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TikTok Application-Based Learning Videos on Climate Change Materials at the Junior High School Level

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Abstrak

Perubahan iklim telah menjadi salah satu isu global paling mendesak untuk segera diselesaikan secara sistemik dan berkelanjutan. Isu ini sering menjadi pokok bahasan dalam persidangan di forum Perserikatan bangsa-bangsa (PBB) untuk mengajak seluruh negara agar menjadi katalisator dalam percepatan pengedukasian masyarakat. Hal ini terkhusus generasi muda agar mereka memiliki pengetahuan dan kesadaran untuk menjaga lingkungan. Tugas ini menjadi tantangan bagi pendidik. Pada abad teknologi saat ini, pengetahuan dan informasi sangat mudah didapatkan berkat bantuan internet. Tiktok merupakan salah satu contoh platform penyebaran informasi yang sudah terbukti efektif untuk bisa mengedukasi masyarakat terutama Generasi Z yang sangat erat kehidupannya dengan teknologi. Tujuan penelitian ini adalah untuk menganalisis kebutuhan pengembangan media belajar berupa TikTok untuk materi perubahan iklim pada tingkat SMP. Penelitian ini menggunakan metode deskriptif kuantitatif dimana pengambilan data dengan menggunakan teknik wawancara dan penyebaran kuesioner. Data yang didapat kemudian disajikan dalam bentuk deksriptif. Hasil penelitian menyimpulkan bahwa peserta didik belum memahami perubahan iklim secara mendalam dan mereka berkeinginan untuk belajar melalui media TikTok.

Kata Kunci: Video Pembelajaran, Multimedia, Tiktok, Perubahan Iklim, Tingkat Satuan SMP

Abstract

Climate change has become one of the most urgent global issues that must be resolved systemically and sustainably. This issue is often discussed in the United Nations (UN) forum to invite all countries to become catalysts in accelerating public education. This is especially true for the younger generation, who need to have the knowledge and awareness to protect the environment. This task is a challenge for educators. In today's technological age, knowledge, and information are very easy to obtain thanks to the help of the internet. TikTok is an example of an information dissemination platform that has proven effective in educating the public, especially Generation Z, who are very close to technology. This study analyzes the need to develop learning media in TikTok for climate change materials at the junior high school level. This study uses a quantitative descriptive method to collect data from interview techniques and questionnaire distribution. The data obtained is then presented in descriptive form. The study results concluded that students do not understand climate change profoundly and want to learn through TikTok media.

Keywords: Learning Videos, Multimedia, Tiktok, Climate Change, Junior High School Unit Level

Introduction

Climate change is one of the most pressing global issues that must be addressed urgently. Climate change can be considered a phenomenon showing that the earth is not doing well. This has impacted various aspects of life worldwide, from rising earth temperatures and changing weather patterns to natural disasters that have claimed lives.

The United Nations (UN) states that the acceleration of technology and the exploitation of fossil resources by humans are the main factors behind the alarming rate of climate change. Ironically, this increase in energy consumption is not accompanied by increased public knowledge about climate change. As a result, awareness of the destructive impacts of climate change is still relatively low (Defra, 2021; Khatibi et al., 2021; Liwan et al., 2022). Research (Yang et al., 2021) shows that people still do not properly understand climate change. This ignorance is a big problem, given the severe and deadly impacts of climate change.

Education is essential in facing global challenges in the 21st century, including overcoming climate change (Fekih Zguir et al., 2021). The Nation Council invites all countries to become stakeholders in accelerating the community's education, especially the younger generation, so they have the knowledge and awareness to protect the environment around them.

Indonesia, through the Pancasila Student Profile, tries to increase the younger generation's awareness of the nature around them (Tajuddien et al., 2023). It is hoped that the young generation will know how to protect the environment around them. Therefore, the younger generation must be aware and sensitive to indicate the changes around them, analyze them, and find the causes. In other words, the younger generation must continue to learn about everything that happens around them.

