JPPIPA 9(Special Issue) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Validity of Video Tutorials CNC/CAM for Learning in the Machining Engineering Department of Vocational High Schools

Rofi Chandra[1], Syahril[1], Ambiyar[1], Refdinal[1]

[1] Pascasarjana Fakultas Teknik, Universitas Negeri Padang, Kota Padang, Sumatera Barat

Received: August 8, 2023
Revised: November 10, 2023
Accepted: December 25, 2023
Published: December 31, 2023

Corresponding Author:
Rofi Chandra
rofichandraa@gmail.com

DOI: 10.29303/jppipa.v9iSpecialIssue.6109

Abstract: The development video tutorials was carried out to address the challenges in learning CNC/CAM at Vocational High Schools (SMK), especially in the CNC/CAM subject. In this research, the 4D model (Define, Design, Develop, and Disseminate) stages of development were employed, which include needs analysis, design, development, and dissemination. The validation results by media experts and subject matter experts indicate that these video tutorials are highly suitable, with a validity percentage of 89.24% by media experts and 85% by subject matter experts. These results demonstrate that the CAM learning videos developed through the 4D model are suitable for use in the learning process. The development of video tutorials for CNC/CAM learning in vocational high schools can be an effective solution to overcome challenges in students' understanding and skills in this subject. By using the 4D model for development, the high validation results from media and subject matter experts indicate that these video tutorials have excellent quality. The use of these video tutorials is expected to enhance students' understanding and skills in the field of CNC/CAM, which are crucial for their preparation in the industrial world. Furthermore, this research also provides recommendations for utilizing these video tutorials in broader learning contexts, teacher training, and the development of other materials.

Keywords: CNC/CAM; Expert validation; Video Tutorial Development

Introduction

Education has become a fundamental need for every human being, as it is essential from birth throughout one's life. Education is a complex learning process that evolves in parallel with human development. This aligns with Purnama Sari's explanation (2018:1), which states that education is a complex process, and its complexity always evolves with human development. Education fundamentally aims to humanize individuals. It should encourage people to engage in the process of personal improvement, fostering self-confidence, nurturing curiosity, and enhancing knowledge throughout their lives. Consequently, education aims to improve the quality of life and society (Ambiyar, 2012). Education serves as a measure of a nation's progress, as per Government Regulation No. 57 of 2021, as cited in Arif (2022), which emphasizes that learners should actively develop their potential, including spiritual strength, self-control, personality, intelligence, noble character, and necessary skills for themselves, society, the nation, and the state.

Vocational education is one of the means of developing human resources that can contribute to a nation's growth. According to Watrianthos (2022), the education system in Indonesia separates vocational education from academic education. Vocational education, which was previously not the primary focus for prospective students, should now be on par with academic education at both the secondary and higher education levels. Vocational education is primarily

How to Cite:
Chandra, R., Syahril, S., Ambiyar, A., & Refdinal, R. (2023). The Validity of Video Tutorials CNC/CAM for Learning in the Machining Engineering Department of Vocational High Schools. *Jurnal Penelitian Pendidikan IPA*, *9*(SpecialIssue), 836–842. https://doi.org/10.29303/jppipa.v9iSpecialIssue.6109

facilitated by Vocational High Schools (SMK). According to Revi et al. (2018), SMK education is skill-oriented, aiming to equip students with knowledge and skills specific to their chosen fields, with a 30% emphasis on theory and 70% on practical training.

The current era, known as the Millennial Era, has brought about significant changes in various aspects of society, the economy, and education due to the Fourth Industrial Revolution, often referred to as Industry 4.0. According to Hairuni (2022), the Industry 4.0 revolution is marked by the continuous development of technology and innovations, which are regularly updated to meet the needs of society. As Dwi Rahdiyanta (2020) describes, new technology and approaches that combine the physical and digital worlds will fundamentally transform humanity. Technological advancements have a profound impact on all aspects of life, requiring innovations in education to keep pace with the changes in this technological era.

