The implementation of augmented reality-based flipbook learning media in improving vocational school students' critical thinking skills in the era of society 5.0

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Abstract: In the era of Society 5.0, digitalization has changed the world of education and requires schools to develop creative, critical thinking skills. Vocational schools such as Vocational High Schools (SMK) play an important role in creating students who are ready to face the demands of this era. The use of learning technology, including media such as PowerPoint and modules, has become common but still needs innovation to reach the optimal level. Therefore, the implementation of virtual-based learning media is important. One of the innovations in learning media is the use of flipbooks with Augmented Reality (AR) in vocational schools. The main objective of this research is to measure the level of critical thinking skills of vocational school students. The results showed that the experimental class using Flipbook with AR achieved a significant increase in N-gain value (0.6), indicating the effectiveness of Flipbook with AR in improving students' understanding. It can be seen from the average results of critical thinking aspects in the experimental class which has a percentage of 85%, while in the control class, it is 55%. Thus, this Flipbook with AR successfully improves students' ability in critical thinking aspects in SMK and shows great potential in the development of interactive learning technology for education.

Keywords: Augmented reality, critical thinking skills, flipbook, Vocational School

1.   Introduction

The era of society 5.0 is characterized by technological advances and resource skills that bring many benefits, especially in the field of education (Tavares et al., 2022). Learners now have access to facilities such as computers, laptops, and smartphones to access learning in an interactive format (Farley et al., 2015). Interaction in the educational process is considered important, with media defined as an intermediary that enables the transmission of information (Fortuna et al., 2023; Rini et al., 2023). These media are tools and materials that can be implemented in software or hardware (Puspitarini & Hanif, 2019). Moreover, digital technology has great potential, especially in the current educational context (Hillmayr et al., 2020). The successful implementation of the learning process cannot be separated from its elements (Abdulrahaman et al., 2020). Several factors influence the course of a teaching-learning process. In the dynamics of learning, several aspects are interconnected, they are: 1) the role of the teacher, 2) the role of students, 3) teaching materials, 4) teaching methods, 5) learning media, and 6) assessment of learning outcomes. These components are interrelated and influence each other (Hassija et al., 2019).

In the context of implementing the Merdeka Curriculum for Vocational High Schools, there is Basic

Programming subject that aims to train students to be proficient in analyzing building materials and developing problem-solving skills (Putra et al., 2021). Due to the different learning styles in each class, especially in subjects focusing on building sciences, the responses to the material may vary (Ratten & Usmanij, 2021). This indicates the need for a variety of different teaching methods according to the characteristics of each class (Shwartz-Ziv & Armon, 2022). Learning in Basic Programming subject that include green building and green material concepts can also improve vocational high school students' critical thinking skills. The subject can stimulate students' critical thinking skills in analyzing building materials.

Critical thinking skills become an important key in understanding material when students are faced with problems that must be solved (Febrianti et al., 2023; Kaeophanuek & Chookerd, 2021). It is important to train critical thinking skills as this ability is not a natural talent (Maknun, 2020). Although the ability to think has been already own from the beginning, it needs to be continuously trained because, without practice, will not develop into a strong skill (Bellaera et al., 2021). Critical thinking involves a series of skills, such as recognizing sources of information, assessing reliability, considering the fit of information with existing knowledge, and drawing conclusions based on critical thinking (Syahril et al., 2021). Critical thinking is a logical, reflective, and responsible thinking process for making reliable decisions (ERDOGAN, 2019). Individuals who think critically have practical and creative abilities in formulating the right questions, obtaining relevant information, selecting information, and providing logical arguments that support reliable information and conclusions (Jalinus et al., 2023). Improving critical thinking skills in Basic Programming subject can be done by inviting students to practice through questions that demand higher-order thinking skills (HOTS).