Learning is essentially a dynamic process where students process the information they receive. This information can come from various sources, both direct and indirect experience (Wardana & Djamaluddin, 2021). Although each individual's learning process has its peculiarities, 21st-century education now carries an approach that utilizes technology as a teaching aid.

Unlike in the past, when information was rare, it is very easy to find information around us today. Sometimes, we are overwhelmed with information that we do not always need. Access to this data is largely altered by internet technology. Teaching and technology are related to each other in the digital age. The complexity of life problems encourages humans to innovate and create various applications that help people live their daily lives more easily, including education. Learners can access thousands to hundreds of educational apps today to enhance their learning experience. TikTok is one of the apps that attracts attention.

TikTok is a social media app and music video platform that allows users to quickly and easily create, edit, and share unique short video clips to share with friends and people around the world. TikTok can produce concise learning materials quickly by limiting videos to no more than 60 seconds (Zhang et al., 2023).

TikTok can also be a learning medium that is very helpful for teachers in explaining subject matter that is difficult to teach if only using the lecture method. Through tiktok, teachers can present fun learning (Syafri & Kulsum, 2021). In addition, TikTok-based learning also increases learning motivation. It allows students to focus more on learning and the material displayed because the nature of TikTok videos is short, making students not easily bored (Ruslan Afendi et al., 2023).

At the junior high school (SMP) level, the Natural Sciences (IPA) subject is a forum to introduce climate change problems to students. However, teachers are often faced with various challenges in the teaching process. One of them is the difficulty in describing climate change material clearly without content visualization. This can make it difficult for students to understand abstract and complex concepts.

Presenting fun learning by presenting various stimuli, such as TikTok videos, is a form of content visualization. This is certainly indispensable for certain materials such as climate change; through content visualization, students will find it easier to understand the working process of how climate change can occur and the impact of climate change on the earth. However, to be able to visualize good

content, a qualified technological infrastructure is needed. On the other hand, education in Indonesia is still colored by the uneven use of technology in teaching and learning activities.

Facts on the ground show that there are still many junior high schools that do not have adequate infrastructure and internet access. As a result, the learning pattern still focuses a lot on the old method, where the teacher becomes the center of learning, and the students only receive information passively. This traditional learning method is no longer practical for reaching the younger generation familiar with technology and visualization. Innovation is needed in science learning so students can understand climate change material more quickly and actively participate in the learning process.

Based on this background, this study aims to see the need to develop a TikTok media-based learning video with climate change material as a learning resource for students at the junior high school level.

Method

This study adopts the Quantitative Descriptive method as the main approach to collect and analyze data. Arikunto explained that quantitative research uses numbers, starting from data collection, interpretation of the data, and the appearance of the results. The descriptive approach is explained by Sudjana and Ibrahim as research that seeks to describe a phenomenon, event, and event that occurs at present (Jayusman et al., 2020). So, it can be concluded that descriptive quantitative research uses statistical numbers to collect data, which is then processed and written descriptively to explain the occurring phenomenon.

The choice of this method is based on its suitability with the research objectives that focus on analyzing the needs of TikTok video development in science lessons related to climate change material. The quantitative method allows researchers to process measurable and objective data from a sizable sample. This is important to confirm the generalization of research findings and increase the validity of research results. It allows researchers to systematically describe and analyze data through descriptive statistics such as diagrams, graphs, and percentages. This descriptive approach helps researchers to understand the patterns and trends that emerge in the data and reveal the meaning behind the numbers.

Using quantitative methods and descriptive analysis techniques is expected to provide a comprehensive overview of the need to develop TikTok videos in science lessons related to climate change materials. This research is expected to produce valid and valuable findings to develop an effective TikTok video development strategy that suits the needs of students.