The rapid progress in science and technology in the early 20th century has given rise to information technology and automated production processes. Industrial machines are no longer manually controlled but are now managed using Programmable Logic Controllers (PLC) or computer-based automation systems. For example, to meet the demands of precise, fast, and cost-effective machining products, CNC machine tools have been developed in conjunction with CAD/CAM software. CNC (Computer Numerical Controlled) machine tools are used to operate cutting processes with numeric control, assisted by computers (Dwi Rahdiyanta, 2020). According to Darmanto (2007), CNC is a control system that uses numeric systems to manage mass production with high precision and speed. CNC controllers can now manage more than seven axes. CAM, on the other hand, stands for Computer-Aided Manufacturing and is a manufacturing system that optimizes computer programs to translate engineering designs created by CAD into machine control for CNC machines, as explained by Subroto (2010).

Before conducting this study, the author observed one vocational school in Padang city, specifically SMK Dhu'afa Padang. SMK Dhu'afa offers a range of programs, including the Machining Engineering department. In the 11th-grade class of the Machining Engineering department, CNC/CAM is one of the subjects taught. Based on the author's observation at this school, there were limitations in the learning process, such as the ineffective use of teaching materials and the unavailability of teaching materials suitable for the school's CNC machines. The instructional materials used were outdated and not relevant to the CNC machines available at the school, resulting in the underutilization of these machines. The author conducted an interview with Effamerismet, the head of the Machining Engineering department at SMK Dhu'afa Padang, who stated that the school had limitations in teaching materials, and they lacked up-to-date textbooks or teaching materials that matched the school's machines.

Furthermore, students also faced difficulties in understanding the CNC lessons, which could hinder their competency development in this field. This was evident from the survey conducted by the author through Google Forms during the observation at SMK Dhu'afa Padang. Based on the survey results, 59% of the students reported experiencing difficulties at the "Very Difficult" level, 22% found it "Difficult," 11% considered it "Moderate," and only 8% found it "Easy." The following diagram supports these finding:

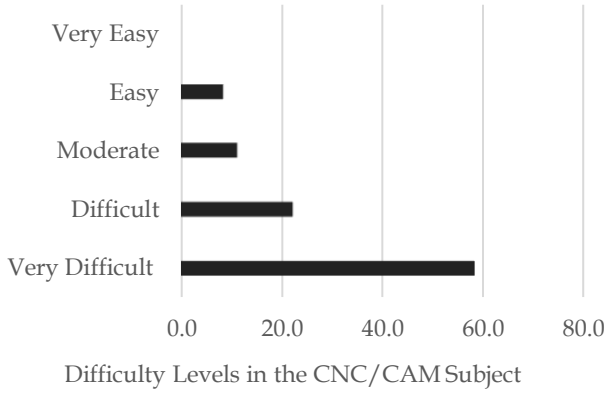

Figure 1. Difficulty Levels in the CNC/CAM Subject

Based on the author's observations, this subject is highly essential in the industrial world. Teachers also face difficulties in delivering lessons because the school has only one CNC machine, while there are 22 students in a class. This situation leads to students taking turns using the machine and spending a lot of time, making it challenging to achieve the learning objectives. According to the author's observation at SMK Dhu'afa Padang, this single CNC machine was acquired in 2019, and teachers have not received adequate training or experience in using CNC machines. As Putra (2020) explains, the lack of teaching materials in education results in suboptimal student learning outcomes.

Given the issues identified, supporting practical learning in the CNC/CAM subject requires effective instructional materials using simulation software. This software can simulate precisely what CNC machines do and can be used by both teachers and students to enhance learning outcomes. One such software is Mastercam X5, developed by CNC Software, Inc. According to Lesmana (2019), Mastercam X5 is design and simulation software that facilitates computer-aided machining by incorporating CAD models. This software

simplifies the programming and operation of machining processes, generating output that CNC machines can understand (NC Code).

Method

The research method used is Research and Development (R&D) with the 4D model (Define, Design, Develop, and Dissemination). Research and Development aims to produce new products through the development process (Endang, 2013). This model consists of four development stages: Define, Design, Develop, and Dissemination, or adapted into the 4-D model, which includes definition, design, development, and dissemination (Endang, 2013). The advantage of the Four D model is that it does not require a relatively long time because the stages are not too complex (Maydiantoro 2019).