A way to improve students' critical thinking skills is through the application of interactive learning media (Ninghardjanti & Dirgatama, 2021). The use of interactive learning media, such as flipbooks supported by Augmented Reality (AR), can facilitate the development of students' critical thinking (Badriyah et al., 2023). AR is a technology that combines the real world with digital elements, creating a unique interactive experience. In the context of teaching and learning activities, it is greatly potential to improve the way we understand and assimilate information. Through the use of devices such as smartphones, students can directly access additional information on the real world. With the help of AR, students can directly analyze the shape and material of buildings from projected visualizations (İbili et al., 2020). This interactive learning media not only supports critical thinking aspects, but also develops communication, collaboration, and creative thinking skills (Rahim, 2022). Based on the views of several previous researchers, it can be concluded that the use of interactive media can encourage students' active involvement in finding solutions to problems or cases encountered, thus enabling them to solve these problems (Ahmad et al., 2020).

The use of technology, especially in the context of education such as PowerPoint, modules, and the like, has been commonly used, but have not reached the optimal level yet (Abdulrahaman et al., 2020). Therefore, innovation is needed in the form of virtual-based learning media, such as flipbooks supported by Augmented Reality (AR), which can maximize the fulfillment of students' needs in developing their skills in line with technological developments in the era of Society 5.0.

Flipbook is a simple interactive medium that can increase students' enthusiasm for learning (Oktarina et al., 2021). Meanwhile, AR is a technology that projects virtual objects into a real environment (Li et al., 2018). This research is focused on the use of flipbooks with AR as learning media in vocational schools since the students have career choices that rely on critical thinking skills in the era of Society 5.0. The novelty of this research is the combination of flipbooks and AR technology which can create a more dynamic and interactive learning experience. By using special

applications or devices, students can view additional information, animation, or multimedia content that is directly connected to the images or texts in the flipbook. It not only increases the appeal of learning, but also provides opportunities for students to explore the content further. In addition, the implementation of this learning media can increase students' learning motivation and help teachers provide more effective teaching through a more visual and practical approach. Therefore, the novelty of this research can build the foundation for positive transformation in learning methods in the digital era. The formulation of the problem that has been explained is how flipbooks and AR as learning media can improve critical thinking skills of vocational school students. The main objective of this research is to measure the level of critical thinking skills of students in vocational schools such as Vocational High School. The benefit of this research is to provide an alternative form of interactive learning media in the form of flipbooks that can be applied in the learning process in vocational schools while improving critical thinking skills that can be improved or identified through the use of flipbook learning media with Augmented Reality.

2.   Methods

This research was conducted in a vocational school in Bandung which is a center of excellence school. The subjects of this research are class X students of the Construction and Property Engineering expertise program with elements of green building technology and materials in the Basic Programming subject as learning material in the flipbook with AR.

This study used a quasi-experimental method (Non-equivalent Group Pre-test Post-test Design) using a control group and an experimental group to measure the improvement of critical thinking skills in students with the scheme in Fig 1 (Insani et al., 2018).

$$
\begin{array}{cccc}
NR_1 & O_1 & X & O_2 \\
NR_2 & O_3 & & O_4
\end{array}
$$

Figure 1. Model of non-equivalent group pre-test post-test design

This stage began with an instrument test in class X.1 to improve the quality of the items through a validity test to determine the accuracy of item measurement, reliability to determine the quality of item measurement, difficulty level to obtain information about the level of item categories, and item differentiation to distinguish high ability students and low ability students.

The instrument that had been tested was used by researchers as an instrument to measure students' critical thinking skills through pre-test and post-test. The pre-test was conducted to measure the ability of students in both the control class, X.2, and the experimental class, X.3.

Furthermore, the experimental class was given treatment in the form of implementing flipbooks with AR. Meanwhile, the control class was not given special treatment. Before implementing the treatment, researchers had conducted a homogeneity test to ensure that both control class and experimental class students had the same initial ability. After that, students in both experimental and control class were given a post-test to measure differences in the level of students' critical thinking skills.

The data collection technique used in this study was a test. The test was used to determine the ability of critical thinking with indicators of analyzing sustainable building, green building, and green materials obtained by students in the control and experimental class.

The research step started with a test used to measure critical thinking skills conducted in class X.2 as the control class and class X.3 as the experimental class. The analysis technique used to measure the increase of critical thinking skills was the N-gain formula developed by Melzer in 2002 by categorizing learning outcomes in this experimental model. The difference between the results of the pre-test and post-test scores of the control class and the experimental class was presented in the form of a graph. The researchers used the N-gain interpretation to see the criteria index.