This research will be conducted at SMPN 6 Lahat by taking a sample of 31 people in grade 8. Data will be collected using two main instruments: questionnaires/questionnaires and interviews. The questionnaire will be distributed to the research sample, namely 8th-grade students, to collect the necessary data related to developing TikTok videos for students as subjects in this study. Follow-up interviews will be conducted with selected respondents to obtain more in-depth and exploratory information about the research topic.

The research results will be presented in a descriptive form, combining data from questionnaires and interviews. This design allows researchers to create a comprehensive picture of the research problem and strengthen the interpretation of the findings. The flow of the research process can be seen in Figure 1

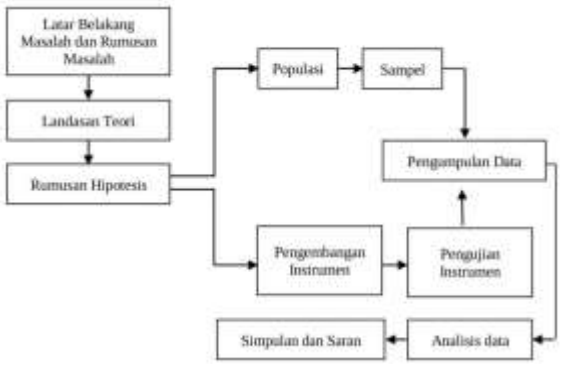

Figure 1. The flow of research stages

Results and Discussions

Result

Science subjects are quite difficult to learn because science often provides an abstract concept and is difficult to understand if the learning process is still traditional (lecture). Therefore, innovation is needed in teaching science, considering the rapid development of technology today; of course, including technology will make it easier for students to understand science concepts or materials. Figure 2 explains the science teaching process at the research site.

Figure 2. Diagram of teacher learning methods

In Figure 2, it can be seen that most students, or 67.7%, stated that the science learning process in the classroom still uses the old learning pattern where teachers still use the lecture method. 16.1% of students answered that teachers often only give assignments through reference books, and students learn independently. Another 16.1% answered that the learning process in class is only by conducting group discussions for each topic in the reference book. Figure 3 will show how satisfied the students are with the teaching method.

Figure 3. Diagram of student satisfaction with the teacher method

Based on Figure 3, it is known that most students, 93.5% of them, answered that they were not satisfied with the lecture method. Based on the statement of one of the students, when asked why he did not like the lecture method, replied, "The lecture method makes us bored in class because we only pay attention to the teacher, and often the teacher's explanation is not drawn in our minds so that we also do not understand the material given." Furthermore, Figure 4 shows what learning is desired by students.

Figure 4. Diagram of learning media of students' desires

Figure 4 shows that most students (51.6%) prefer to use media in the form of learning videos while providing material in the classroom. 25.8% of other students stated that they preferred images, and another 22.6% stated that they preferred media in the form of text. So, it can be concluded that innovation is needed to present good and interesting learning videos to improve students' critical thinking skills. Furthermore, in Figure 5, students' interest in using technology will be shown when learning occurs.

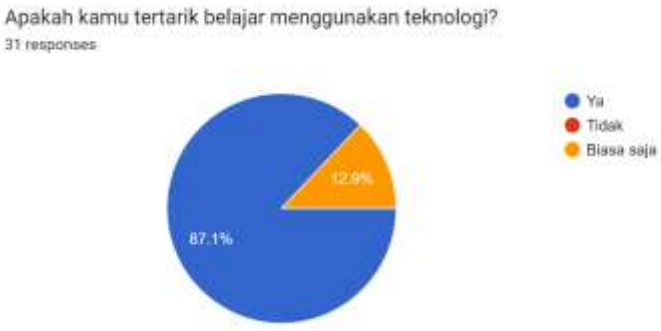

Figure 5 Diagram of students' interest in learning with technology

Based on Figure 5, it is known that the % of students, 87.1%, feel interested in learning science by utilizing technology such as smartphones. Then another 12.9% stated that they were ordinary if the learning carried out by teachers involved technology. In Figure 6, the

researcher wanted to see if students were familiar with TikTok media as one of the main sources of information used by the younger generation today.

