformation.

This design can be packaged as a teacher's learning approach or class strategy, especially for junior high school science subjects. According to Wael et al. (2018), a strategy or approach is a learning design designed by the teacher, beginning with planning, implementing, and evaluating to achieve goals. The digital transformation strategy is used by teachers in the teaching and learning process, which starts with planning and ends with evaluation (plan, do, see) to create a fun, creative, and effective learning process and achieve science learning goals. Ben-Atar and Ben-Asher (2023) state that digitalization in learning is one of the characteristics of 21st-century learning, so digital-based media literacy must be integrated into professional development. Integrating digital literacy into science teaching materials is very useful for students in real life in the future (Techataweewan & Prasertsin, 2018; Chaiyama & Kaewpila, 2022). Some of the results of previous research show that integrating digitalization into learning can develop students more than just mastering concepts but practicing various 21st-century skills. One of the expected 21st-century skills for students is life skills. Life skills are vital (Saddiq, 2020; Chaiyama & Kaewpila, 2022). They will help students develop attitudes towards the subject, negotiate a better life, have a high level of productivity, and allow a person to manage interactions with other people and the environment. Rais et al. (2023) explain ten students' life skills in the 21st century that can be developed: creative thinking, critical thinking, metacognitive thinking, communication, collaboration, information literacy, digital literacy,

nationalism, work and career, and individual and social responsibility skills. Life skills will train students to have mental capital for life in the future through the ability to open new horizons for work, manage life management, adapt to modern changes and life needs, solve life problems, and practice different thinking skills. Paiwithayasirit-ham and Yanprechaset (2023) define life skills as a personal ability consisting of adaptability, flexibility, self-direction, leadership, good interpretation, and responsibility.

Thus, in this study, it is hoped that the digital transformation strategy can help teachers implement classroom learning management more interestingly and effectively and impact students' life skills by being trained as one of the 21st-century skills they should master. This study has two novelties: (1) The digital transformation is designed as a strategy in teachers' learning management in science subjects that will explore students' skills, such as constructing new knowledge, solving problems, developing communication skills, collaborating, and training to use information technology as needed; (2) Bringing up indicators of students' life skills as a result of implementing digital transformation in high school students. This digital transformation is expected to solve research problems and answer the research objectives to describe the quality of teachers' learning management based on digital transformation and improve the science life skills of junior high school students. The quality of teacher learning management in this research looks at teacher innovation in learning planning, implementation, and assessing learning evaluation aspects, especially student life skills about 21st-century competence. Therefore, the research question is, "How is the application of digital transformation to the quality of teachers' learning management and students' science life skills in Bireuen District?"

METHODS

This research was conducted in three junior high schools (SMP N 1 Peusangan Siblah Krueng, SMP N 2 Peusangan Siblah Krueng, and SMP N 3 Peusangan Siblah Krueng, Bireuen Regency) in human circulatory system material with a total of 270 students and eight science teachers involved. Determination of the research sample is determined by using the Slo-

vin equation, which is used for taking the number of samples that must be representative so that the research results can be generalized and the calculation does not require a table of the number of samples (Bertsche & Dazer, 2022). In this research, the researcher determines the sources of information related to the qualitative data needed. At the same time, sources of information related to quantitative data are designed based on the following Slovin formula equation.

$$n = \frac{N}{1+N(e)^2} \text{ ; with } \alpha \text{ of } 10\%$$

Information:

n = Sample size/number of respondents

N = Population size

e = percentage of accuracy of sampling errors that can still be tolerated is 10% or $e = 0.1$.

Before setting the subject, the researchers observed the initial data results through the distribution of questionnaires with 100 respondents who were taken randomly from junior high school teachers in the Peusangan sub-district of the Bireuen district. As for the preliminary observation data of four questions submitted to teachers through interview techniques: (1) Do you master technology (IT) in learning? (2) Have you ever used laptops, InFocus, and other types of technology when teaching? (3) Do you use the internet as a learning resource in class? (4) Do you use PowerPoint or other digital media in the teaching and learning process? Furthermore, the research method in this study is to use a mixed method with a research design using sequential exploratory (Åkerblad et al., 2021b). According to Creswell (2009), mixed research methods combine qualitative and quantitative research. The mixed method with a Sequential Exploratory design is appropriate because this research found empirical facts and descriptions of teachers' learning management problems in the classroom and evaluated the implementation of digital transformation in three junior high schools. According to Åkerblad et al. (2021a), the design of this research in the first stage was data collection and data analysis qualitatively, followed by a second stage of data collection and data analysis quantitatively to strengthen the quantitative results in the first stage. The stages of carrying out this mixed method research follow the mixed method with sequential exploratory design stages, as shown in Figure 1.