The first stage is "define," which is carried out to outline the material and understand the concepts to be explained. This stage begins with an analysis of the needs for the media production process. In this stage, syllabus analysis, material analysis, and student analysis are conducted. The second stage is "design," in which instructional materials to be developed are designed. During this stage, text preparation, media selection, and design are determined. The third stage is "development." In this stage, the aim is to produce the final product after going through the validation and revision process. Validation in this context involves validation by experts and practitioners in CNC learning and media experts. Validation is performed once and uses a Likert scale with five answer alternatives: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD).

The techniques of testing validity and reliability are inseparable from the design and methods of research.(Budiastuti, 2022). The validation process consists of a systematic procedure, including a pilot study. The pilot study's main goal is to improve the quality of the item and increase confidence in the interpretation of the data (Mohamad, 2020). Data for validation are obtained from the instruments filled out by the validators, who are experts in media and learning materials. The feedback from the validators is used for revisions to the video tutorial learning media until it is deemed suitable for the research. The following are the results of the validation testing questionnaire data by the experts. The data obtained from the subject matter experts and students are then analyzed using the following steps; Step one is Converting quantitative data into qualitative data based on the following criteria:

Tabel 1. Data Conversion

Category	Score
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

Source: (Sugiyono, 2014)

After That collected data is then analyzed by calculating the assessment levels' percentage using the Formula 1.

$$Percentage = \frac{\sum Researcher's\ score}{\sum Ideal\ score} \times 100 \quad (1)$$

Then percentage calculation results, obtained as quantitative data, are then converted back into qualitative data by using the following method:

a. Determine the ideal score percentage (maximum score)
$$\frac{5}{5} \times 100 = 100\%$$
b. Determine the percentage of the lowest score (minimum score)
$$\frac{1}{5} \times 100 = 20\%$$
c. Determine the range = 100 – 20 =80
d. Determine the desired intervals = 4 (Highly Suitable, Suitable, Less Suitable, Not Suitable)
e. Determine the interval width:
$$\frac{80}{4} \times 100 = 20\%$$

Based on the calculations above, the percentage range and qualitative criteria are as follows:

Tabel 2. Feasibility Criteria

Formula	Category
100% ≥ Skor ≤81%	Highly Suitable
80% ≥ Skor ≤61%	Suitable
60% ≥ Skor ≤41%	Less Suitable
40% ≥ Skor ≤21%	Not Suitable

The fourth stage is "dissemination." Dissemination is the final stage in the development of the 4-D model, and in this stage, it is carried out to promote the product that has been developed to be accepted by users. In this research, dissemination is only conducted in the 11th-grade CNC/CAM class at SMKS Dhu'afa Padang.

Result and Discussion

The CAM learning video is an adaptation and modification of the 4D model research, specifically the define (needs analysis), design, development, and dissemination stages. In the define stage, the researcher analyzed the needs by interviewing (XI) 11th-grade

students at SMKS Dhuafa, and it was determined that video tutorial-based learning media was required. The next stage involves the discovery and design, which includes the preparation of test standards, media selection, scriptwriting for the video flow, image and sound capture, and finally editing.

Once the design stage is completed, the next stage is the development phase. The development phase aims to produce a valid video tutorial learning media. This phase consists of assessing media and material validation by validators. Media validation testing is carried out to determine the suitability of the developed video tutorial learning media based on assessments by content and media experts. The purpose of the validation activity in this research is to obtain the status of suitability from experts.

In this validity test, the Pearson coefficient values are utilized, and the decision is made by comparing the calculated Pearson coefficient (r-calculation) with the tabled Pearson coefficient value (r-table). Validation is a measurement or test to determine the precision and accuracy of a measuring instrument or a measurement itself (Purnomo, 2018). This developmental research aims to produce a specific product, involving processes for testing validity, practicality, and effectiveness (Fransiska, 2017).

