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Cyberspace Metaverse Connected to Artificial Intelligence: Analysis of Merdeka Curriculum Interactive Multimedia Needs on Science Material

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Abstract. The independent curriculum utilizes technology as a digital platform that facilitates teachers and students in developing their potential. Using various existing learning platforms is less efficient and makes things difficult for students, so they need a platform that can accommodate multiple learning needs. The research method used is netnography, which is descriptive qualitative. The data collection technique in this research is observation of the use of digital media in the independent learning curriculum, in-depth interviews, and library research. The research results showed that as many as 53 percent of respondents did not agree with the existence of diverse learning platforms with different functions. The metaverse cyberspace platform can be an innovation relevant to the independent learning curriculum because it can provide a variety of media so that it does not take up student storage space. The metaverse cyberspace platform based on local wisdom can integrate technology with everyday life and support science learning. The metaverse cyberspace platform connected to artificial intelligence (AI) is a solution to the problems of the independent curriculum, namely the character education crisis and the need for learning technology.

Keywords: Cyberspace Metaverse, Articificial Intelligence, Merdeka Curriculum, Science Material

INTRODUCTION

The Minister of Education and Culture of the Republic of Indonesia emphasized simplifying the curriculum to restore the quality of education after the pandemic, called the independent learning curriculum (Kemdikbud, 2020). One indicator of an independent curriculum is creating flexible learning through digitalizing education (Pertiwi et al., 2023). The independent curriculum utilizes technology as a digital platform that facilitates teachers and students in developing their potential (Mustofa & Mariati, 2022). The digital platforms in the current independent curriculum are independent teaching and home learning (Wahira et al., 2023).

Independent teaching is a platform that focuses on developing teacher potential so that the platform contains the development of learning models, innovative learning methods, and other learning innovations that can encourage teachers to innovate (Marisana

et al., 2023). Meanwhile, the learning house is a platform that focuses on developing student potential so that students can learn independently through the materials and materials available (Wahdani et al., 2023). Both platforms focus on developing the potential of students and teachers by utilizing technology to answer the challenges and needs of education in the digital era.

The independent learning curriculum has three objective indicators: developing soft skills and character, focusing on essential material, and flexible learning using technology. The independent curriculum applies a flexible learning concept to focus more on student development in achieving learning goals (Pertiwi et al., 2023). Therefore, the independent curriculum can carry out learning activities synchronously and asynchronously (Martani, 2023).

The currently available asynchronous-based learning platforms only carry out unidirectional learning, such as giving assignments or grades to students and collecting assignments without interaction, for example, Google Classroom (Kemdikbud, 2020). Meanwhile, synchronous learning platforms only occur via video conference (Zoom, Google Meet) or WhatsApp (Abdillah, 2021). This platform cannot produce visual effects that can depict the virtual world like the real world so that students and teachers can experience classroom learning through cyberspace (Pustikayasa, 2021).

The currently available platforms have limitations because teachers cannot monitor student activities during teaching and learning activities (Asmiyunda et al., 2023). If the teacher does not require students to be on camera, many students will leave the conference room and not pay attention to the lesson (Pustikayasa, 2021). The use of conference media is considered less effective in its implementation, so it requires innovation to optimize technology-based learning systems (Abdillah, 2021).

One of the breakthroughs that can be used in technology-based learning is the cyberspace metaverse. Cyberspace is a learning media that utilizes technology and is not limited by space and time so that learning can be done anywhere and anytime; this creates a more efficient learning concept (Anggoro & Sari, 2021). Meanwhile, the metaverse is a platform that can visualize the virtual world like the real world (Díaz et al., 2020). The cyberspace metaverse is a combination of platforms that creates a social network for teachers and students to interact virtually by replicating the actual learning experience in the classroom (Firdaus, 2023).

Implementing cyberspace metaverse in the education sector can create virtual classrooms so students can teleport virtually in the learning process (Hemmati, 2022). In addition, learning resources and learning processes can be integrated directly into one platform so that it does not require many applications as learning resources. The metaverse cyberspace platform allows users to feel sensations in a natural environment; this is needed in science learning, which requires interactive multimedia to provide students with experience in virtual scientific investigation activities (Nurcahyo, 2020).

Science learning that utilizes the metaverse cyberspace platform must be integrated with daily life to achieve the three indicators of an independent learning curriculum. Local wisdom is one aspect of daily life and can be integrated into the metaverse cyberspace platform (Firdaus, 2023). Local wisdom is a cultural concept in community life that is shared based on the formation of local culture in understanding the natural environment in which one lives and is hereditary (Setyawan, 2019).