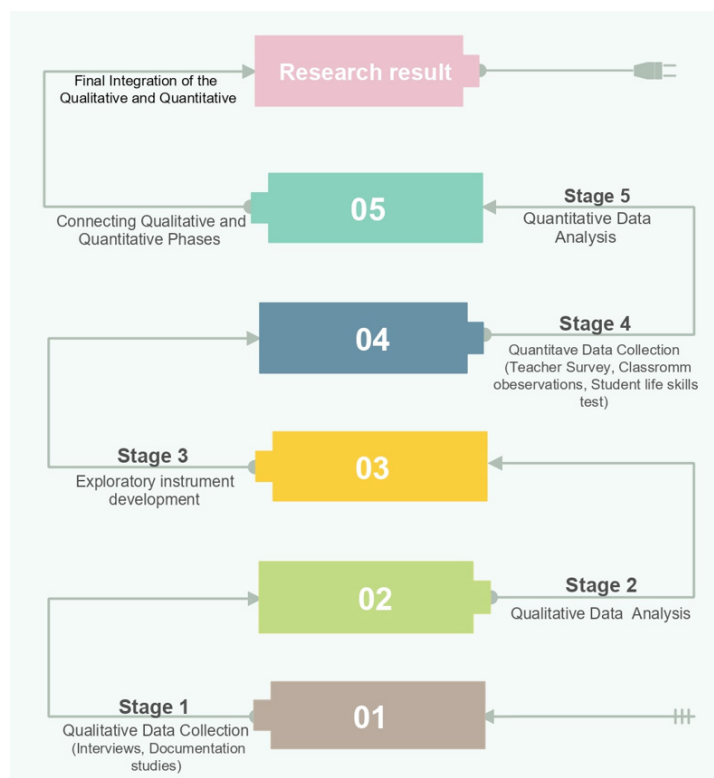


Figure 1. The Stages of Mixed Method with Sequential Exploratory

Based on Figure 1, the researchers collected qualitative and quantitative data. The validity of this qualitative data developed trust through four criteria: credibility, transferability, dependability, and confirmability (Diaz-Bazo, 2019). Data triangulation is carried out to get accurate and credible findings and interpretations. Triangulation is a technique in data collection to get more accurate and credible data findings and interpretations (McCreery et al., 2022). This qualitative data was obtained through observation, documentation studies, and interviews in the first stage. Interviews were conducted at different places and times at each respondent's school. During the documentation study and interviews with 100 junior high school teacher respondents, some of the researchers' questions were: (1) Are you familiar with technology (IT) in learning?; (2) Do you prepare technology-based lesson plans and worksheets such as TPACK, AR, or VR?; (3) Have you ever used laptops, InFocus, and other types of technology when teaching?; (4) Do you use PowerPoint, electronic media (Scrapbook), or other digital media in the teaching and learning process?; (5) Do you use Canva, Kinemaster, or video learning applications in the teaching and

learning process?; (6) Do you use the internet as a learning resource in class? Furthermore, from the observations, documentation studies, and interviews, the researchers assisted teachers in preparing technology-based learning tools and 21st-century learning.

(2) Quantitative Data Analysis. The second stage is the quantitative stage. The researchers collected data through tests of students' learning outcomes in the form of students' natural science life skills. Implementing the teaching and learning process in the classroom using technology-based learning tools and oriented towards 21st-century learning was carried out by teachers in the field of science studies on the circulatory system in humans in three face-to-face meetings. A life skills test was carried out at the end of the third meeting to obtain quantitative data from evaluation results of integrating digital transformation in teachers' learning management in the form of students' life skills. The test items given to students measure students' natural science life skills: creativity, critical thinking, problem-solving, teamwork, negotiation, and decision-making. These items have previously been tested for validity and reliability. The reliability test was conducted with