3. Results

The researchers used Unity software with Vuforia to create Flipbook with AR. This application can be used on Android devices version 7 which is compatible with AR features. Flipbook with AR consists of two main menus, including Flipbook which contains material in the form of text, audio, and video, and Augmented Reality which projects 3D into the real world. In addition, some menus contain Information, Credit, and Exit as shown in Fig. 2.
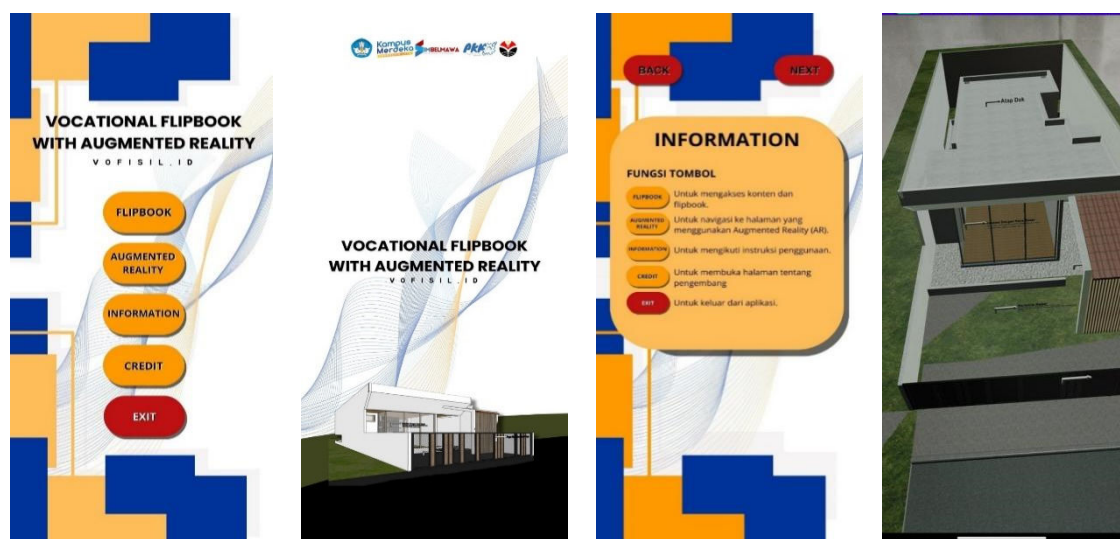

Figure 2. Display of Flipbook Application with AR

Furthermore, to test the results of students' critical thinking skills improvement, the test items were first tested limited to class X.1 to examine the quality of the items from validity, reliability, difficulty level, and item differentiation in a limited sample. The researchers used the IBM SPSS Statistics 27 application to analyze the statistical data. The following are the results of the item test using SPSS.

a) Test Validity. With the Product Moment Correlation formula, a test with 20 items was given to 30 students in class X TKP. The validity of this instrument was measured by referring to the criteria table described in Table 1. This validity test was carried out by comparing the value of rcount with rtable. If the significance value is <0.05, then it is said as valid, and if the significance value is> 0.05, then it is said as invalid. The result obtained from the tcount was more than rtabel $= 0.362$. It indicates that the validity of the test is in the range of 0.356 to 0.661, and it can be concluded that the 20 items used are valid.

Table 1. Validation of test instruments

Pearson Correlation	,587**	,502**	0,356	,446*	,587**	,535**	,431*	,448*	,489**	,488**	,643**	,482**	,643**	,448*	,552**	,533**	,465**	,552**	,489**	,661**	1
Sig. (2-tailed)	0,001	0,005	0,054	0,014	0,001	0,002	0,017	0,013	0,006	0,006	0,000	0,007	0,000	0,013	0,002	0,002	0,010	0,002	0,006	0,000	

b) Test Reliability. Using the Cronbach Alpha formula, the reliability was measured by referring to the criteria table described in Table 2. This reliability test was carried out with a positive r-Alpha, in which if the result is greater than rtabel, it is interpreted as reliable, or with a negative r-Alpha, in which if the result is smaller than rtabel, it is interpreted as not reliable. The results of the study obtained a reliability value of 0.926, so it is in the very high-reliability category.