The validation of the video tutorial learning media development was conducted using questionnaires. The questionnaires were given to two validators, two media experts, and two content experts. The purpose of the validation activity in this research is to obtain the suitability status from experts. Validation data was obtained through validation instruments filled out by several validators who are experts in instructional media and instructional content. The feedback from these experts was used for revisions. Below is the questionnaire data from the expert validation testing:

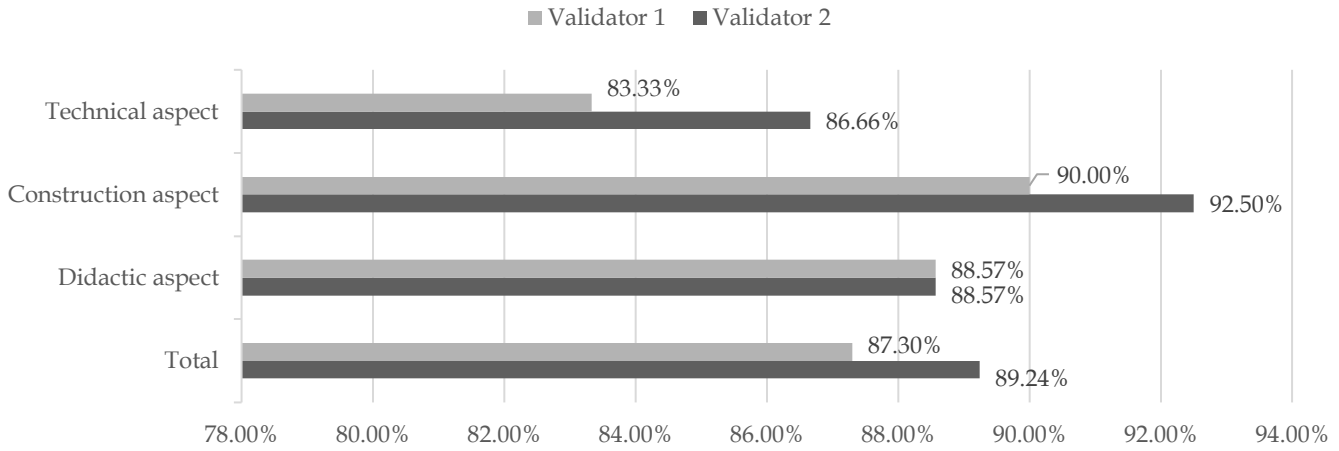

Figure 2. Results of Media Expert Validation

The results of the validity test analysis by media experts yielded an average score given by validators 1 and 2 of 89.24%. Therefore, the video tutorial learning material falls into the category of "Highly Suitable."