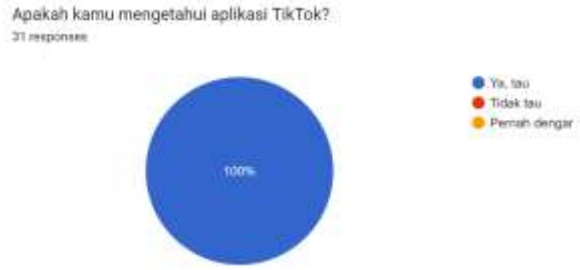

Figure 6. Learners' knowledge diagram about the TikTok application

Based on Figure 6, it is known that they know the TikTok application and 100% of students have used it. Furthermore, in figure 7, it will be shown how long they used the TikTok application in 1 day.

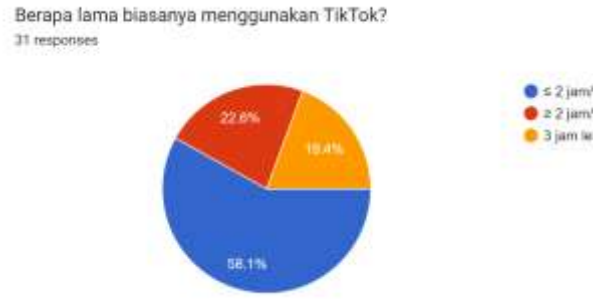

Figure 7. A diagram of the time students use when accessing the TikTok application

Figure 7 shows that most students, 58.1%, use TikTok for less than 2 hours/day. 22.6% of students answered if they use the TikTok application for more than 2-3 hours/day. And 19.4% said they use TikTok for more than 3 hours/day. Furthermore, in Figure 8, based on the students' experience using the TikTok application, students' opinions regarding the potential of TikTok to become a learning resource will be shown.

Figure 8. Diagram of students' opinions regarding the potential of the Tiktok application

Based on Figure 8, it is known that the majority of students, 77.4%, agree that TikTok has the potential to be an innovative learning platform or learning medium in the classroom. 19.1% answered that TikTok cannot be a complete learning medium. Based on further interviews, they argue that because the TikTok algorithm cannot be fully regulated, the information that will appear is not always about learning concerning climate change material. Figure 9 shows whether students have learned about climate change.

Figure 9. Learners' knowledge diagram about climate change

Figure 9 shows that most students, or 90.3%, stated that they had studied climate change, while the other 9.7% stated that they had never learned about climate change. In Figure 10, they will be shown their learning resources about climate change.

Figure 10. Diagram of students' understanding of the surrounding environment

Based on Figure 10, it can be concluded that the majority of students, or 51.6%, stated that they do not know the causes of changes in temperature and the increase in the number of natural disasters that occur around them. Meanwhile, another 48.4 percent stated that they already knew the cause. However, through more in-depth interviews, they only knew the main cause but could not explain why it could happen. Students already have basic information about climate change; it's just that their source of information determines the depth of their understanding of this problem. In Figure 11, you will be shown sources of information that students usually use to learn about climate change.

Figure 11. Diagram of learners' resources on climate change

Based on Figure 11, it is known that most students, or 58.1%, find information about climate change when surfing the internet. 22.6% found information through news on television, and another 19.4%. Stating that they learn about climate change through books, especially textbooks at school. In Figure 12, students' interest in learning climate change material will be shown.

Figure 12. Learners' interest in learning about climate change

Based on Figure 12, it is known that if awareness of the importance of climate change material is not yet owned by all students, only 80.6% are interested in learning about this material, and 19.4 are still not interested. Of course, this number is good, considering that most students already have awareness. However, it would be nice if 19.4% of students who are not interested could be interested in deepening this material. Furthermore, Figure 13 shows the media of students' choice to learn about climate change topics.