Metaverse cyberspace needs to be improved in utilizing technology in learning. It can erode student character because there is no direct supervision by the teacher, making cheating possible (Alifiyah, 2023). Artificial intelligence (AI) in this platform uses sensors that can recognize faces, bodies, and human movements so that technology can supervise students in the learning process (Rathore, 2023).

Based on the problem description above, it is essential to carry out this research. This research creates an innovation, namely a cyberspace metaverse platform connected to artificial intelligence (AI), which can complement the shortcomings of the independent learning curriculum. Implementing the metaverse cyberspace platform connected to

artificial intelligence (AI) in learning science material based on local wisdom creates meaningful and cultural learning.

METHODOLOGY

The method used in this research is a netnography method, which is descriptive qualitative. Netnography is a research method that utilizes information technology to obtain observation and interview data (O'Donohoe, 2010). The subjects of this research were 100 respondents consisting of college students teaching in Indonesia. The respondent sample selection technique uses random sampling by taking samples from each school.

The data collection technique in this research is observation of the use of digital media in the independent learning curriculum, in-depth interviews, and library research. The data analysis technique used in this research is interpretive analysis from observations and in-depth interviews. Interpretive analysis aims to analyze in depth and detail to obtain meaning from the respondents' real experiences to understand the research object (Smith et al., 2009).

RESULTS AND DISCUSSION

The existence of an independent learning curriculum with various platforms applied in the learning process has given rise to various kinds of responses. It has both negative and positive impacts in its implementation. Based on the research results, there are four main points of discussion, namely regarding the use of the independent learning platform, the implementation of science learning based on the independent learning platform, character formation through the independent learning platform, and innovation as a solution to problems that arise in implementing the independent learning curriculum.

Use of the Merdeka Belajar Platform

The research results through observation of the independent curriculum platform and in-depth interviews with teaching campus student respondents regarding the use of the independent teaching platform can be seen in Figure 1.

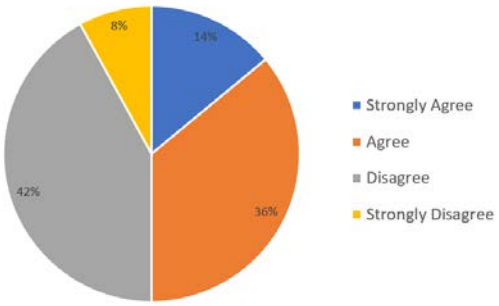


Figure 1. Teachers' use of the independent teaching platform

The diagram in Figure 1 shows that as many as 14% of respondents and 36% of respondents strongly agreed and agreed that the independent teaching platform made it easier for teachers to find and develop innovative learning methods. The independent teaching platform provides many features, such as assessments, teaching media, learning videos, and creative learning materials that teachers can apply during the teaching and learning process. It shows that the independent teaching platform can facilitate teachers to innovate in the learning process. An independent teaching platform supports the implementation of the independent curriculum, which aims to improve the quality of education in Indonesia (Iskandar et al., 2023).

42% and 8% of respondents stated that they neither agreed nor disagreed that teachers could utilize the independent teaching platform. Respondents stated that the actual situation was that many teachers needed to be made aware of the independent teaching platform. Apart from the need for more socialization of the use of the independent

teaching platform, the age and internet network conditions in the 3T area also mean that teachers are unable to utilize the platform. The limited internet network in the 3T area is a challenge for the digitalization of education, which causes education in Indonesia to be unequal (Suryaningrum, 2023).

The independent learning curriculum focuses on learning patterns and developing students' competencies (Santoso et al., 2023). Flexible learning patterns utilize various platforms that can be accessed by students, such as home learning, Google Classroom, video conferencing (Zoom, Google Meet), WhatsApp, and other networking-based learning platforms (Siregar et al., 2023). The research results through observations of various independent learning platforms and in-depth interviews with respondents can be seen in Figure 2.

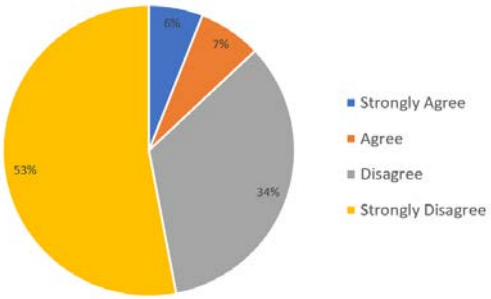


Figure 2. Use of various learning platforms that students can access

Based on the diagram in Figure 2, it shows that as many as 53% of respondents and 34% of respondents stated that they did not agree or disagree with the use of various learning platforms. The large number of diverse platforms with different functions means that teachers and students often need more memory space on smartphone devices. Using these various learning platforms also requires a strong internet network. Of course, it disrupts the implementation of learning because teachers and students must have smartphones that have ample storage capacity to access various learning platforms. Using various platforms will create a gap for students with low economic conditions because they need help to afford smartphones with large storage capacities, which are unsuitable for areas with weak internet networks (Ramadani et al., 2023).