Table 2. Item reliability

Cronbach's Alpha	N of Items
0,926	20

c) Level of Test Difficulty. This test was conducted by using the difficulty level formula which is described in Table 3. To measure students' critical thinking skills well, the test must be in the moderate and difficult categories or cognitive levels based on Anderson's formulation (revision of Bloom's theory) at cognitive level of C4 (analyzing), C5 (evaluating), and C6 (creating). The results toward 20 items were in "moderate" to "difficult" category with 16 moderate items and 4 difficult items with a range of 0.33 to 0.60.

Table 3. Level of test difficulty

No	Mean		No	Mean	Category
1	0,53	Moderate	11	0,6	Moderate
2	0,6	Moderate	12	0,53	Moderate
3	0,37	Difficult	13	0,6	Moderate
4	0,37	Difficult	14	0,53	Moderate
5	0,53	Moderate	15	0,57	Moderate
6	0,37	Difficult	16	0,33	Difficult
7	0,6	Moderate	17	0,53	Moderate
8	0,53	Moderate	18	0,57	Moderate
9	0,47	Moderate	19	0,47	Moderate
10	0,4	Moderate	20	0,6	Moderate

d) Test Distinguishing Power. This test was conducted by using the distinguishing power formula which is described in Table 4. The results showed that the test distinguishing power of was in the range of 0.356 to 0.643. The category can be said as "moderate" if the coefficient value is in the range of 0.3 to 0.39 and can be said as "good" if the coefficient ranges between 0.4 to 1.00. Thus, it can be concluded that the 20 items used in the instrument obtained good results with 1 fair and 19 good items.

Table 4. Item distinguishing power

No	rCount	Category	No	rCount	Category
1	0,587	Good	11	0,643	Good
2	0,502	Fair	12	0,482	Good
3	0,356	Good	13	0,642	Good
4	0,446	Good	14	0,448	Good
5	0,587	Good	15	0,552	Good
6	0,535	Good	16	0,533	Good
7	0,431	Good	17	0,465	Good
8	0,448	Good	18	0,552	Good
9	0,489	Good	19	0,489	Good
10	0,488	Good	20	0,611	Good

4. Discussion

The instrument that had been tested was used by the researchers as an instrument to measure students' critical thinking skills through pre-test and post-test. The pre-test was conducted to measure the initial ability of students in both the control class, X.2, and the experimental class, X.3. After that, the experimental class was given a special treatment in the form of implementing flipbooks with AR, while the control class continued to use conventional teaching media. Then, a post-test was given to both experimental and control class to measure differences in the level of students' critical thinking skills. Based on the results of the pre-test and post-test, it was concluded that the control class had a lower N-gain value compared to the experimental class.

Based on the data in Fig.3 below, the indicator of understanding green building of the control class was categorized "good" with the largest percentage was 77%. Meanwhile, the indicator for understanding sustainable building was 41% as the smallest percentage. It is different from the results of the experimental class in which all indicators were in the "very good" category with the highest indicator reached 88% on understanding green materials. In fact, critical thinking skills are intellectual capital for individuals and are a fundamental element in human development (Alvino et al., 2020).
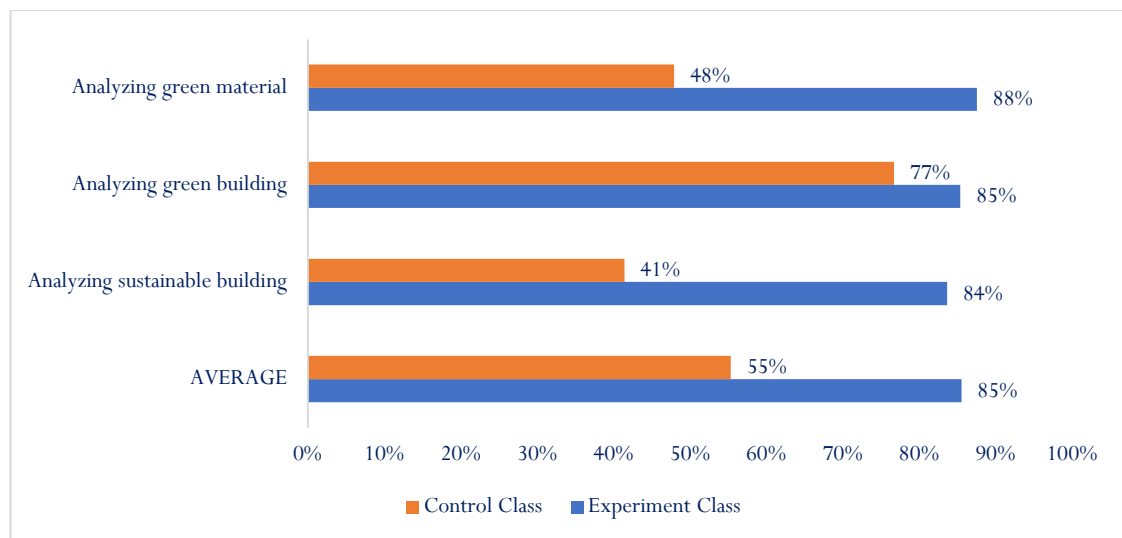