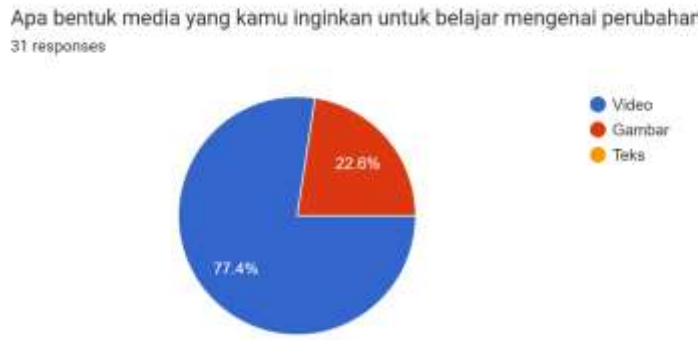

Figure 13. Media diagrams that students want to learn about climate change

Figure 13 shows that most students, or 77.4%, want to learn about climate change topics through learning videos. In comparison, the other 22.6% want to learn this topic through image media in PowerPoint or infographics. Furthermore, in Figure 14, the researcher wants to see students' interest in learning this topic through Tiktok media.

Figure 14. Diagram of students' interest in learning climate change through the Tiktok application

Based on Figure 14, it is known that most students, or 54.8%, stated they are interested in learning about climate change through TikTok videos. 32.3% of students answered mediocre, and another 12.9% answered that they were not interested in learning this topic through TikTok media. In Figure 15, they will be shown the material they want to deepen on climate change.

Figure 15. Diagrams of material that students want to learn

Figure 15 shows that most students, or 58.1%, stated that the material they want to deepen is *"Causes and impacts of climate change."* 9.7% want to deepen the material on *"Real efforts that can be made to prevent and improve the current state of climate change."* Then another 32.3% want to study these two materials. Finally, in Figure 16, the researcher wanted to find out what students thought about the potential of TikTok to help them think critically when using TikTok as a learning medium.

Figure 16. Diagram of students' opinions regarding the potential of the TikTok Application to improve critical thinking skills.

Figure 16 shows that most students, or 77.4%, think that TikTok can help them in critical thinking. 16.1% of students answered that they do not know whether TikTok can or cannot improve their ability to think critically.

Discussion

Susilawati, 2021 (Malihah, 2022) (Harvian & Yuhan, 2019) Susilawati, 2021(Malihah, 2022)(Harvian & Yuhan, 2019) (Kundrát & Rojková, 2021) refers to a mechanism in the human brain that determines one's reliance on the scale of priority of a given problem. The more significant the impact of a problem on one's life, the higher priority it will be given for resolution. Based on this theory, it can be concluded that if society does not perceive climate change as a real and imminent threat to themselves, they will continue to adopt a passive attitude while facing this issue (Kundrát & Rojková, 2021).

The above theory is also proven by the facts obtained from the questionnaire results shown in Figure 10, where students realize there are many changes to natural disasters around them. However, they don't know why this happens. So, based on this theory, students have not seen the changes or natural disasters that occur around them into a problem that directly affects them, so they do not have the awareness to find out the causes and what real actions they can take to adapt to the changes that occur.

At the junior high school level, the subject of Natural Sciences (IPA) serves as a platform for introducing climate change issues to students. However, teachers often face

various challenges in the learning process, including difficulty in clearly illustrating climate change material. Learning is a process in which students transfer and receive information (Irawan et al., 2016). Appropriate media is needed to convey this information for the teaching and learning process to be effective. Good learning media are tailored to students' needs and preferences (Suhendi et al., 2018).