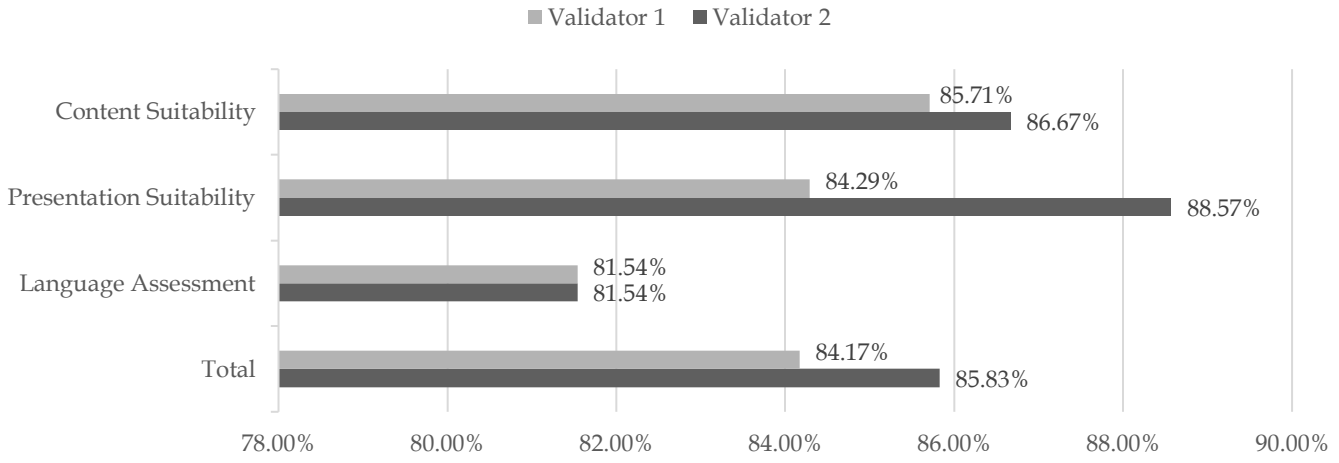

Figure 3. Results of Content Expert Validation

The results of the validity test analysis by content experts yielded an average score given by validators 1 and 2 of 85%. Therefore, the video tutorial learning material falls into the category of "Highly Suitable."

Based on the results, This video tutorial learning media is designed to meet the needs and challenges faced by educators and students. The development of this video tutorial learning media takes into account animations and steps related to CAM. The video tutorial learning media is also equipped with sound and text to make it engaging. It includes step-by-step instructions for CAM and evaluation questions. Each module is accompanied by stages that are easy for students to understand, making them interested and active in the CAM learning process.

The development of this video tutorial learning media uses the 4-D development model. In the development phase, the researcher conducted two stages of validation: validation by media experts and validation by content experts. Media validation by experts aims to obtain input, suggestions, and criticisms for improvement and refinement of the video tutorial learning media to be developed. Validation data was obtained through validity instruments filled out by several validators who are experts in instructional media. Media validation focuses on the presentation and visual aspects of the media.

Validity is a measurement used to determine that what is being measured is valid (Afrina, 2023). In line with the opinion of Rahayu (2019), validity is a measure used to assess the level of validity of an instrument so that the instrument can be used if it achieves high validity.

Based on the results of media validation by validators through questionnaires, the average media validity is 89.24%, falling into the "Highly Suitable" category, while the average content validity is 85%, also classified as "Highly Suitable." The media and content validation process resulted in various recommendations for revisions in terms of content and media design. This confirms that the learning media is worthy of further development and testing, consistent with the findings of Muthiah (2018), which indicated that video tutorial learning media received an average validity rating of 87% and was classified as valid and suitable for use in learning.

In accordance with the research (Zeda 2022), the validation results from all three validators overall state that the wordwall-based learning media is already highly valid, with an average validity score of 75.66%. Overall, the wordwall-based learning media is declared very valid by the validators after making improvements and additions based on their suggestions.

The significance of utilizing CNC machines as practical learning tools in vocational education is vital for preparing students with relevant skills in modern manufacturing industries. However, when support resources, such as teaching materials, are lacking, achieving this objective becomes challenging. Therefore, this thesis aims to address this issue by creating a solution using MasterCAM X5 simulation software packaged as video tutorial-based learning materials that can be used by both teachers and students. With this media, it is expected that there will be an improvement in students' understanding and skills in CNC, ultimately benefiting their future careers. Thus, this thesis seeks to address the challenges faced by students and teachers at SMK Dhu'afa Padang and make a positive contribution to the development of vocational education at the school.

Utilizing instructional media with sound and visual stimuli can maximize the effectiveness of learning. Audio stimuli are received through listening, and for most adults, listening accounts for 45% of their time, while speaking takes up 30%, reading 16%, and writing only 9% (Niswa, 2012). Based on this fact, it is evident that listening skills need to be developed, especially in an educational context. Additionally, visual stimuli result in better learning outcomes for tasks involving recall, recognition, memorization, and connecting facts and concepts. Typically, individuals can understand better when all their senses are engaged, as in the case of watching videos. An innovative approach in education is to use technology-based teaching materials through video tutorials.

The use of video technology to facilitate learning is increasingly being applied in the educational process and can influence students' motivation to learn (Puyada et al., 2018). One such approach is the use of video tutorial-based instructional media, also known as Hybrid Learning. Hybrid Learning combines technology-assisted learning with face-to-face instruction (Putra, 2014). The use of the hybrid learning model makes it easier for students to access learning materials, as they have unrestricted access to documents and resources (Lin, 2008). Video Tutorials are a development within the hybrid learning model. Video Tutorials serve as a medium to aid in understanding instructional content (Syahril & Mandalika, 2020). A video tutorial consists of visual elements and audio narration delivered by the instructor, containing the necessary material to be understood by the learners (Pramudito, 2013). Video tutorials can tell a story (narrative), deliver instructional content (original material), provide background information

(documentaries, interviews), and convey emotions (De Leng et al., 2007).