Figure 3. Critical thinking skill results

Based on the results of the pre-test and post-test, it was concluded that the control class had a lower N-gain value compared to the experimental class. The control class got an N-gain score of 0.28 which was categorized "low" and the experimental class with an N-gain of 0.6 which was categorized "medium". Thus, the use of Flipbook with AR in the experimental class can be said to be more improved than other conventional learning media such as PowerPoint in the control class (Abdulrahaman et al., 2020). Based on the criteria for interpreting the N-Gain value, the use of flipbook learning media with AR is interpreted as effective in improving critical thinking skills.

Table 5. N-Gain result

Class			Statistic	Std. Error
N-gain_Percentage	Control	Mean	28,0948	2,88930
	Experiment	Mean	60,7594	4,00506

This comparison indicates that the use of flipbook learning media with AR significantly contributes to the improvement of students' critical thinking skills. With a higher N-gain score, the experimental class shows that this learning approach can be more effective in stimulating the development of critical thinking skills compared to the conventional method applied to the control class.

As explained in the background, the importance of digitalization in education in the era of society 5.0, interactive learning media such as flipbooks with AR can make students more motivated to learn (Jumaroh et al., 2023; Simatupang, 2021). The integration of augmented reality (AR) in flipbooks leads the students to a learning experience that is more dynamic and relevant to the demands of the digital era. By engaging students interactively, it not only increases the attractiveness of learning, but also provides a deeper introduction to content (Al-Ansi et al., 2023; Nita et al., 2023; Varadila et al., 2023). To conclude, flipbook learning media with AR has been proven effective in improving students' critical thinking skills. It provides strong support for the development and application of interactive learning technology in education, particularly in improving critical thinking aspects in students.

5.   Conclusion

The results confirmed the success of the experimental class that implemented Flipbook with Augmented Reality (AR) in achieving a significant increase in N-gain value, reaching an N-gain of 0.6. This is clearly indicated of the effectiveness of Flipbook with AR in improving students' understanding. Concrete evidence comes from the comparison of the mean of critical thinking aspects, where the experimental class showed a percentage of 85%, while the control class only reached 55%. This striking difference provides a clear picture of the positive impact on the use of Flipbook with AR towards the progress of students' understanding, especially in the development of critical thinking skills. Hence, this research is relevant to its initial aim which is to determine the increase of critical thinking skills of vocational school students by implementing the integration of flipbook learning media with AR. This research is important to do since in the future, critical thinking skills will be needed more. This ability not only supports wise decision making, but also encourages innovation and creative problem solving which must be possessed by every individual, especially future leaders. The sustainability potential of this research can be directed to a further exploration of interactive learning media which aims to improve soft skills, including critical thinking, which are crucial for facing future demands.