The field data reveals that the process of learning Natural Sciences (IPA) at SMP 6 Lahat is still predominantly dominated by the lecture method. However, the data in Figure 3 indicates that the participants were dissatisfied with the method. This occurs when the methods and media teachers use are not aligned with the preferences of the learners who are the target audience in this learning process. Monotonous lecture methods without collaboration with technology are considered less effective for learning in the 21st century (Sari et al., 2022). The classroom atmosphere centers around the teacher, and the students easily feel bored. Students generally prefer interactive learning involving visual stimuli, especially at the junior high school level. This aligns with the desires of the learners in Figures 4 and 5, where they express a desire for innovation in the learning process that incorporates technology in the form of instructional videos.

In recent times, students prefer short video stimuli over long lectures. This new pattern has emerged due to children's habituation of using smartphones, even from a very young age. This phenomenon will undoubtedly impact their learning process and their ability to learn in the future.

Students' lives are now very close to technology, leading to the creation of many applications that assist in learning. TikTok is one form of technology that has emerged as a fast and engaging information dissemination medium (Rahmana et al., 2022). Additionally, numerous studies have proven that TikTok can be an educational tool (Berliana et al., 2023; Fatimah et al., 2021; Suprihatin, 2022). Reviewing other research, it can be said that most learning using TikTok as a medium involves abstract or complex material that requires content visualization to make it easier for students to understand the material.

As seen in Figure 6, all respondents are familiar with the TikTok application, with the majority of students using TikTok for 2-3 hours a day. Based on their experience with TikTok, students believe that TikTok has the potential to be an educational medium. This view aligns with several studies indicating that learning through TikTok can enhance critical thinking skills (Dinda Safira et al., 2022; Sulistiyaningrum et al., 2023) and increase students' motivation to learn (Bujuri et al., 2023).

Materials not found in books can often be accessed through TikTok. In the context of climate change material, students find more information on this topic through the internet, such as TikTok, than books or television. This indicates that TikTok successfully acts as an information platform, sharing multisectoral information with its users. Moreover, as seen in Figure 13, students are also interested in learning about climate change through TikTok.

Climate change can be categorized as a complex subject, especially at the middle school level. Therefore, the learning process must be related to students' daily activities to ensure they fully understand the causes, impacts, and solutions to climate change. In other words, teachers must present contextual learning related to students' lives. Thus, to convey clearer messages from abstract materials like climate change, educational videos like those on TikTok are needed to connect theoretical concepts with students' real or more contextual lives (Jundu et al., 2020). Therefore, incorporating TikTok as a multimedia tool to assist teachers in teaching climate change material at the middle school level is highly necessary.

Conclusion

Based on the research results, there is an urgent need to develop innovative learning media to help middle school students understand the complexities of climate change issues. This learning media must be engaging and easily accessible, aligning with the habits and preferences of the younger generation, who are accustomed to technology and visualization.

TikTok, with its immense popularity among teenagers, is identified as an ideal platform to reach the target audience and deliver educational messages about climate

change. Therefore, developing educational videos that serve as learning resources for students about climate change is necessary.

The video content must be accurate, informative, and easy to understand, using language appropriate for the comprehension level of middle school students. Survey results indicate that students are particularly interested in topics such as the causes and impacts of climate change and practical actions they can take to contribute to environmental conservation to mitigate climate change.

Using educational TikTok videos in science education at middle schools is expected to enhance students' understanding of climate change and improve their critical thinking skills, enabling them to participate actively in environmental conservation efforts.

References

[1] Berliana, S. R., Mulyana, D., & Cahyono, C. (2023). Pengaruh Penggunaan Media Sosial Tiktok Terhadap Hasil Belajar Peserta Didik Pada Mata Pelajaran Pendidikan Pancasila Dan Kewarganegaraan. Melior : Jurnal Riset Pendidikan Dan Pembelajaran Indonesia, 3(2), 39–48. https://doi.org/10.56393/melior.v3i2.1720

[2] Bujuri, D. A., Sari, M., Handayani, T., & Saputra, A. D. (2023). Penggunaan media sosial dalam pembelajaran: analisis dampak penggunaan media Tiktok terhadap motivasi belajar siswa di Sekolah Dasar. Jurnal Ilmiah Pendidikan Dasar, 10(2), 112. https://doi.org/10.30659/pendas.10.2.112-127

[3] Defra, C. D. (2021). Climate Change and Net Zero: Public Awareness and Perceptions.