SPSS version 25 and the Alpha Cronbach formula. A good reliability test is suggested to have a Cronbach alpha value of more or equal to 0.6. According to Taherdoost (2018), the instrument's reliability can be seen from the Cronbach alpha value. Value <0.5 has low reliability, $0.5-0.7$ has moderate reliability, $0.7-0.9$ has high reliability, and >0.9 has very good reliability. The assessment instrument for creative thinking skills, critical thinking, problem-solving, teamwork, negotiation, and decision-making consists of 25 items tested by two experts to measure validity and reliability. The content validity test analysis obtained a very high category of 1,00, and based on the validity test of the items obtained r count $> r$ table, all items were declared valid. Furthermore, the analysis results of instrument reliability tests for the ability to think creatively, think critically, solve problems, work in teams, negotiate, and make decisions show very-high reliability criteria, equal to 0,96.

The percentage of completeness of students' learning outcomes through teachers' learning management using a digital transformation strategy on the circulatory system material in humans was calculated using the formula for the percentage of completeness of student learning outcomes, according to Sudijono (2018) by adding up the students' acquisition score, dividing it by the maximum score, then multiplying it with 100. Analysis of students' natural science life skills was carried out by calculating the average class score. Then, the results were qualified using the following guidelines in Table 1.

Table 1. Class Average Qualifications

No	Grade Point Average	Qualification
1	$81 \leq x \leq 100$	Good
2	$61 \leq x \leq 80$	Enough
3	$41 \leq x \leq 60$	Not enough
4	$21 \leq x \leq 40$	Low
5	$0 \leq x \leq 20$	Very low

The qualification percentage of completeness is done by calculating the number of students who obtain learning outcomes above the passing grade of 65. The percentage of completeness was calculated by comparing the number of students who passed the passing grade to the total number of students. Then, it is qualified by using the following guidelines in Table 2.

Table 2. Percentage of Completeness of Students' Science Life Skills

No	Completeness Percentage	Mastery Learning Outcomes
1	$81\% \leq x \leq 100\%$	Good
2	$61\% \leq x \leq 80\%$	Enough
3	$41\% \leq x \leq 60\%$	Not enough
4	$21\% \leq x \leq 40\%$	Low
5	$0 \leq x \leq 20\%$	Very low

\bar{X} = Students' science life skills

RESULTS AND DISCUSSION

The results of initial observations of 100 respondents consisting of teachers from three (3) junior high schools (SMP N 1 Peusangan Siblah Krueng, SMP N 2 Peusangan Siblah Krueng, and SMP N 3 Peusangan Siblah Krueng, Bireuen Regency) show that the teacher's learning strategy averagely has not used the digitalization approach in a good and structured way. It is irrelevant to the urgency of the characteristics of 21st-century learning for Generation Z, which should be prepared as a generation with adequate life skills. Even though, from a regulatory standpoint, the government has proclaimed teachers as innovative learning leaders, the results of documentation and survey studies show that there are still teachers who are not good at operating laptops.

On the other hand, students who are used to using gadgets to surf in their daily lives are not interested in following the learning process without the touch of digital technology. The following are preliminary observation data of four questions submitted to teachers through interview techniques: (1) Do you master technology (IT) in learning?; (2) Have you ever used laptops, InFocus, and other types of technology when teaching?; (3) Do you use the internet as a learning resource in class?; (4) Do you use PowerPoint or other digital media in the teaching and learning process?

Items 1-4 from Figure 2 are (1) Are you good at IT in learning?; (2) Have you ever used laptops, InFocus, and other types of technology when teaching?; (3) Do you use the internet as a learning resource in class?; (4) Do you use PowerPoint or digital media in learning? The results of this figure show the average gain, as presented in Figure 2.

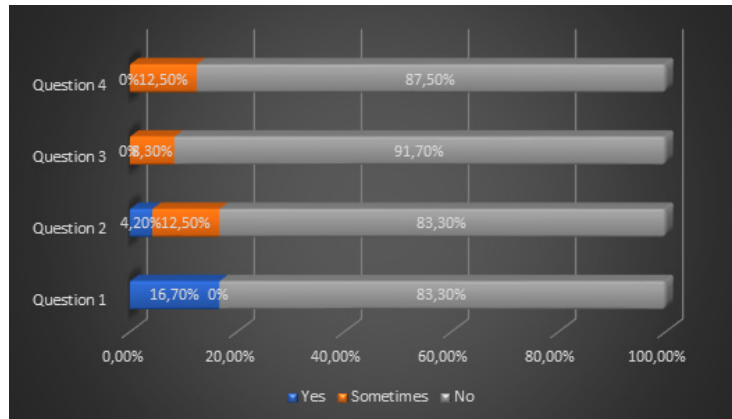


Figure 2. The Average Percentage of Respondents' Answers in the Preliminary Survey