As many as 6% of respondents and 7% of respondents stated that they strongly agreed and agreed because they felt that the benefits of the various platforms available made it easier for teachers and students to carry out distance learning so that learning could be carried out flexibly. Learning platforms with many types make it easier for teachers to choose a variety of platforms so that learning is not boring. It shows that the various learning platforms currently available can be utilized by users who have smartphones with ample storage space. However, the use of various platforms that have different functions could be more efficient and adequate for teachers and students who have smartphones with small storage capacities. So, we need an innovative platform that can accommodate various media types so that students can download only a few learning platforms.

Implementation of Science Learning Based on the Independent Learning Platform

The use of various platforms in implementing the independent learning curriculum influences the implementation of learning, one of which is learning science material. The research results through observation of the implementation of science learning based on the independent learning platform and in-depth interviews with respondents can be seen in Figure 3.

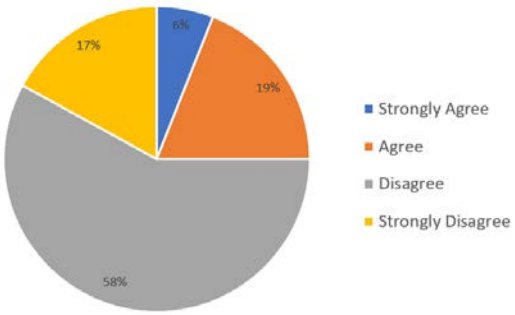


Figure 3. Teacher implementation in visualizing science material on digital platforms

The diagram in Figure 3 shows that as many as 58% of respondents and 17% of respondents stated that they disagreed and disagreed with implementing science learning on digital platforms because, currently, teachers cannot visualize science practicum on digital platforms. Hence, science learning is only limited to theory. Science learning based on digital platforms cannot provide real experiences such as direct practicums, so students must understand the concepts. Science learning, dominant with curriculum activities, aims to increase understanding of science concepts through experience. Therefore, a platform is needed that facilitates students to carry out online practicums (Indriyani et al., 2023).

As many as 6% of respondents and 19% of respondents stated that they strongly agreed and agreed with the implementation of science learning on digital platforms because teachers can use animations or practical videos so that students can understand concepts. It shows that the dominant science material with practicum can be implemented through a digital platform with practicum visualization through animation or other media. Currently, science learning has yet to be optimal because the implementation of learning on digital platforms cannot visualize science practicum, so innovation is needed in the form of a platform that can visualize practicum in a virtual space similar to the real world.

Character Building through the Merdeka Belajar Platform

An indicator of the independent learning curriculum is the development of student character (Nurdiana Sari et al., 2023). Therefore, observations are needed regarding the formation of student character when using the independent learning platform. The research results through observation of the formation of honest and disciplined character through the independent learning platform and in-depth interviews with respondents can be seen in Figure 4.

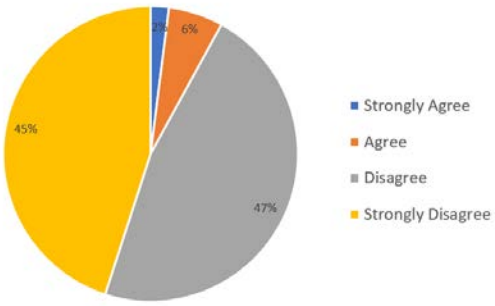


Figure 4. Formation of honest and disciplined character through the independent learning platform

The diagram in Figure 4 shows that 47% of respondents and 45 respondents stated that they neither agree nor disagree that the independent learning platform can shape students' honest and disciplined character. This is because digital-based independent learning platforms mean that students need more direct supervision, thereby allowing students to cheat in the learning process. In addition, with digital learning, students are

laxer in their responsibilities and less disciplined, so digital learning can shape students' character. There is no supervision by teachers or parents in using technology, so that students generally misuse technology. Many students do not participate in synchronous or asynchronous learning because learning via digital platforms is only limited to providing material and assignments, so students get bored and prefer to play games.