[4] Dinda Safira, Satria Wiguna, & Zaifatur Ridha. (2022). Upaya Peningkatan Hasil Belajar Siswa Melalui Aplikasi Tiktok Sebagai Media Pembelajaran Pada Mata Pelajaran Aqidah Akhlaq Di Kelas VII MTs Al Hidayah Gebang. INVENTION Journal Research and Education Studies, 3(3).

[5] Fatimah, S. D., Hasanudin, C., & Amin, A. K. (2021). Pemanfaatan Aplikasi Tik Tok Sebagai Media Pembelajaran Mendemonstrasikan Teks Drama. Indonesian Journal Of Education And Humanity, 1.

[6] Fekih Zguir, M., Dubis, S., & Koç, M. (2021). Embedding Education for Sustainable Development (ESD) and SDGs values in the curriculum: A comparative review on Qatar, Singapore and New Zealand. In Journal of Cleaner Production (Vol. 319). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2021.128534

[7] Harvian, K. A., & Yuhan, R. J. (2019). KAJIAN PERUBAHAN IKLIM TERHADAP KETAHANAN PANGAN (The Impact of Climate Change on Food Security). Seminar Nasional Official Statistics 2019: Pengembangan Official Statistics Dalam Mendukung Implementasi SDG's.

[8] Irawan, I. B., Musthofa, J. A., & Yusuf Iriyanto, M. (2016). PEMBUATAN MEDIA PEMBELAJARAN MOBILE POCKET BOOK BERBASIS ANDROID MENGGUNAKAN ADOBE FLASH PROFESSIONAL CS6 PADA MATERI USAHA DAN ENERGI. In Seminar Nasional Pendidikan dan Saintek.

[9] Jayusman, I., Agus, O., & Shavab, K. (2020). STUDI DESKRIPTIF KUANTITATIF TENTANG AKTIVITAS BELAJAR MAHASISWA DENGAN MENGGUNAKAN MEDIA PEMBELAJARAN EDMODO DALAM PEMBELAJARAN SEJARAH. Jurnal Artefak, 7(1). https://jurnal.unigal.ac.id/index.php/artefak

[10] Jundu, R., Nendi, F., Kurnila, V. S., Mulu, H., Ningsi, G. P., & Ali, F. A. (2020). PENGEMBANGAN VIDEO PEMBELAJARAN IPA BERBASIS

KONTEKSTUAL DI MANGGARAI UNTUK BELAJAR SISWA PADA MASA PANDEMIC COVID-19. LENSA (Lentera Sains): Jurnal Pendidikan IPA, 10(2), 63–73. https://doi.org/10.24929/lensa.v10i2.112

[11] Khatibi, F. S., Dedekorkut-Howes, A., Howes, M., & Torabi, E. (2021). Can public awareness, knowledge, and engagement improve climate change adaptation policies? In Discover Sustainability (Vol. 2, Issue 1). Springer Nature. https://doi.org/10.1007/s43621-021-00024-z

[12] Kundrát, J., & Rojková, Z. (2021). Psychological distance as a means of evaluation. New Ideas in Psychology, 63, 100900. https://doi.org/10.1016/J.NEWIDEAPSYCH.2021.100900

[13] Liwan, A., Surianshah, N. S., Surianshah, S., & Hwang, J. Y. T. (2022). Level of public awareness on climate change in Sabah. IOP Conference Series: Earth and Environmental Science, 1103(1). https://doi.org/10.1088/1755-1315/1103/1/012001

[14] Malihah, L. (2022). Tantangan Dalam Upaya Mengatasi Dampak Perubahan Iklim Dan Mendukung Pembangunan Ekonomi Berkelanjutan: Sebuah Tinjauan. Jurnal Kebijakan Pembangunan, 17(2), 219–232. https://doi.org/10.47441/jkp.v17i2.272