Figure 3 shows that 86.45% of the interview answers state 'no,' which means that the teacher is not used to using technology in teaching and learning due to their limited ability to master IT. Furthermore, the observations and documentation studies also show that the percentage of teachers who master IT but are still not used to using various digital-based teaching strategies is still relatively low. Only four teachers out of a total of 24 teachers were observed and interviewed. Thus, the results of this qualitative data will become the basis for researchers regarding problems related to teachers' learning management that are still conventional in natural science subjects on the circulatory system in humans. The next step is to carry out a mentoring

program for teachers to change the management of teacher learning to strengthen the findings regarding quality through observation, documentation, and interviews. It begins with preparing learning tools, worksheets, and teaching media relevant to digital transformation in education. A team of teachers compiled learning tools through lesson plans and worksheets based on TPACK and HOTS. Furthermore, the teacher also prepares visual media in the form of learning videos on the circulatory system in humans. When the learning process occurs based on learning tools and learning video media that have been prepared, the teachers accompany students to resume all important notes in the form of an interesting and creative scrapbook.

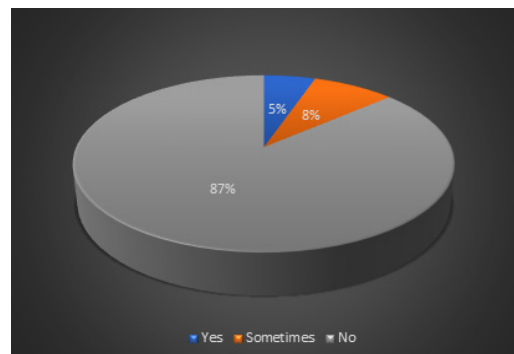


Figure 3. The Average Percentage of Respondents' Answers in the Preliminary Survey

This scrapbook media is very interesting for students. Students seem enthusiastic about finding various colorful pictures related to the circulatory system material in humans, which are then created as student scrapbooks. It can potentially train students' high-level skills and creativity to work while exploring the concept of the human circulatory system so that students can master this concept well. The learning process applied by the teacher with a digital transformation orientation shows a tremendous impact on students.

Students look very enthusiastic collaboratively in their groups, observe the teacher's explanation through the PowerPoint, listen to learning videos about the human circulatory system, and actively collect all the information from the teacher's explanations and learning videos into an interesting scrapbook. Compiling electronic notes in scrapbook media can build active interaction or communication between students and teachers, create good student collaboration within the group, and provoke students' creative ideas.

The digital transformation practiced in this study follows teachers' learning management, starting from planning, implementing, and evaluating success. Science teachers prepared the plans in three junior high schools (SMP N 1 Peusangan Siblah Krueng, SMP N 2 Peusangan Siblah Krueng, and SMP N 3 Peusangan Siblah Krueng, Bireuen Regency) where they prepared learning tools in the form of lesson plans and worksheets as well as evaluation tools which are oriented towards TPACK and HOTS. In learning, the teachers used PowerPoint slides and video learning materials on the human circulatory system, and students designed electronic notes in digital scrapbooks. The teacher distributed a digital scrapbook, designed using the Canva application, and asked students to perfect the contents of their scrapbook according to student creations related to the material conveyed through PowerPoint slides and learning videos on the circulatory system in humans. Teachers design learning management based on 21st-century skills and a touch of technology in each learning session. One is using TPACK (Technological Pedagogical Content Knowledge) in learning. According to Akyuz (2018), Juanda et al. (2021), and Tanak (2020),

TPACK, as a digital-based learning model, can explore the critical and creative thinking skills needed in science learning designed so that students will more easily absorb all science concepts.

The teachers' learning management implementation was obtained based on teacher interviews. Teachers' learning management is measured through observation, documentation study, and interviews. The interview contains questions related to the readiness of teachers to carry out learning management in the classroom with all digital transformations and whether teachers feel at ease in implementing digital-based learning. The interview results state that the teacher is accommodating in motivating students to be active in their learning with management based on digital transformation strategies. To complete the researchers' measurement of teachers' learning management in class, the researchers also interviewed students regarding the teaching and learning process they had gone through. The following is the conclusion of the results of student opinions regarding the ease and enjoyment of students towards the learning process carried out by teachers on a digital basis.