References

Abdulrahaman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, *6*(11), e05312. https://doi.org/10.1016/j.heliyon.2020.e05312

Ahmad, K., Nurkhin, A., Muhsin, M., & Pramusinto, H. (2020). Problem-Based Learning Strategy: Its Impact on Students' Critical and Creative Thinking Skills. *European Journal of Educational Research*, *9*(3), 1141–1150. https://doi.org/10.12973/eu-jer.9.3.1141

Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, *8*(1), 100532. https://doi.org/10.1016/j.ssaho.2023.100532

Alvino, F., Di Vaio, A., Hassan, R., & Palladino, R. (2020). Intellectual capital and sustainable development: a systematic literature review. *Journal of Intellectual Capital*, *22*(1), 76–94. https://doi.org/10.1108/JIC-11-2019-0259

Badriyah, N. L., Yusuf, M., & Efendi, A. (2023). Augmented Reality as a Media for Distance Learning in the Digital Era: Contribution in Improving Critical Thinking Skills. *International Journal of Information and Education Technology*, *13*(11), 1769–1775. https://doi.org/10.18178/ijiet.2023.13.11.1988

Bellaera, L., Weinstein-Jones, Y., Ilie, S., & Baker, S. T. (2021). Critical thinking in practice: The priorities and practices of instructors teaching in higher education. *Thinking Skills and Creativity*, *41*, 100856. https://doi.org/10.1016/j.tsc.2021.100856

ERDOGAN, F. (2019). Effect of Cooperative Learning Supported by Reflective Thinking Activities on Students' Critical Thinking Skills. *Eurasian Journal of Educational Research*, *19*(80), 89–112. https://doi.org/10.1088/1742-6596/893/1/012002/PDF

Farley, H., Murphy, A., Johnson, C., Carter, B., Lane, M., Midgley, W., Hafeez-Baig, A., Dekeyser, S., & Koronios, A. (2015). How Do Students Use Their Mobile Devices to Support Learning? A Case Study from an Australian Regional University. *Journal of Interactive Media in Education*, *2015*(1). https://doi.org/10.5334/jime.ar

Febrianti, R., A, Y., Putra, R. P., & Phongdala, P. (2023). Implementation of project-based learning for improve students' critical thinking skills in creative product and entrepreneurship subjects. *Jurnal Pendidikan Teknologi Kejuruan*, *6*(4), 240–247. https://doi.org/10.24036/jptk.v6i4.34523

Fortuna, A., Waskito, Purwantono, Kurniawan, A., Andriani, W., & Alimin, M. (2023). Designing Learning Media Using Augmented Reality for Engineering Mechanics Course. *Journal of Engineering Researcher and Lecturer*, *2*(1), 18–27. https://doi.org/10.58712/jerel.v2i1.20

Hassija, V., Chamola, V., Saxena, V., Jain, D., Goyal, P., & Sikdar, B. (2019). A Survey on IoT Security: Application Areas, Security Threats, and Solution Architectures. *IEEE Access*, *7*, 82721–82743. https://doi.org/10.1109/ACCESS.2019.2924045

Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education*, *153*, 103897. https://doi.org/10.1016/j.compedu.2020.103897

İbili, E., Çat, M., Resnyansky, D., Şahin, S., & Billinghurst, M. (2020). An assessment of geometry teaching supported with augmented reality teaching materials to enhance students' 3D geometry thinking skills. *International Journal of Mathematical Education in Science and Technology*, *51*(2), 224–246. https://doi.org/10.1080/0020739X.2019.1583382

Insani, N., Fadiawati, N., Rudibyani, R. B., & Fauzi Syamsuri, M. M. (2018). Using Project-Based Learning in Improving Students' Critical Thinking Skills to Separate of Mixtures. *International Journal of Chemistry Education Research*, 84–88. https://doi.org/10.20885/ijcer.vol2.iss2.art5

Jalinus, N., Syahril, Haq, S., & Kassymova, G. K. (2023). Work-based learning for the engineering field in vocational education: Understanding concepts, principles and best practices. *Journal of Engineering Researcher and Lecturer*, *2*(1), 9–17. https://doi.org/10.58712/jerel.v2i1.22

Jumaroh, J., Pernanda, D., Ulum, M., & Tin, C. T. (2023). Practicality of Smart Apps Creator-based Instructional Media on 2D Animation Subject. *Journal of Computer-Based Instructional Media*, *1*(1), 1–8. https://doi.org/10.58712/jcim.v1i1.8