As many as 2% of respondents and 6% of respondents stated that they strongly agreed and agreed because digital learning carried out at home could be directly supervised by parents so that it could shape students' character. Apart from that, there is a working time limit so that students can work in a structured and systematic manner. It shows that learning via digital platforms currently cannot shape students' honest and disciplined character due to the lack of direct supervision. Based on research by Alifiyah (2023), using digital platforms as learning media causes a crisis in character education. Therefore, innovation is needed in the learning platform to supervise students even though they carry out learning independently.

Innovation as a Solution to Independent Learning Curriculum Problems

The independent teaching platform has yet to be utilized optimally. Many teachers need more facilities and infrastructure to implement the learning methods found on the independent teaching platform (Arnes et al., 2023). The existence of the metaverse cyberspace platform can facilitate teachers to implement innovative and creative learning methods. The metaverse cyberspace platform provides centralized learning media, making it easier for teachers to operate it (Díaz et al., 2020).

Apart from that, using the metaverse cyberspace platform in learning is a solution to the many independent learning platforms on one device, causing storage space to be full and inefficient. Using the metaverse cyberspace platform is an excellent opportunity to complement implementing an independent curriculum focusing on independent learning (Muslim, 2023). The advantage of metaverse cyberspace is that it can create a centralized platform that makes it easier for students and teachers to carry out learning (Indarta et al., 2022). It is supported by data on the development of metaverse discussion topics and popular searches on YouTube and Google, as shown in Figure 5.

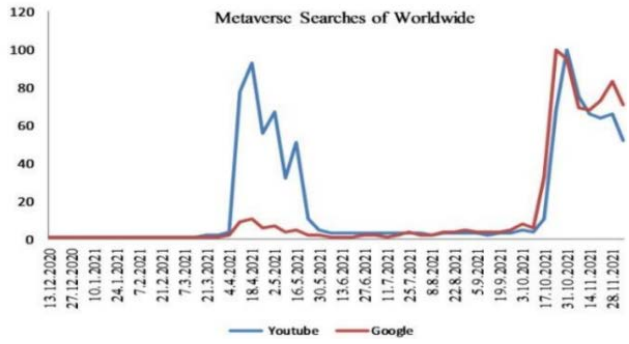


Figure 5. Popular Metaverse searches on YouTube and Google Source: (Narin, 2021)

The metaverse cyberspace platform creates a communication environment through computer networks by presenting interactive software control visual effects using modern software by connecting text, sound, graphics, photos, and videos in a digital representation (Díaz et al., 2020). Learning through the metaverse cyberspace platform contributes to more conscious assimilation and deeper understanding of the material, saving learning time, efficiency in learning, and visual information that can arouse students' motivation and interest in learning (Yazdani et al., 2020). Implementing the metaverse cyberspace platform is characterized as an exchange between humans and avatars in a three-dimensional virtual space that can engage in social activities like the real world in cyberspace (Hyun, 2021). It creates a visual state of the classroom in cyberspace to increase student learning motivation.

The metaverse cyberspace platform is an innovation in learning that can optimize distance (online) learning, which is currently implemented through the independent learning curriculum so that students can learn independently (Muslim, 2023). Using the cyberspace metaverse platform allows students to develop their abilities through interactive learning that is not limited by space and time (Indarta et al., 2022). The metaverse cyberspace platform has a high chance of implementing the independent curriculum because this platform supports the development of student potential and makes it easier for teachers and students to carry out learning (Mustofa & Mariati, 2022). A visualization of the metaverse cyberspace platform in creating classrooms in cyberspace is shown in Figure 6.

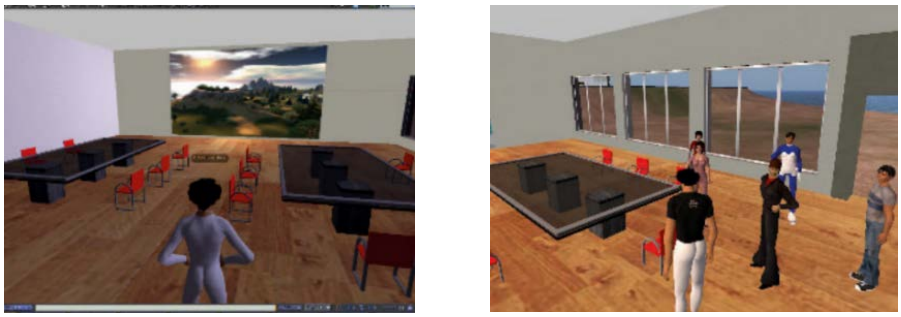
Figure 6. Visualization of student avatars present in class. Source: (Díaz et al., 2020). The virtual world as a resource for hybrid education. Avatar at platform cyberspace metaverse.