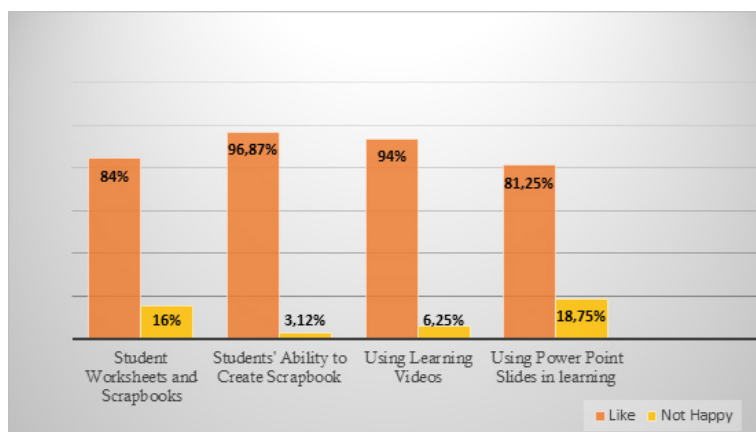


Figure 4. The Percentage of Students Who Liked Digital-Based Teachers' Learning Management

The results of interviews with teachers and students and researchers' documentation show that the teacher has carried out all learning management activities, starting from planning, implementing, and evaluating based on digital transformation. The teacher stated that students were more enthusiastic about participating in learning, so the teacher became more enthusiastic. The teacher stated that students' independent and group activity was evident when they were teaching, so the learning process in the class was student-centered. Thus, the teacher can carry out learning management in class very well, and learning is more student-centered. It means teachers'

learning management works effectively through digital-based learning processes. It is caused by the phenomenon of learning with digital media, which has high satisfaction for students who are familiar with various applications on cellphones or gadgets, which have become standard technology in students' lives. This finding is in line with Rizal et al. (2020) concerning the use of LMS as a form of digital transformation in learning, which shows that the level of satisfaction in using LMS reaches a high level with an average of 76.03%. At a significance level of 0.01, the adjusted R² value of the four predictor variables is 0.393.

Furthermore, the results of data analysis in this study indicate that teacher management is good with the teacher's digital competence, which is also quite satisfying. It can be seen from the students' enthusiasm to participate in the entire learning process, starting with teacher activities motivating students and instilling a nationalist character through singing the Indonesia Raya song accompanied by a music video instrument for the Indonesia Raya song. The teacher also shows PowerPoint slides and learning videos about the human circulatory system material. Students look very enthusiastic in following the lesson. The students also distribute electronic handouts called scrapbooks. This scrapbook is a part of the teacher's digital transformation and can also be a medium to train student skills. This is in line with Wusqo et al. (2021), who find that participants can increase their level of visual literacy quickly, and it can be concluded that digital science scrapbooks are effective for training students' visual literacy and life skills.

Furthermore, the researchers also distributed student response questionnaires to the learning process. This response questionnaire is intended to see student responses to changes in teacher teaching patterns. Student response questionnaires show that 92% of students like the teacher's teaching style using digital transformation. Analysis of teachers' learning management shows that digital transformation can improve teachers' learning management, which means that teacher pedagogic competence can increase as teachers can properly involve digitalization in learning. This finding is in line with Esteve-Mon et al. (2020), stating that digital competence is a fundamental ability in the 21st century, which is a new challenge for teachers to master various digitalization trends in education, for example, ar-

tificial intelligence, LMS, and others. Marnita et al. (2023) also state that digital literacy competencies are effective and efficient at improving teachers' learning management and can help students build their understanding, especially in science. Teachers and students have unlimited free time to study; students go through the learning process with enthusiasm. It aligns with Oddone (2022), stating that digital or online-based learning can be done without being limited by time and place.