Kaeophanuek, S., & Chookerd, N. (2021). A Development of the Flipped Learning Model Using the Critical Inquiry Process to Enhance Research Skills. *International Journal of Interactive Mobile Technologies (IJIM)*, *15*(03), 70. https://doi.org/10.3991/ijim.v15i03.17905

Li, X., Yi, W., Chi, H.-L., Wang, X., & Chan, A. P. C. (2018). A critical review of virtual and augmented reality (VR/AR) applications in construction safety. *Automation in Construction*, *86*, 150–162. https://doi.org/10.1016/j.autcon.2017.11.003

Maknun, J. (2020). Implementation of Guided Inquiry Learning Model to Improve Understanding Physics Concepts and Critical Thinking Skill of Vocational High School Students. *International Education Studies*, *13*(6), 117. https://doi.org/10.5539/ies.v13n6p117

Ninghardjanti, P., & Dirgatama, C. H. A. (2021). Building Critical Thinking Skills Through a New Design Mobile-Based Interactive Learning Media Knowledge Framework. *International Journal of Interactive Mobile Technologies (IJIM)*, *15*(17), 49. https://doi.org/10.3991/ijim.v15i17.23801

Nita, W., Meilisa, R., Imamudin, Pebrianti, R., & Su Nandar, H. (2023). The effect of articulate storyline-based interactive learning media to facilitate student learning independence. *Journal of Computer-Based Instructional Media*, *1*(1), 25–33. https://doi.org/10.58712/jcim.v1i1.18

Oktarina, R., -, A., -, M. G., -, F., Muskhir, M., & Effendi, H. (2021). The Effect of The Use of Multimedia Flip Book With the Flipped Classroom Approach in Vocational School. *Journal of Education Technology*, *5*(1), 159. https://doi.org/10.23887/jet.v5i1.31435

Puspitarini, Y. D., & Hanif, M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. *Anatolian Journal of Education*, *4*(2), 53–60. https://doi.org/10.29333/aje.2019.426a

Putra, I. M. A., Widanta, I. M. R. J., Ardika, I. W. D., Hudiananingsih, P. D., Yuliantini, N. N., & Sitawati, A. A. R. (2021). *Designing English for Vocational Purposes (EVP) in the Context of Merdeka Belajar of Kampus Merdeka*. https://doi.org/10.2991/assehr.k.210424.051

Rahim, F. R. (2022). Interactive learning media for critical and creative thinking skills development. *Pillar of Physics Education*, *15*(4), 235. https://doi.org/10.24036/14085171074

Ratten, V., & Usmanij, P. (2021). Entrepreneurship education: Time for a change in research direction? *The International Journal of Management Education*, *19*(1), 100367. https://doi.org/10.1016/j.ijme.2020.100367

Rini, F., Pratiwi, L., Mary, T., & Weay, A. L. (2023). Analysis of student responses toward activities using e-learning in higher education. *Journal of Engineering Researcher and Lecturer*, *2*(1), 1–8. https://doi.org/10.58712/jerel.v2i1.11

Shwartz-Ziv, R., & Armon, A. (2022). Tabular data: Deep learning is not all you need. *Information Fusion*, *81*, 84–90. https://doi.org/10.1016/j.inffus.2021.11.011

Simatupang, N. I. (2021). *Effectiveness Using Flipbook Maker to Improve Student Learning Interest in Chemistry*. https://doi.org/10.2991/assehr.k.210615.060

Syahril, S., Nabawi, R. A., & Safitri, D. (2021). Students' perceptions of the project based on the potential of their region: A Project-based learning implementation. *Journal of Technology and Science Education*, *11*(2), 295. https://doi.org/10.3926/jotse.1153

Tavares, M. C., Azevedo, G., & Marques, R. P. (2022). The Challenges and Opportunities of Era 5.0 for a More Humanistic and Sustainable Society—A Literature Review. *Societies*, *12*(6), 149. https://doi.org/10.3390/soc12060149

Varadila, J., Meilisa, R., Imamudin, Annisa, A., & Folkourng, F. (2023). Development of learning media based on macromedia flash 8 to see learning outcomes and achievements in vocational high school students. *Journal of Computer-Based Instructional Media*, *1*(1), 9–18. https://doi.org/10.58712/jcim.v1i1.16