From the above discussion, the importance of using instructional materials in the form of video tutorial-based learning media is emphasized to support more effective learning, enabling students to master the competencies provided and allowing them to learn at their own pace, anytime and anywhere. The ultimate goal is to produce competent graduates in all fields, enabling them to play a role in the industrial world with optimal resources, especially in CNC machining. Therefore, the researcher is interested in creating video tutorials on the use of MasterCam X5 software and the use of CNC machines as teaching media for the CNC subject at SMK Dhu'afa Padang. It is hoped that this instructional media development will make learning more effective and help students learn independently.

Conclusion

The development of CNC/CAM learning video tutorials through the 4D model has been successfully completed, involving the stages of needs analysis, design, development, and dissemination. The needs analysis stage involved interviews with 11th-grade students at SMKS Dhuafa, which revealed the need for video tutorial-based learning media. The design phase included the preparation of test standards, media selection, script creation, image capture, and editing. The development phase aimed to create valid video tutorial learning media. This involved validation of both the media and the content by experts in the fields of instructional media and instructional content. The validation results indicate that the video tutorial is highly suitable according to the validators, with a validity percentage of 89.24% for media experts and 85% for content experts. Therefore, the CAM learning video developed through the 4D model is considered successful and suitable for use in the learning process. Based on this research, several recommendations can be made. First, the CAM learning video developed through the 4D model should be used more widely in the learning process, not only in SMKS Dhuafa but also in other educational institutions. Continuous evaluation of the effectiveness of this video is crucial to ensure students' improved understanding. Furthermore, further research can focus on developing other learning materials using the same model. Teachers need to be provided with training to integrate this video into classroom teaching, and collaboration with related industries can enhance the material's relevance. Expanding distribution through online platforms and evaluating student performance should also be a concern. All these steps will help maximize the benefits of this learning video in education.

Acknowledgments
We would like to thank all parties who have contributed to this research.

Author Contributions
All authors had significant contributions to the preparation of this article.

Funding
There is no source of funding for this research, all funding comes from the author.

Conflicts of Interest
The author publishes this article for research and publication purposes. There are no conflicts or other interests in writing this article.

References

Afrina, A., Aminah, S., & Hadi, S. (2023). Pengaruh Pendidikan Aqidah Akhlak Terhadap Kepribadian Siswa Kelas V Di MIS Mathlail Khoir, Kecamatan Bojong Gede, Kabupaten Bogor. *At-Tadris: Journal of Islamic Education*, 2(1), 108-116. http://dx.doi.org/10.56672/attadris.v2i2.73

Ambiyar, A. (2012). Profesional Development Education Vocational High School Teacher Knowledge Century. http://repository.unp.ac.id/id/eprint/16108

Arif, C., Muskir, M., & Refdinal, R. (2022). Pengembangan E-Modul Pembelajaran Berbasis Web pada Mata Pelajaran Gambar Teknik Listrik di Sekolah Menengah Kejuruan. Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme, 4(2), 170-196. https://doi.org/10.37680/scaffolding.v4i2.1409

Budiastuti, D. (2022). Validitas dan reliabilitas penelitian.

Darmanto, Joko. (2007). Modul CNC Milling. Bogor: Yudistira, 20017.