Appropriate teachers' learning management competencies impact students' life skills in human circulatory system material. Life skills can be interpreted as psychological skills that involve new experiences in one's life. Student life skills can be seen in students' social-emotional intelligence when dealing with digital technology in the learning process, for example, in teaching video presentations and the Canva application. When organizing electronic scrapbook notes, students can be seen training themselves to analyze information, consider information, make the right decisions, and then communicate it effectively with friends and teachers. It aligns with Chaayama and Kaewpila (2022), who state that life skills are used to develop children and youth in a global society, including Thailand, to help them think critically, adapt, make decisions, communicate emotions, and manage stress. The following is an excerpt from the results of student scrapbooks adopted by students from the teacher's presentation of learning videos via YouTube. Each group designed this scrapbook, formed in class when the teacher carried out the learning. These student activities were accompanied by teachers in their respective fields of study after students had watched the learning videos and PowerPoints presented by the teacher. Figure 5 shows an example of a student's scrapbook about the human circulatory system.

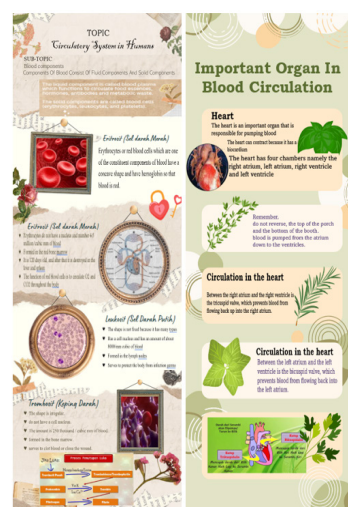


Figure 5. The Example of Student's Scrapbook about Human Circulatory System

Furthermore, the observations on activity indicators for students' life skills consisting of creativity, critical thinking, problem-solving, teamwork, negotiation skills, and decision-making

show an average of 87.65% with a good category. Figure 6 presents the percentage of students' life skills indicators.

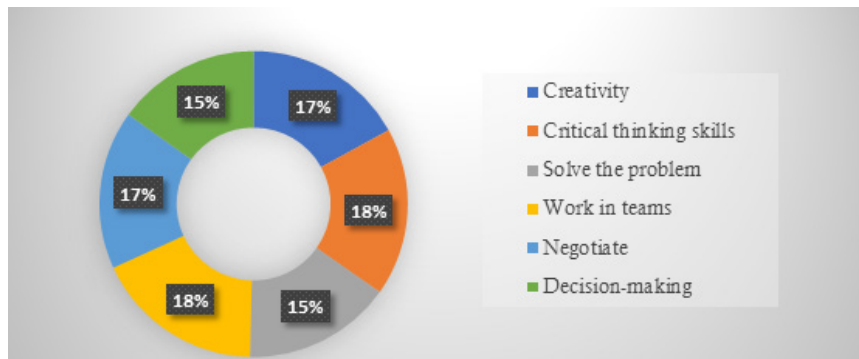


Figure 6. Percentage of Students' Life Skills Indicators

The percentages in Figure 6 are obtained based on the percentage analysis of achievement indicators of students' life skills, which observers can observe during students' independent and group activities. This finding aligns with Chaiyama and Kaewpila (2022), that life skills are 21st-century skills that can be used as a guideline for planning educational programs effectively and productively based on the level of student life and career skills. Conradty and Bogner (2020) find that combining technology and science has a positive impact that can increase students' creativity and self-efficacy so that students are motivated to collaborate and solve problems together. These findings support one of the indicators of student life skills in this study: creativity, problem-solving, and teamwork. According to Rohm et al. (2021),

the ability to collaborate, work together in teams, negotiate, and think critically and effectively within a team is an important skill that will become a living capital.

Furthermore, the researchers evaluated the impact of digital transformation strategies on teachers' learning management practices and students' life skills. They looked at the completeness of the overall learning outcomes. The quantitative data analysis results in the percentage of completeness of the learning outcomes obtained after the teaching and learning process on the circulatory system material in humans using a digital transformation strategy. Figure 7 shows the results of the analysis of learning completeness at meeting 1, meeting 2, and meeting 3.