[15] Rahmana, P. N., Putri N, D. A., & Damariswara, R. (2022). PEMANFAATAN APLIKASI TIKTOK SEBAGAI MEDIA EDUKASI DI ERA GENERASI Z. Akademika, 11(02), 401–410. https://doi.org/10.34005/akademika.v11i02.1959

[16] Ruslan Afendi, A., Fauziyah, N., Rohan Saputra, M., & Islam Sultan Aji Muhammad Idris Samarinda, U. (2023). Pemanfaatan Aplikasi Tiktok dalam Mata Pelajaran PAI sebagai Media Pembelajaran Inovatif Era Digital. Borneo Journal of Islamic Education, 3(1), 2023.

[17] Sari, N., Wulandari, D., Jamil, N., & EZ Muttaqien Purwakarta, S. K. (2022). Relevansi Penggunaan Metode Ceramah pada Pembelajaran Abad 21 melalui Analisis Hubungan Tanggapan Peserta didik dengan Hasil Belajar Kognitif. International Conference on Islamic Studies (ICoIS), 3(1).

[18] Suhendi, H. Y., Mulhayatiah, D., Anjani, R., Ramdani, M. A., & Ardiansyah, R. (2018). HATRAVY: A virtual laboratory of heat transfer concept in microscopic form. IOP Conference Series: Materials Science and Engineering, 434(1). https://doi.org/10.1088/1757-899X/434/1/012288

[19] Sulistiyaningrum, F., Tiur Maria, H. S., & Karolina, V. (2023). Pengaruh Media Pembelajaran Video Tiktok Materi Interaksi Desa Kota terhadap Hasil Belajar Geografi pada Siswa SMAN 9 Pontianak. EDUKASIA: Jurnal Pendidikan Dan Pembelajaran, 4, 2413–2420. http://jurnaledukasia.org

[20] Suprihatin, G., & Daerah Istimewa Yogyakarta, G. (2022). PENGGUNAAN MEDIA TIKTOK DALAM MENINGKATAN HASIL BELAJAR IPA DI MTSN 4 GUNUNGKIDUL. LEARNING : Jurnal Inovasi Penelitian Pendidikan Dan Pembelajaran , 2(1).

[21] Susilawati. (2021). DAMPAK PERUBAHAN IKLIM TERHADAP KESEHATAN. E-SEHAD, 1(2).

[22] Syafri, E. P. E., & Kulsum, U. (2021). TikTok; Media Pembelajaran Alternatif dan Atraktif pada Pelajaran PPKn Selama Pandemi di SMP Negeri 2 Mertoyudan. Seri Prosiding Seminar Nasional Dinamika Informatika, 5(1), 110–115.

[23] Tajuddien, R., Ida Farida, S., & Fitra Arifianto, C. (2023). Penerapan Profil Pelajar Pancasila untuk Mempersiapkan Generasi Emas 2045 pada Pelajar Sekolah Dasar. In Jurnal Pengabdian Kepada Masyarakat (Vol. 1, Issue 3).

[24] Wardana, & Ahdar Djamaluddin. (2021). BELAJAR DAN PEMBELAJARAN Teori, Desain, Model Pembelajaran dan Prestasi Belajar. CV Kaaffah Learning Center.

[25] Yang, J., Gounaridis, D., Liu, M., Bi, J., & Newell, J. P. (2021). Perceptions of Climate Change in China: Evidence From Surveys of Residents in Six Cities. Earth's Future, 9(12). https://doi.org/10.1029/2021EF002144

[26] Zhang, Y., Lucas, M., Bem-Haja, P., & Pedro, L. (2023). Analysis of short videos on TikTok for learning Portuguese as a foreign language. Comunicar, 31(77), 9–19. https://doi.org/10.3916/C77-2023-01