

Implementation of Multimedia Autoplay-Based Communication Media in Science Learning

Syamsul Mudir¹, Andi Vita Sukmarini¹, Yusmanizar¹

¹Master of Communication Studies Program, Faculty of Postgraduate Studies, Universitas Fajar Makassar, Indonesia

Abstract. *The Application of Multimedia Autoplay-Based Communication Media in Science Learning at SMAN 3 Penajam Paser Utara (supervised by Andi Vita Sukmarini and Yusmanizar) Audiovisual multimedia autoplay-based instructional media is one form of technological advancement in learning. In its use, teachers can present text, images or videos, graphics, maps, and other materials not available in textbooks in an engaging format to attract students' attention to the learning process. This study is qualitative research employing a phenomenological approach. The data were collected through observation, interviews, and documentation. The researcher used a flow model analysis which involves several stages: data collection, data reduction, data presentation, and conclusion drawing, based on empirical information from SMAN 3 Penajam Paser Utara. The results of the study show that the implementation of multimedia autoplay-based communication media in science learning at SMAN 3 Penajam Paser Utara was carried out in three stages: design (developing multimedia autoplay-based teaching media), implementation (classroom teaching and learning activities), and evaluation (receiving feedback from students). The challenges encountered in using this media include a lack of understanding and skills in creating learning materials, the difficulty of accessing free applications to support media development, and technical obstacles such as electricity and internet connectivity.*

Keywords: *Communication Media, Learning, Multimedia, Autoplay*

Received: August 2, 2025

Revised: September 22, 2025

Accepted: November 27, 2025

INTRODUCTION

Education is a fundamental right of every citizen, guaranteed by the government. Through the provision of quality educational services, a nation can develop and develop a strong civilization. Education, as a human right, is mandated in the Universal Declaration of Human Rights, agreed upon by all member countries of the United Nations (UN). This demonstrates that every nation worldwide is committed to creating a comprehensive education system and implementing it in accordance with the needs and principles of each country (Khakim, 2018).

Good, quality education is also a priority in Indonesia as an effort to build an intelligent society capable of fostering an advanced civilization. In the early days of independence, the nation's founders established a shared consensus in the preamble to the 1945 Constitution of the Republic of Indonesia, which stated that one of the noble ideals of the Indonesian nation was to educate the nation, ensuring that all elements of society have access to adequate and adequate education (Nasution, 2011). According to Abdillah (2024), through several levels, such as early childhood education, primary education, secondary education, and higher education, supported by a strong curriculum and quality standards, Indonesia's human resources (HR) are expected to be able to fill every aspect of life in Indonesia and be able to compete regionally and globally.

The National Education System Law (Sisdiknas) Number 20 of 2003 states that the goal of national education in Indonesia is to develop the potential of students to become individuals who are faithful, pious, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Based on these educational goals, a curriculum or toolkit is then formulated, encompassing learning objectives, content and learning materials, and the methods used to achieve these objectives. This curriculum is developed by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) and then implemented nationally and comprehensively across all formal and informal educational institutions in Indonesia.

The curriculum currently used in educational institutions is the Merdeka curriculum, or "Freedom to Learn." The Merdeka curriculum can be described as a development of the emergency curriculum implemented during the COVID-19 pandemic in Indonesia in 2020, resulting in significant changes to the teaching and learning process in educational institutions (Ariga, 2022). The Merdeka curriculum essentially incorporates intracurricular learning with diverse content to optimize student learning and allow sufficient time to deepen concepts and strengthen competencies (Lestari et al., 2023). In addition to being adapted from the emergency curriculum applicable during the pandemic, the Merdeka curriculum was also launched to address the challenges facing Indonesian education, particularly low student numeracy and literacy skills.

This is confirmed by the results of the PISA (Programme for International Student Assessment) test, which ranked Indonesia 66th out of 81 countries that took the test (Yusmar & Fadilah, 2023). This shows a strong urgency to improve the educational system in Indonesia by strengthening students' understanding of science, numeracy, literacy and so on. In the implementation of the Merdeka curriculum (Nugraha, 2022), there is a concept that provides freedom/flexibility for educational units to determine learning outcomes, teaching materials, and methods used in classroom learning. This is done considering that each school has its own characteristics and conditions, which can make it different from other educational units/schools.

Furthermore, in the implementation of the Merdeka curriculum, learning is carried out by focusing on essential material and discussing it in depth, interspersed with projects to encourage students to be more active in learning and explore needed information during the lesson (Wahyuni, 2024). The teaching method used in the Merdeka curriculum no longer focuses on teachers delivering material through lectures, but rather provides opportunities for students to actively seek information and develop their critical thinking skills (Pertwi et al., 2022). The lecture method previously widely used by teachers was considered outdated, stifling students' creativity and making them easily forget the material presented.

With the Merdeka curriculum, teachers act as facilitators, providing an introduction to the material to students, who can then explore it in-depth through observations or group discussions to deepen the material, find alternative solutions to problems, and even engage in group project activities to create new ideas or objects relevant to the learning material (Rahmadhani et al., 2022). By considering the interests and needs of each student, differentiated learning can be implemented in Merdeka curriculum-based learning.

According to Prof. Suyatno, engaging and effective learning is essential in today's education system due to the ever-evolving educational paradigm (Habsy et al., 2023). To create engaging and effective learning, one option is to use technology-based tools that facilitate students' understanding of the context of the learning material. In today's digital era, the use of technological aids is no longer a novelty; it has become commonplace among teachers in their teaching activities (Saskia et al., 2024). However, further development is needed to create new media or innovate to expand the use of existing technological aids.

Audiovisual multimedia autoplay-based teaching media is one example of the development of technological aids in learning. Through its use, teachers can present text, images, or videos in an engaging way to foster student attention (Sidaruruk, 2023). Multimedia autoplay

teaching media allows the display of graphics, maps, and other materials not available in textbooks, allowing students to learn and understand the material more deeply, enriching learning resources beyond textbooks.

Teaching using audiovisual multimedia autoplay has also been implemented in educational institutions, including SMAN 3 Penajam Paser Utara. At the school, teachers are given the freedom to determine the teaching media used in teaching, including when using autoplay multimedia audiovisual media. One of the subjects taught using this media is natural science learning in grade 10. According to the Science Teacher of SMAN 3 Penajam Paser Utara, Mr. Santoso S.Pd, the use of this teaching communication media has been used for 2 semesters or the last year with the intention of increasing student participation and interest in learning science.