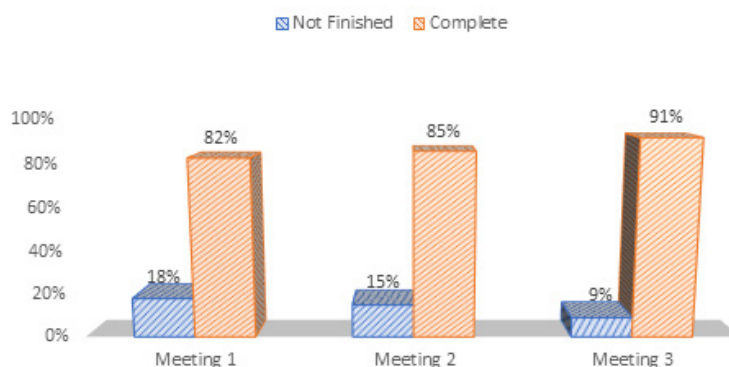


Figure 7. The Percentage of Complete Student Learning Outcomes

From Figure 7, the percentage of students' science life skills reached the good category, with an average percentage of completeness of 82% after going through the learning process with te-

achers' learning management based on the digital transformation of human circulatory system material. The human circulatory system is one of the natural science materials that are difficult for

teachers to explain using direct media or concrete media, causing the circulatory system material in humans to reach the mastery level of student learning often not. Sadagheyani et al. (2021) find that digital multimedia-based learning can arouse student learning motivation and control student emotional management. Yulianci et al. (2021) reveal that interactive multimedia in learning video presentations affects students' creative thinking skills. Departing from the success of other studies, in this study, the presentation of various learning video animations and the involvement of students in assembling electronic scrapbooks prepared by the teacher can be a significant learning experience for students. It makes students enthusiastic about learning and able to explore all indicators of student life skills so that their learning mastery results improve. This is in line with Fernández-Gutiérrez et al. (2020), who find that using technology positively improves students' science learning outcomes but has no significant effect on mathematics and reading subjects.

Students' teaching and learning process includes experiencing, living, communicating, exploring, creating, and concluding. The process experienced by these students is a learning process that involves all students' mental activities in total, which is called higher-order thinking skills (Marnita et al., 2020). This process benefits students in the real world, especially in student decision-making. Science subject requires students' higher-order thinking skills. The teaching media, learning situations, or learning environment will greatly determine students' decision-making skills, especially in science material. This is in line with Tong et al. (2022), who stated that the learning environment dramatically influences students' decision-making skills in the learning process.

Based on all the data analysis that has been carried out, the digital transformation strategy can create teachers' learning management that is fun, meaningful, full of creativity, and very effective in terms of time and cost. Better learning management also positively impacts the completeness of student learning outcomes. This aligns with Masry-Herzalah and Dor-Haim (2022), who find that resistance to change among teachers plays a crucial role in teaching success, thereby moderating the relationship between technological competency and teaching success. Furthermore, it was found that good teachers' learning management can improve student learning outcomes, as seen from the percentage of comple-

teness of student learning that reached the good category at meetings 1 to 3. The percentage of completeness achieved by students is above 81% (good category), which means that students already understand the material content of the circulatory system in humans. The advantage obtained in the results of this study is that digital transformation can take one form of teacher learning strategies in the 21st century that must be mastered by millennial teachers to deal with students who are also millennials. The advantages obtained from these findings have become a novelty value in this study: digital transformation as a strategy to improve teachers' learning management in the classroom. The next novelty is that "this research facilitates the emergence of life skills in middle school students and not students of a higher education," where these skills are a part of the 21st-century skills that are appropriated to appear from the current educational output. Thus, in a broader scope, the results of this study recommend the development of teacher human resources in the form of teacher digital competency development training in order to be able to prepare student competencies better and to be able to compete in the world of work and industry in the future.

CONCLUSION

Based on the results of research in three junior high schools (SMP N 1 Peusangan Siblah Krueng, SMP N 2 Peusangan Siblah Krueng, and SMP N 3 Peusangan Siblah Krueng Bireuen Regency), the findings in this study are (1) Digital transformation can be one of the teachers' strategies to create better quality, fun, meaningful, full of creativity, and effective learning management in class; (2) The implementation of digital transformation-based teachers' learning management can explore students' science life skills in the material on the circulatory system. The percentage of completeness of students' science life skills at the first meeting is 82%, 85% at the second meeting, 91% at the third meeting, and the average students' science life skills is 86%. Thus, it can be concluded that applying digital transformation can improve the quality of teachers' learning management and science life skills of students in the Bireuen District. While this study's novelty shows (1) Digital transformation as a teachers' learning management strategy; (2) This strategy can explore some of the students' 21st-century skills, such as science life skills.

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