Metaverse cyberspace platform-based learning creates real-like learning in cyberspace (Yazdani et al., 2020). It, of course, can increase students' learning motivation. However, using the cyberspace metaverse platform still cannot directly control student activities. Therefore, it is necessary to use artificial intelligence (AI). Technology supported by artificial intelligence (AI) can provide sensors for metaverse cyberspace platform users (Rathore, 2023). Face and gesture detection sensors can recognize and ensure that students are in front of the camera (Kuklin et al., 2023).

Face and gesture detection sensors can control students using metaverse cyberspace platforms (Dimitriadou & Lanitis, 2023). The metaverse cyberspace platform connected to artificial intelligence (AI) as a facial detection sensor and gesture recognition can control students so they do not cheat and are disciplined (Salamah et al., 2022). The cyberspace metaverse platform connected to artificial intelligence (AI) has a high opportunity to implement the independent curriculum because it can minimize cheating and thus shape students' character to be disciplined and honest following the Pancasila student guidelines (Kemdikbud, 2020). The metaverse cyberspace platform connected to artificial intelligence (AI) can create innovative learning in line with current developments without eliminating the student guidelines of Pancasila as the nation's identity. The facial recognition sensor using artificial intelligence (AI) can be seen in Figure 7.

Figure 7. Visualization of facial recognition sensors. Source: (Kuklin et al., 2023)

The metaverse cyberspace platform can facilitate independent learning, one of which is science learning. Science material that studies living things and the elements of life in all their complexity can gain knowledge through experimental activities to find new findings (Priyani & Nawawi, 2020). As virtual learning technology develops, experimental activities will be more accessible using virtual technology (Martani, 2023). The metaverse cyberspace platform can create an online practicum atmosphere like in the real world (Suzuki et al., 2020). The cyberspace metaverse platform connected to artificial intelligence (AI) on science material in conducting natural virtual experiments allows students to collaborate in a virtual room, which can be seen in Figure 8.



(a) (b)

Figure 8. (a) Experiment room (b) Students collaborate to create a project. Source: (Suzuki et al., 2020). Virtual experiments in metaverse and their applications to collaborative project: The framework and its significance

Apart from making it easier to carry out virtual experiments, the metaverse cyberspace platform integrated with local wisdom can also make it easier to learn science based on local wisdom and everyday life. Science learning integrated with local wisdom makes it easier for students to understand concepts and create meaningful learning without abandoning socio-cultural concepts so that they are not eroded by developments over time (Fauzi et al., 2022). It is because the cyberspace metaverse platform integrated with local wisdom can integrate technology with daily life, thereby creating digital literacy that does not eliminate elements of local culture. Integrating technology with culture and the social environment in science learning will become more meaningful, supported by ease of use, such as when playing online games (Jovanović & Milosavljević, 2022). The integration of technology and daily life on the metaverse cyberspace platform can be seen in Figure 9.

Figure 9. Student interaction with the virtual environment. Source: (Huynh-The et al., 2023). Artificial Intelligence for the Metaverse: A Survey

Using a metaverse cyberspace platform connected to artificial intelligence (AI) has excellent opportunities for implementing the independent curriculum. The metaverse cyberspace platform connected to artificial intelligence (AI) can create technology-based interactive learning and foster honest, disciplined, and responsible student character.

Implementing a metaverse cyberspace platform connected to artificial intelligence (AI) in science learning based on local wisdom can make technology-based learning more accessible and meaningful. It aligns with the objectives of the independent curriculum, namely flexible, technology-based learning, developing student potential through creativity and innovation, and building student character and culture (Arnes et al., 2023).

CONCLUSION AND IMPLICATIONS

Implementing the metaverse cyberspace platform connected to artificial intelligence (AI) in the independent curriculum has a good impact on the quality of education. The metaverse cyberspace platform can provide a variety of media, so it does not take up student storage space. The metaverse cyberspace platform based on local wisdom can integrate technology with everyday life and enable students to carry out practicums in cyberspace so that this platform supports science learning. Apart from that, the metaverse cyberspace platform connected to artificial intelligence (AI) solves the independent curriculum problem, namely the character education crisis. The presence of facial and movement sensors on the metaverse cyberspace platform connected to artificial intelligence (AI) can shape the character of students who are honest and disciplined in digital-based independent learning. Using the cyberspace metaverse platform connected to artificial intelligence (AI) in science learning based on local wisdom makes it easier for students to understand science concepts and create meaningful learning without abandoning socio-cultural values and character education so that they are not eroded by developments over time.

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