He added that in practice, teachers create visual presentations that include images or videos that are relevant to learning and students can choose the video display to be observed and analyzed for further discussion sessions. Based on the explanation above, the researcher will further explore the application/use of multimedia autoplay-based teaching communication media for science or natural science (IPA) learning which has been running for two semesters at SMAN 3 Penajam Paser Utara in order to illustrate the importance of utilizing technology in learning at the senior high school level.

METHODS

The type of research used in this study is qualitative. Qualitative research aims to describe a condition or phenomenon that occurs, both generally and specifically, to become a research object (Moleong, 2018). In this case, the researcher observed that the use of communication media in learning is commonplace along with significant technological developments, thus encouraging the emergence of initiatives from teachers/schools to use technology-based teaching media. Qualitative research has six characteristics, including: (1) Careful consideration of the situation and environment (contextual concern); (2) Natural setting; (3) Humans as the primary instrument (human instrument); (4) Descriptive data; (5) Research design conducted concurrently with the observation process; (6) Data analysis was conducted using inductive analysis. Furthermore, the researcher used a descriptive approach to describe a phenomenon that occurred and explain it in detail. This description relates to the use of multimedia autoplay learning communication media in science learning and the obstacles encountered. The approach used in this study is also phenomenological research. This is based on the goal of gathering information regarding the experiences of the subjects (teachers and students) in planning, implementing, and evaluating the use of multimedia autoplay learning media in science learning. The aforementioned approach is fundamentally based on philosophical and psychological studies that play a role in describing and reconstructing the current state of the research object based on empirical facts.

Research using a phenomenological approach emphasizes an in-depth understanding of the experiences of individuals or groups in interpreting and giving meaning to their circumstances. The goal is to explore the subjective meaning contained in these experiences and to gain deeper insight into the essential aspects of a particular context. The steps of the phenomenological approach in qualitative research include: (1) Data collection, namely data obtained through in-depth interviews, participant observation, or direct monitoring of the phenomenon being studied; (2) Phenomenon description, namely a detailed description of the individual or group's subjective experiences with the phenomenon; (3) Data analysis, namely identifying themes or patterns of meaning that emerge from the data, with a focus on subjective understanding; and (4) Interpretation of results, namely understanding the data analysis to formulate in-depth conclusions and comprehend the meaning contained in the subjective experiences of individuals or groups. In this study, the researcher acted as the primary instrument, utilizing knowledge and interpretive skills to understand the use of the multimedia learning communication media, Autoplay, in science learning at SMAN 3 PPU through interviews, observation, and documentation with school stakeholders, such as the principal, science teachers,

and students. The data obtained were then analyzed using an inductive approach, identifying the concept, implementation, and evaluation of the use of the multimedia learning communication media, Autoplay, in science learning. This research will be conducted at State Senior High School 3 Penajam Paser Utara and will be implemented over a four-month period, from March to June 2025.

Data Sources

Data is information or explanations about something, which can be knowledge, assumptions, or beliefs. Data can also be facts expressed in the form of numbers, symbols, codes, and so on. Based on the collection method, data can be divided into two types: primary data and secondary data. Primary data is data obtained, processed, and presented by the researcher directly from the original source. Meanwhile, secondary data is data that has been obtained, processed, and presented by another party, usually in publication or journal format. The data source for this study is primary data obtained from science teachers at State Senior High School 3 Penajam Paser Utara through observation and interviews. The primary data used in this study relates to the application of autoplay multimedia communication media in science learning and the obstacles or constraints faced by science teachers in implementing autoplay multimedia communication media. Researchers will obtain primary data from informants through a purposive informant selection technique, which involves selecting informants based on their competence. In this context, the selected informants are those with knowledge or relevance, either directly or indirectly, to the research focus. In this study, the key informants are the principal, science teachers, and students. Supporting informants are the students' parents. Primary data sources are original data received directly from the informants interviewed. Therefore, primary data is data collected directly by the researcher from the primary source and is truly original or authentic. These data sources come from the principal, science teachers, and students of SMAN 3 PPU. Secondary data is secondary data obtained after the primary data and used to supplement the research data. Secondary data is tailored to the needs of the research. In this study, the secondary data sources include: Parents, as guardians of students, directly observe their children's behavior within the family environment. Behavior here emphasizes the child's attitude or character. School literature and documents, namely literature as reference sources in the form of books, scientific articles, proceedings, seminar results, and so on. School documents can include school profile archives, program activity reports, photo documentation of activities, the school organizational structure, school infrastructure data, teacher and staff data, and student data at SMA Negeri 3 Penajam Paser Utara.

Data Collection Techniques

Data collection techniques relate to the methods used to gather the information needed to support the research process, which is conducted using a systematic approach. Three data collection techniques were used in this study: observation, interviews, and documentation. The following is a detailed explanation of the data collection mechanisms: In this study, the researcher used direct observation as a data collection technique. The purpose of this observation was to obtain data and information related to the use of multimedia autoplay learning communication media in science lessons at SMA Negeri 3 Penajam Paser Utara. Two approaches were used in this study: participant observation and non-participant observation, which allowed the researcher to maximize data collection while remaining objective regarding the aspects being studied. The researcher used participant observation in this research data collection, meaning the researcher was directly involved in the activities or situations being observed. Participant observation in research can be divided into four types: passive, moderate, active, and complete participant observation. In passive participant observation, the researcher simply observes activities without actively participating. Meanwhile, in moderate participant observation, the researcher actively participates in the activities or situations being observed, but with a lower level of interaction and is not fully involved in every aspect of the activity. Active participant observation involves the researcher directly participating in activities and interacting with participants, while complete participant observation is a form of observation in which the researcher is fully

involved without revealing their identity as the researcher to the participants. Each type of observation has different roles and levels of involvement in observing and understanding the situation at the research site.

In this study, the researcher used moderate participant observation (Harrison et al., 2013) with the following stages: (1) Planning: The initial stage involves research planning, considering the research objectives, observation design, selection of the observation environment or context, and development of observation guidelines. (2) Introduction and Consent: The researcher introduces themselves to the participants and explains the purpose and scope of the study. Consent from the participants is also obtained before the observation begins. (3) Orientation: Before the observation begins, the researcher orients themselves to the environment or context, identifying and ensuring a clear understanding of the activities to be observed. (4) Active observation: the researcher actively engages in the activity or situation being observed, noting relevant behavior, interactions, and contexts consistent with the research focus, but with a lower level of interaction and not being fully involved in every aspect of the activity. (5) Field notes: during the observation, the researcher takes detailed field notes, noting important details, observations, and reflections that emerge during the observation. (6) Reflection: after the observation, the researcher reflects on the research subject's experience, considering the impressions, emotions, and understandings that emerge, and records these in field notes. (7) Data analysis: data from the observation are processed and analyzed taking into account the research objectives and relevant findings. (8) Interpretation and findings: the results of the data analysis are used to develop interpretations of the observed phenomena, identify key findings, and formulate the findings within a broader theoretical and conceptual context. The final data collection technique used in this study was the interview method. Interviews are a data collection instrument used to obtain information or information through direct or face-to-face conversations. This interview method was carried out to obtain detailed data and confirm the use of multimedia autoplay learning communication media in science learning implemented at SMA Negeri 3 Penajam Paser Utara. In qualitative research with a phenomenological approach, interviews are used to gain an in-depth understanding of the experiences and subjective meanings experienced by research participants. Through interviews, researchers seek to understand how individuals interpret and give meaning to phenomena experienced by informants in everyday life.

RESULTS AND DISCUSSION

Implementation of Multimedia-Based Autoplay Science Learning Communication Media at SMAN 3 Penajam Paser Utara

The increasingly rapid development of technology has impacted all aspects of human life, including education (Salsabila et al., 2023). Previously, every teacher and student relied solely on printed textbooks as a source of knowledge, but now this has evolved significantly with the availability of other resources such as blogs, social media, e-books, and even audiovisual-based electronic media like YouTube. All information needed for learning can be accessed anytime and anywhere without the constraints of space and time. Current technological developments, in addition to expanding learning media, have also significantly influenced the paradigm of classroom learning activities (Sofyan & Hidayat, 2022). This paradigm refers to the role of teachers/educators, which is no longer centralized but rather involves active collaboration with students to achieve shared learning goals.

Teachers/educators can be pioneers of innovative new learning models that adapt to current developments and develop engaging learning strategies for their students. Consequently, teachers/educators must possess a high level of creativity to ensure that lesson plans are achieved, coupled with enjoyable and participatory learning methods. One school that is attempting to innovate to develop its learning activities is SMAN 3 Penajam Paser Utara. At the school, each teacher is asked to create engaging and participatory learning models for students. Furthermore, teachers are also encouraged to explore numerous supporting references and

create interactive learning media. This was expressed by the Principal of SMAN 3 Penajam Paser Utara. In the following interview excerpt:

"As the principal, I certainly encourage the teachers here not to be afraid to try new things, including preparing different learning models from the past, where we usually talked a lot. Now, the students are more active in learning. Furthermore, I also ask them all to be adaptive to technological developments, namely by utilizing technology optimally as a learning medium." (Interview with Principal of SMAN 3 PPU, January 6, 2025)

Mr. Yusva added that efforts are being made to optimize the facilities and infrastructure supporting digital learning, such as high-speed internet and a projector that is directly proportional to the number of classes. One teacher at SMAN 3 Penajam Paser Utara who has implemented learning activities that incorporate technology is Ms. Vera Arianti, S.Pd. She teaches Science for Grade 10. According to Ms. Arianti, she began implementing teaching and learning activities using electronic learning media within the past year. However, she doesn't create all of her learning materials electronically due to limited time. This is explained by Ms. Vera Arianti in the following interview excerpt:

"Since the discourse on digitalization in schools began and all teachers were asked to use technology in their learning, I've had to do the same. Over the past year, I've tried to create several technology-based learning materials or media. Although it's still a bit difficult, I've had to. Our teaching schedule is also quite busy, and with other activities, we haven't had much digitalization of the materials." (Interview with Science Teacher at SMAN 3 PPU, January 6, 2025)

At the beginning of the technology-based learning process, Ms. Vera Arianti created simple presentation slides and included extensive text related to the learning material. Over time, coupled with the innovative teacher training she attended and the assistance of other teachers, Ms. Vera Arianti learned to make presentation slides more engaging and interactive for students by incorporating varied content, such as images, sound, and YouTube video links that can be played over the internet. The presence of media such as images, sound, and YouTube video links can support learning by providing students with a deeper understanding of the material being studied. This is as explained by Ms. Vera Arianti in the following interview excerpt:

"So when I first started using presentation slides, I used the original PPT template and I wrote a lot on each slide I made. Then, there was input from students and other teachers to try to reduce the portion of writing on the slides so that they only focused on important points. Then I also participated in training on creating teaching media, there I learned to include additional media such as images, sounds, videos or YouTube links that can be played via PowerPoint and thank God it can be applied until now" (Interview with Science Teacher at SMAN 3 PPU on January 6, 2025)

Ms. Vera Arianti is currently teaching green chemistry, specifically how to utilize, manage, and recycle chemicals based on environmentally friendly principles. She created a multimedia-based science learning communication media using autoplay in Microsoft PowerPoint, incorporating relevant teaching materials and accompanying image and video clips that reflect the ideals of green chemistry and the phenomenon of environmental damage caused by hazardous chemicals or waste. To be able to develop this learning communication media, Ms. Vera Arianti must create a learning plan, including determining the content to be delivered in the lesson. Typically, her learning planning is done during the semester break, during which time Ms. Vera Arianti begins creating learning communication media to support her learning, including this multimedia autoplay learning media on green chemistry. Ms. Vera Arianti added that before creating learning media, a crucial step is to organize the learning administration, which includes setting learning objectives, developing lesson plans, and determining the learning media to be used in teaching and learning activities. As a result, when the active learning period begins, teachers only need to deliver the predetermined learning material and display the previously designed learning media. According to Ms. Vera Arianti, this is the process of planning and

designing the learning communication media she created, which ultimately led to its use in classroom teaching and learning. The following is an excerpt from an interview:

"When students are on semester break, teachers prepare lesson plans, including lesson plans (RPPs), learning objectives, and determining the learning media they will use, whether they will be entirely textbook-based or combined with tools or technology. In designing this autoplay multimedia, I incorporate material based on the lesson plan I created and strive to make it as engaging as possible for students. Although it's not perfect, at least we're making an effort to prepare more engaging lessons. Then, when active learning takes place, we simply operate the learning media, sometimes seeking feedback from students and under the supervision of the principal." (Interview with Science Teacher at SMAN 3 PPU, January 6, 2025)

In its implementation in teaching and learning activities, the use of autoplay multimedia teaching media is almost similar to the concept of a general presentation. However, the teacher does not simply repeat the narrative on the slides but also displays images, audio, or videos that reflect the material being discussed, including this topic on green chemistry. Based on the researcher's observations, during the science lesson, Ms. Vera Arianti slowly displays the presentation slides she has prepared previously while providing explanations to her students. When a slide contains an image, she provides a brief introduction explaining the meaning of the image and asks students to provide further explanations. Ms. Arianti also shows a YouTube video depicting the material being taught, namely pollution in rivers and oceans, which helps students develop a perspective and understanding of the reality, rather than simply imagining it based on the narrative in the textbook. After showing the presentation slides, Ms. Vera Arianti also opened a discussion space for students regarding the content presented previously and at the same time honed students' thinking and speaking skills. Ms. Vera Arianti's use of autoplay multimedia learning media has received positive attention from students and the principal of SMAN 3 Penajam Paser Utara. According to Ayu Nur Cahyani, a 10th-grade student at SMAN 3 Penajam Paser Utara, she found the use of autoplay multimedia learning media in science lessons very engaging and not monotonous or boring. She was able to find references other than the printed textbooks in front of her. This variety of learning resources was what she felt was very suitable. The following is an excerpt from an interview:

"When I take science lessons, Ms. Vera Arianti often delivers the material not only through textbooks but also through presentations on her laptop. In the presentations, there are pictures or photos of the objects we're discussing, and there are also YouTube videos we can watch together, which contain problems or lessons we can learn together. Basically, it's quite interesting and not boring." (Interview with, SMAN 3 PPU student, January 7, 2025)

Echoing Ayu Nur Cahyani, another student, Dita Fahrina, also gave positive feedback to science lessons using multimedia autoplay, which made it easier and quicker for her to understand the material. The following is an excerpt from an interview:

"I feel like I understand and comprehend the material presented by Ms. Vera Arianti more quickly, because she doesn't just talk at length in class, but also provides direct illustrations of what we're learning, whether through images or YouTube videos." (Interview with SMAN 3 PPU student, January 7, 2025)

The principal of SMAN 3 Penajam Paser Utara, Mr. Yusva S.Pd., also appreciated Ms. Vera Arianti's efforts in teaching using technology-based teaching media such as multimedia autoplay. He hopes that this initiative can be continued through grade 12, so that student interest and participation in science lessons will also improve. Ms. Vera Arianti was pleased with the appreciation from her students and the principal, as she didn't expect much from them. She believes that the goal of effective learning can be achieved beyond any form of appreciation from the authorities. He also tries to be more diligent in preparing technology-based teaching media according to the number of classes he teaches so that all students can have the same opportunity to experience the use of autoplay multimedia learning communication media in science learning.

Obstacles in the Implementation of Multimedia-Based Autoplay Science Learning Communication Media at SMAN 3 Penajam Paser Utara

The existence of learning media is an effort to optimize the teaching and learning process in schools, because through learning media, teachers can provide more in-depth information related to the material being presented. Several types of learning media are used by teachers to support their learning, such as image-based media, text, videos, and even 3D or 4D prototypes (Nasution et al., 2022). The use of learning media can also contribute to students' interest and motivation to learn, as it can stimulate their curiosity about new things while preventing them from feeling bored with the existing learning environment.

However, the use of learning media under certain conditions may not be entirely successful. In other words, there is the potential for obstacles or constraints to arise related to the use of learning media. These obstacles are a form of barrier or limitation that hinders or limits the ability of an individual or entity to achieve a goal or perform an action. These obstacles can make the implementation of learning media less than optimal. Obstacles encountered in implementing learning communication media can stem from users, supporting devices, applications, and other factors that can impact the conduciveness of learning media use.

Obstacles that can be encountered by users of learning media include a lack of understanding and skills in creating and using them in learning. This is what Vera Arianti, a science teacher at SMAN 3 Penajam Paser Utara, experienced in the early days of using electronic learning media. According to Vera Arianti, she had to adapt to new school policies, such as the use of electronic learning media in her lessons, a practice she had rarely experienced before. The adaptation process also included a transition from having no prior knowledge of creating learning media to a more advanced understanding of developing learning media. As a result, Vera Arianti has now overcome obstacles related to user technology mastery. The following is an excerpt from an interview:

"So, at the beginning of the policy, we were required to create learning media. Even though we often use laptops for assignments, the math was new to us. Initially, I didn't really understand how to create engaging slide designs, and I received criticism from the principal and students for my lack of effectiveness. But slowly, I tried to learn more, gradually, until I was finally able to create engaging learning media that aligned with the lesson plan (RPP) that had been prepared." (Interview with Science Teacher at SMAN 3 PPU, January 6, 2025)

From this interview excerpt, it is clear that Ms. Vera Arianti made efforts to overcome the obstacles that arose in the initial development and implementation of electronic, autoplay multimedia learning media. Furthermore, other obstacles to implementing autoplay multimedia learning media in science lessons were the time required to develop the media and limited access to supporting platforms. According to Ms. Vera Arianti, creating autoplay multimedia learning media requires meticulous attention to detail, making it quite time-consuming. This is compounded by the other duties and obligations Ms. Vera Arianti undertakes as an educator. As a result, she must juggle her time between various tasks and responsibilities to ensure she can complete all her assigned tasks effectively. Here's an excerpt from an interview:

"At school, my job isn't just teaching in class; I have other duties, such as being the vice principal, and there's also all sorts of administrative work to do, which takes up quite a bit of time. So, to create comprehensive learning media, you really have to find time amidst your busy schedule to focus on it. Furthermore, ensuring that the images don't blur and that the attached videos play properly requires careful attention when creating the media. So, one of the challenges is also related to time and other commitments." (Interview with Science Teacher at SMAN 3 PPU on January 6, 2025)

Another obstacle to implementing autoplay multimedia learning media is limited access to certain platforms or the availability of paid applications that are out of reach. Producing engaging content requires sophisticated applications that facilitate user engagement. However,

not all online applications that support the creation of e-learning media are free or affordable. This is compounded by the situation where schools do not specifically budget for licensing the applications they intend to use. Consequently, teachers who need to create e-learning media must find solutions to these challenges, such as using alternative, free or affordable applications that may have lower performance than their predecessors. This is what Ms. Vera Arianti experienced when designing her desired learning media, ultimately leading to the use of more affordable and user-friendly applications. The following is an excerpt from an interview with Ms. Vera Arianti:

"To create excellent learning media, you have to put in the effort to use sophisticated applications, and that's quite expensive. So I switched to another, more affordable application because the school couldn't fully support the cost of the application. I just focused on creating the learning media, not worrying too much about the application. That's it." (Interview with Science Teacher at SMAN 3 PPU, January 6, 2025)

Finally, an obstacle encountered in implementing this autoplay multimedia learning communication media was unexpected situations such as power outages or slow or intermittent internet connections. This meant that teachers couldn't display the autoplay multimedia presentation slides to students during the lesson. According to Ms. Vera Arianti, these power and internet connection issues had occurred several times during her teaching, preventing her from directly presenting the materials and supporting media to students. The following is an excerpt from an interview:

"An equally crucial obstacle for me is when the power goes out or the internet connection is slow or down. We can't connect to the projector, and the image displayed might be unclear, and YouTube video links won't play as planned. I've had several times while teaching, and at those times, I've encountered similar obstacles, so I haven't utilized this learning media optimally. It's more or less like that." (Interview with Science Teacher at SMAN 3 PPU, January 6, 2025)

Some of the obstacles mentioned by Ms. Vera Arianti were also conveyed to the principal as part of her performance report and the challenges faced in teaching. In response, the Principal of SMAN 3 Penajam Paser Utara, Mr. Yusva S.Pd., is doing his best to support his teachers in creating and developing learning media. However, he also acknowledged the school's shortcomings in addressing the challenges raised by Ms. Vera Arianti. The following is an excerpt from an interview:

"We listen to feedback and complaints from teachers, including any challenges in learning. I strive to provide the best solutions for teachers, including those related to learning media. However, I also apologize if certain aspects are not yet optimal due to limitations at our school." (Interview with Principal of SMAN 3 PPU, January 6, 2025)

From the interview excerpt above, it can be concluded that the implementation of learning communication media such as multimedia autoplay is not without challenges, including user factors, supporting applications, and other technical factors like electricity and internet connection. Nevertheless, the principal has made efforts to address these issues so that learning using electronic media can run smoothly and sustainably at every grade level.

Implementation of Multimedia-Based Autoplay Science Learning Communication Media at SMAN 3 Penajam Paser Utara

The use of communication media in teaching and learning activities is becoming increasingly commonplace in every educational institution today, from kindergarten to higher education (Jenita et al., 2023). The use of communication media is intended to assist educators/teachers in conveying teaching materials to their students so that they are well received and understood by each student. Communication media is essentially a tool that functions to disseminate information or messages between individuals or groups (Yulianah & Watini, 2022). The utilization of communication media can be optimized for the transformation of knowledge involving teachers and students within the classroom or outside the classroom.

Communication media, when viewed from the level of technological complexity, can be divided into two categories: simple, conventional communication media and modern, or more sophisticated, communication media (Komalasari, 2020). Examples of conventional communication media include letters, billboards, banners, radio, and so on. Modern communication media include computers, television, the internet, mobile phones, and other sophisticated devices. The existence of more sophisticated modern communication media is the result of efforts/innovations by experts/technicians to create communication media that are easier to use, can reach more people, and offer lower costs for sending or accessing information needed in daily life. Therefore, it can be said that the development of technology in general and communication media in the current era represents a step towards overcoming obstacles encountered with media/technology in the past while also serving as a platform for innovation/renewal that goes hand in hand with the increasingly modern human capacity for thought.

The use of communication media in learning in educational institutions can be considered a form of adaptation to the technological developments that accompany human life (Setiyana & Kusuma, 2021). Almost all aspects of human life are increasingly in contact with advanced technology, from the moment they wake up in the morning until the time they go to rest at night. A simple example is when people use alarm clocks or mobile phones to wake themselves up in the morning. Furthermore, before bedtime, people sometimes use their mobile phones to check messages from family or colleagues or simply to find some entertainment to relieve stress. Other examples of technology utilization include travel or ordering food or goods, which can be done using online motorcycle taxi apps, which are currently popular among the public, especially the younger generation. This demonstrates that humans are faced with the sophistication of today's technology and can utilize this sophistication to support their daily activities and needs.

Furthermore, the concrete forms of modern communication media utilization in teaching and learning activities can be categorized into two aspects: hardware and software (Kresnamurti et al., 2021). Hardware can be devices or tools whose presence can be seen and felt directly by humans, such as laptops, PCs, speakers, projectors, and so on. Software refers to digital applications available on hardware and can be used to support the teaching process in the classroom, such as Microsoft Office, Windows Media Player, Adobe, and so on. Educators can create learning materials/class discussions using a combination of hardware such as laptops or PCs with applications/software already available on the laptop/PC and manage them according to their imagination and creativity. Once the material/discussion material has been created, it can then be delivered to students using a projector and speakers if there is audio content to be presented to students. The presentations presented with the projector and speakers can be educational and attract students' attention to observe the content in depth.

As previously stated in research, one way to optimize the use of teaching communication media is through the use of multimedia autoplay. Multimedia autoplay is a form of teaching material application that can contain various content such as video, audio, or a combination of the two, which can be played during learning to provide additional insights to students (Makalao et al., 2021). With video and audio displayed on teaching material slides, students can directly identify objects in the learning resources, rather than simply visualizing them. For example, in learning about the characteristics of living things, students can directly see the objects being studied and hear the sounds that characterize those living things. As a result, students can understand the context of the learning content regarding the characteristics of living things comprehensively, not just by looking at images in printed books or simply imagining the body shape or sounds of the living things. Upon closer examination, learning with sophisticated teaching communication media is not merely to follow current technological development trends, more than that, there is a shift in the educational paradigm that is currently applicable in educational institutions, namely that teachers/educators are no longer the central point in transferring knowledge to students, but rather the involvement of other resources such as digital books, educational videos and so on as references in learning (Saputra et al., 2024).

Another developing paradigm is the activeness/contribution of students to independent learning by working on a project or creating problem solving according to the learning material they are studying (Handayani et al., 2023). This systematic change in education is based on the design/idea of policy makers in the field of education who see that learning that only focuses on the delivery of teacher material to students or direct learning is seen as less effective because it makes students passive in learning and unable to understand the learning concept as a whole. Consequently, strategic changes are needed in Indonesian education, starting with curriculum changes that provide freedom for teachers and students, which can then be referred to as the Merdeka curriculum or Freedom to Learn. Furthermore, one form of implementing the Merdeka curriculum is optimizing the use of other resources, including digital technology, in learning. This has been implemented in educational units from elementary school to high school and vocational schools (Rahayu et al., 2022).

One of the subjects included in the Merdeka curriculum is natural science. In this subject, students can study phenomena occurring in their environment, from mechanical equipment and chemical substances to the biota or living things around us. In phase E of the Merdeka curriculum, students can understand the general concepts of natural science before delving into them in more depth in phase F, or when they are in grades 11 and 12 (Sari & Supriadi, 2022). In learning related to physics, chemistry and biology, teachers/educators can present teaching materials in accordance with learning outcomes and learning objectives by using technological assistance such as laptops/computers and supported by applications such as Microsoft Office integrated with visual or audio media such as YouTube and other media that can provide a complete understanding of the material presented in teaching these subjects. This then emphasizes that the use of communication media in learning in general, or science specifically, is a necessity that is very necessary to welcome the era of the Merdeka curriculum currently implemented in each educational unit.

Obstacles in Implementing Multimedia-Based Autoplay Science Learning Communication Media at SMAN 3 Penajam Paser Utara

Learning, whether conducted in the classroom or outside of it, is essentially a process or result of a pre-planned learning activity. To ensure effective learning, a teacher/educator is responsible for designing the desired learning model, the material to be covered in the semester, the learning outcomes, and managing the use of supporting learning media (Ni'mah et al., 2018). Preparations encompassing the elements mentioned above can be implemented before active teaching and learning activities begin. Ideally, every teacher/educator should be meticulous in designing the teaching and learning process for the new semester, including preparing teaching materials and supporting devices. Teaching materials can be sourced from printed books, e-books, videos, music, and other media deemed relevant and suitable for use in learning (Simatupang & Purnama, 2019).

With the help of supporting technology devices such as laptops and applications such as Microsoft Office that support multimedia autoplay-based science learning communication media, teachers/educators can be creative in creating teaching materials or discussion materials that are interesting for students while creating an innovative and participatory learning culture. After going through the process of designing teaching materials, teachers can then present them in class learning by using supporting technology devices such as projectors and speakers that can display the appearance and sound of the multimedia-based teaching materials that have been previously designed. This is what is seen as an idealism for interesting and perfect learning. A process essentially faces two choices: success or failure. Success in designing and presenting teaching materials/discussion materials to students can be seen from their acceptance of the material presented and their level of participation in the learning process (Suryapermana, 2017). Furthermore, the achievement of learning outcomes is also an indicator of success in the classroom learning process, including when it involves the use of additional teaching media. However, it cannot be denied that in designing teaching media or when presenting them to students, teachers/educators face obstacles that can arise, both predictable and unexpected.

It is important to understand that obstacles or barriers are a form of hindrance that can limit someone's ability to achieve a desired goal (Anggeraini et al., 2020). In general, obstacles/barriers can be physical, financial, technical, or other factors perceived as slowing or hindering efforts to achieve a goal. Obstacles are commonplace in the dynamics of human life, ranging from minor ones to major ones that significantly impact human life. In line with the realities of life, the teaching and learning process in educational institutions is also prone to these challenges. According to education observer Prof. Suryo Wijoyo, several obstacles can arise during the teaching and learning process in schools, including the absence or lack of supporting learning infrastructure, low quality learning, a lack of innovation in education and teaching in the classroom, and the failure of knowledge transformation involving teachers and students (Sahelatua et al., 2019). Ideally, schools should be aware of these four examples of obstacles that are likely to occur in education and address them independently to ensure that learning is carried out effectively and that students receive the maximum benefit from their rights.

In welcoming a new era of Indonesian education that also leverages technological developments, all obstacles/barriers that occur in the school environment, especially those related to learning, can ideally be overcome, as numerous references and resources are accessible online to improve the quality of teaching in schools (Widiasanti et al., 2023). However, like a double-edged sword, the availability of adequate internet facilities also presents a challenge for school administrators. This is due to Indonesia's geographical conditions, which mean that not all areas have access to high-speed internet. Consequently, school administrators must carefully plan the use of internet networks in schools to facilitate the teaching and learning process, involving teachers and students, and data management by educational staff/school administrators. Another challenge faced by schools relates to providing facilities to support effective classroom learning. Examples of such facilities include projectors, speakers, clip-on devices, digital cameras, and laptops/computers.

Each of these tools plays a crucial role in learning, such as laptops for creating teaching materials, projectors for displaying the materials, speakers for amplifying the sound of videos/audios presented in the lessons, and so on (Nurharirah & Effane, 2022). To meet all these learning support needs, further planning and allocation of school operational funds are needed to meet these needs. Another potential obstacle/barrier affecting learning in schools is the readiness of implementers/teachers to utilize technology to support their learning. In addition to the availability of adequate technology, another factor that must be considered is the ability of the users of the technology-based learning devices to be used, both in terms of hardware and software proficiency. It is often found that teachers/instructors in Indonesia still have low or minimal technological skills in utilizing technology in learning (Mukaromah, 2020).

This is inseparable from various problems such as difficulty leaving their comfort zones, difficulty adapting and implementing new things, and a lack of adequate understanding to elaborate learning with digital or internet-based communication media (Gazali & Pransisca, 2020). Consequently, significant steps are needed to ensure that every teacher/educator is equipped with the understanding and ability to create engaging teaching models with the help of technological devices, utilize applications and teaching materials available on the internet to support the learning process, and utilize image, video, or audio media to introduce students to the topic of discussion in depth. By implementing these steps, the obstacles/barriers that occur in teaching and learning activities can be minimized or can be overcome independently by the school.

CONCLUSION

The implementation of multimedia-based science communication media at SMAN 3 Penajam Paser Utara was carried out in three stages: design, implementation, and evaluation. In the design stage, teachers/educators were asked to create multimedia-based learning media based on the lesson plan (RPP) and learning outcomes (CP). The autoplay learning media was then used in classroom teaching and learning activities according to the predetermined learning

schedule. The final step in this implementation was providing input/feedback from students on the use of multimedia-based learning media for science (IPA) learning. Obstacles encountered in implementing multimedia-based science communication media at SMAN 3 Penajam Paser Utara included a lack of understanding and skills in creating learning media, the difficulty of freely accessing applications to support learning media creation, and technical constraints such as sudden power and internet outages that could disrupt teaching activities using technology-based tools like laptops, projectors, and speakers.

REFERENCES

- Abdillah, F. (2024). Peran perguruan tinggi dalam meningkatkan kualitas sumber daya manusia di indonesia. *EDUCAZIONE: Jurnal Multidisiplin*, 1(1), 13-24. <https://doi.org/10.37985/educazione.v1i1.4>
- Anggeraini, R., Nasirun, M., & Yulisdeni, Y. (2020). Kendala Guru Dalam Penggunaan Media Pembelajaran. *Jurnal Pena Paud*, 1(1), 19–26. <https://doi.org/10.33369/penapaud.v1i1.13968>
- Ariga, S. (2022). Implementasi Kurikulum Merdeka Pasca Pandemi Covid-19. *Edu Society: Jurnal Pendidikan, Ilmu Sosial Dan Pengabdian Kepada Masyarakat*, 2(2), 662–670. <https://doi.org/10.56832/edu.v2i2.225>
- Gazali, M., & Pransisca, M. A. (2020). Pentingnya Penguasaan Literasi Teknologi Informasi Dan Komunikasi Bagi Guru Madrasah Ibtidaiyah Dalam Menyiapkan Siswa Menghadapi Revolusi Industry 4.0. *Jurnal Ilmiah Global Education*, 2(1), 87–95. <https://doi.org/10.55681/jige.v2i1.76>
- Habsy, B. A., Azizah, N. H., Viola, N. P., & Mahendra, W. (2023). Peran Guru dalam Menciptakan Lingkungan Pembelajaran yang Efektif dengan Cara Pengelolaan Kelas yang Menarik. *Tsaqofah*, 4(2), 545–566. <https://doi.org/10.58578/tsaqofah.v4i2.2305>
- Handayani, A. S., Nurlisa, K., & Mustafiyanti, M. (2023). Efektivitas dan Peran Guru Dalam Kurikulum Merdeka Belajar. *Perspektif: Jurnal Pendidikan Dan Ilmu Bahasa*, 1(4), 319-330. <https://doi.org/10.59059/perspektif.766>
- Harrison, M. B., Graham, I. D., van den Hoek, J., Dogherty, E. J., Carley, M. E., & Angus, V. (2013). Guideline adaptation and implementation planning: a prospective observational study. *Implementation science*, 8(1), 49. <https://doi.org/10.1186/1748-5908-8-49>
- Jenita, J., Harefa, A. T., Pebriani, E., Hanafiah, H., Rukiyanto, B. A., & Sabur, F. (2023). Pemanfaatan teknologi dalam menunjang pembelajaran: Pelatihan interaktif dalam meningkatkan kualitas pendidikan. *Community Development Journal: Jurnal Pengabdian Masyarakat*, 4(6), 13121-13129.
- Khakim, A. (2018). Hak Asasi Manusia Dalam Perspektif Pendidikan Islam. *Jurnal Evaluasi*, 2(1), 371–381. <https://doi.org/10.32478/evaluasi.v2i1.84>
- Komalasari, R. (2020). Manfaat Teknologi Informasi Dan Komunikasi Di Masa Pandemi Covid 19. *Tematik*, 7(1), 38–50. <https://doi.org/10.38204/tematik.v7i1.369>
- Kresnamurti, R., Fauziyah, D. N., & Syafrida, R. (2021). Efektivitas penggunaan whatsapp sebagai media komunikasi dalam pembelajaran anak usia dini pada masa pandemi Covid-19. *Jurnal Pendidikan Vokasi Raflesia*, 1(2), 7-13. <https://doi.org/10.53494/jpvr.v1i2.91>
- Lestari, D., Asbari, M., & Yani, E. E. (2023). Kurikulum Merdeka: Hakikat kurikulum dalam pendidikan. *Journal of Information Systems and Management (JISMA)*, 2(6), 85-88. <https://doi.org/10.4444/jisma.v2i6.840>

- Makalao, D. A. M., Ardianto, A., & Anuli, W. Y. (2021). Pengembangan Media Pembelajaran Animasi Berbasis Autoplay pada Mata Pelajaran IPA. *Journal of Elementary Educational Research*, 1(2), 89-98. <https://doi.org/10.30984/jeer.v1i2.71>
- Moleong, L. J. (2018). *Metodologi Penelitian Kualitatif* (VIII). Bandung: PT Remaja Rosdakarya.
- Mukaromah, E. (2020). Pemanfaatan teknologi informasi dan komunikasi dalam meningkatkan gairah belajar siswa. *Indonesian Journal of Education Management & Administration Review*, 4(1), 175-182.
- Nasution, H. N., Wita, E., Siregar, R. A., & Siregar, S. (2022). Pengaruh Penerapan Media Pembelajaran Berbasis Autoplay Media Studio 8 Terhadap Aktivitas Belajar Siswa Di Kelas X Mas Nu Sibuhuan. *JURNALPhysEdu(PHYSICS EDUCATION)*, 4(1), 11. <https://doi.org/10.37081/physedu.v4i1.2966>
- Nasution, S. (2011). *Sejarah Pendidikan di Indonesia* (2nd ed.). Jakarta: Bumi Aksara.
- Ni'mah, S., Lestari, N. C., & Adawiyah, R. (2018). Pengembangan dan uji validasi perangkat pembelajaran SMA berbasis Kurikulum 2013 pada konsep sistem pencernaan. *Jurnal Pendidikan Hayati*, 4(1).
- Nugraha, T. S. (2022). Kurikulum Merdeka untuk Pemulihan Krisis Pembelajaran. *Inovasi Kurikulum*, 19(2), 251–262. <https://doi.org/10.17509/jik.v19i2.45301>
- Nurharirah, S., & Effane, A. (2022). Hambatan dan Solusi dalam Manajemen Sarana dan Prasarana Pendidikan. *Karimah Tauhid*, 1(2), 219-225. <https://doi.org/10.30997/karimahtauhid.v1i2.7709>
- Pertiwi, A. D., Nurfatimah, S. A., & Hasna, S. (2022). Menerapkan metode pembelajaran berorientasi student centered menuju masa transisi kurikulum merdeka. *Jurnal Pendidikan Tambusai*, 6(2), 8839-8848.
- Rahayu, R., Rosita, R., Rahayuningsih, Y. S., Hernawan, A. H., & Prihantini, P. (2022). Implementasi Kurikulum Merdeka Belajar di Sekolah Penggerak. *Jurnal Basicedu*, 6(4), 6313–6319. <https://doi.org/10.31004/basicedu.v6i4.3237>
- Rahmadhani, P., Widya, D., & Setiawati, M. (2022). Dampak Transisi Kurikulum 2013 Ke Kurikulum Merdeka Belajar Terhadap Minat Belajar Siswa. *JUPEIS : Jurnal Pendidikan Dan Ilmu Sosial*, 1(4), 41–49. <https://doi.org/10.57218/jupeis.vol1.iss4.321>
- Sahelatua, L. S., Vitoria, L., & Mislinawati, M. (2019). Kendala guru memanfaatkan media IT dalam pembelajaran di SDN 1 Pagar Air Aceh Besar. *Elementary Education Research*, 4(4).
- Salsabila, U. H., Hanifan, M. L. N., Mahmuda, M. I., Nur Tajuddin, M. A., & Pratiwi, A. (2023). Pengaruh Perkembangan Teknologi terhadap Pendidikan Islam. *Journal on Education*, 5(2), 3268–3275. <https://doi.org/10.31004/joe.v5i2.995>
- Saputra, D. T., Kartika, R. C., & Sumardjoko, B. (2024). Perubahan paradigma guru dalam kurikulum merdeka di sekolah dasar. *Jurnal Pendidikan*, 33(1), 469-476. <https://doi.org/10.32585/jp.v33i1.4868>
- Sari, N. F., & Supriadi, S. (2022). Perancangan Media Pembelajaran Interaktif pada Mata Pelajaran Ilmu Pengetahuan Alam Berbasis Android Kelas VIII di SMP Negeri 9 Pariaman. *Indonesian Research Journal On Education*, 2(2), 660–672. <https://doi.org/10.31004/irje.v2i2.18>
- Saskia Permana, B., Ainun Hazizah, L., & Tri Herlambang, Y. (2024). Teknologi Pendidikan: Efektivitas Penggunaan Media Pembelajaran Berbasis Teknologi Di Era Digitalisasi. *Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora*, 4(1), 19–28. <https://doi.org/10.55606/khatulistiwa.v4i1.2702>

- Setiyana, F. N., & Kusuma, A. B. (2021). Potensi pemanfaatan youtube dalam pembelajaran matematika. *Jurnal Pendidikan, Matematika, Dan Sains*, 6(1), 71-90. <https://doi.org/10.33541/edumatsains.v6i1.2945>
- Sidaruruk, D. I. (2023). Pediaqu: Jurnal Pendidikan Sosial dan Humaniora Volume 2 Nomor 1 (2023) 74. *Pendidikan Sosial Dan Humaniora*, 2(2), 11576-11584.
- Simatupang, H., & Purnama, D. (2019). Analisis Pelaksanaan Kurikulum 2013 Ditinjau Dari Standar Proses Dalam Pembelajaran Ipa Kelas Vii Smp Al-Ulum Kota Medan. *Jurnal Biolokus*, 2(1), 135-138. <https://doi.org/10.30821/biolokus.v2i1.438>
- Sofyan, A., & Hidayat, A. (2022). Dampak perkembangan teknologi peningkatan kualitas pendidikan. *Jurnal Satya Informatika*, 7(02), 16-24. <https://doi.org/10.59134/jsk.v7i02.163>
- Suryapermana, N. (2017). Manajemen Perencanaan Pembelajaran. *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan*, 3(02), 183-193. <https://doi.org/10.32678/tarbawi.v3i02.1788>
- Wahyuni, S. (2024). Kurikulum Merdeka untuk Meningkatkan Kualitas Pembelajaran. *Jurnal Pendidikan Dan Konseling*, 6(4), 13404-13408. <https://doi.org/10.47467/reslaj.v6i4.1339>
- Widiasanti, I., Nirvia, G. A., Zahra, F. Y., Hamidah, F., & Prasetyo, A. B. (2023). Implementasi Kendala Guru di Era Perkembangan Teknologi Informasi dalam Sistem Pembelajaran di Sekolah. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 09(01), 1301-1314. <https://doi.org/10.23969/jp.v8i1.7640>
- Yulianah, N., & Watini, S. (2022). Peran TV Sekolah Sebagai Media Pembelajaran dan Komunikasi yang Efektif di RA Senyum Muslim. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 8(3), 841. <https://doi.org/10.37905/aksara.8.3.1841-1848.2022>
- Yusmar, F., & Fadilah, R. E. (2023). Analisis Rendahnya Literasi Sains Peserta Didik Indonesia: Hasil Pisa Dan Faktor Penyebab. *LENSA (Lentera Sains):Jurnal Pendidikan IPA*, 13(1), 11-19. <https://doi.org/10.24929/lensa.v13i1.283>