De Leng, B. et al. (2007). How video cases should be used as authentic stimuli in problem-based medical education. Medical Education, 41(2), 181–188. https://doi.org/10.1111/j.1365-2929.2006.02671.x

Fransisca, M. (2017). Pengujian validitas, praktikalitas, dan efektivitas media e-learning di sekolah menengah kejuruan. *VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro*, *2*(1), 17-22. DOI: http://dx.doi.org/10.30870/volt.v2i1.1091

Hairuni. (2022). Media Online Di Era Revolusi Industry 4.0 Dan Society 5.0 Serta Peran Humas Dalam Menyajikan Informasi. diakses pada tanggal 11 Desember 2022 pukul 15:58 dari https://humas.paserkab.go.id/

Lesmana, Hendra Jaya (2019) Analisis Optimasi Parameter Permesinan Terhadap Waktu Proses Pada Pemrograman CNC Milling Dengan Menggunakan Mastercam X5 di PT. Servitama Teknindo. http://repository.uki.ac.id/id/eprint/4096

Lin, Q. (2008). Student Views of Hybrid Learning: A One-Year Exploratory Study. Journal of Computing in Teacher Education, 25(2), 57–66. Macmillan Publishing Company. https://doi.org/10.1080/10402454.2008.10784610

Maydiantoro, A. (2021). Model-Model Penelitian Pengembangan (Research and Development). Jurnal Pengembangan Profesi Pendidik Indonesia (JPPPI).

Mulyatiningsih, Endang. (2013). Metode Penelitian Terapan Bidang Pendidikan. Yogyakarta: Alfabeta.

Muthiah. 2018. Pengembangan Media Pembelajaran Video Tutorial Pembuatan Rok Suai Kelas XI Tata Busana Di SMK Negeri 1 Ngawen. Jurnal Pendidikan Teknik Busana UNY.

Mohamad, M. M., Masek, A., Yunos, J. M., Alias, M., Hamdan, N. H., & Rahma Putra, A. B. N. (2020). Assessing heutagogical elements in learning of engineering education: Instrument validation. Advances in Science, Technology and Engineering Systems, 5(5), 245–252. https://doi.org/10.25046/AJ050530.

Niswa, Auliyah. (2012). Pengembangan bahan ajar mendengarkan berbasis video interaktif bermedia flash kelas VIID SMP Negeri 1 Kedamean. Fakultas Bahasa dan Seni, Universitas Negeri Surabaya.

Pramudito, A. (2013). Pengembangan Media Pembelajaran Video Tutorial Pada Mata Pelajaran Kompetensi Kejuruan Standar Kompetensi Melakukan Pekerjaan Dengan Mesin Bubut di SMK Muhammadiyah 1 Playen. Jurnal Pendidikan Teknik Mesin, 1–12.

Purnomo, D. (2018). Uji Validitas dan Realibilitas Step Test Sebagai Alat Ukur Keseimbangan Pada Lansia. Jurnal Fisioterapi Dan Rehabilitasi, 2(2), 53-70. https://doi.org/10.33660/jfrwhs.v2i2.23

Putra, Ino Angga. (2014). Pengembangan Model Hybrid Learning Untuk Meningkatkan Penguasaan Konsep Siswa Selas X SMA Pada Materi Kinematika Gerak [Universitas Negeri Malang. http://repository.um.ac.id/id/eprint/59742

Putra, R. F., Syahril, S., Yufrizal, A., & Arafat, A. (2020). Pengembangan Panduan Pengunaan Mastercam Pada Mata Pelajaran NC-CNC dan. Jurnal Vokasi Mekanika, 2(1), 46-52. https://doi.org/10.24036/vomek.v2i1.86

Puyada, D., Ganefri, G., Ambiyar, A., Wulansari, R. E., & Herawan Hayadi, B. (2018). Effectiveness of interactive instructional media on Electrical Circuits. International Journal of Engineering and Technology(UAE), 7(2.14 Special Issue 14), 220–223. http://repository.unp.ac.id/id/eprint/21390

Rahayu, C., & Festiyed, F. (2019). Validitas perangkat pembelajaran fisika SMA berbasis model pembelajaran generatif dengan pendekatan open-ended problem untuk menstimulus keterampilan berpikir kritis peserta didik. JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar, 7(1), 1-6. https://doi.org/10.24252/jpf.v7i1.5363

Rahdiyanta, Dwi. (2020). Tantangan Pembelajaran Pemesinan di Era Revolusi Industri 4.0. diakses pada desember 2022 dari https://www.uny.ac.id/id/fokus-kita/prof-dr-ir-dwi-rahdiyanta-mpd_tantangan-pembelajaran-pemesinan-di-era-revolusi-industri.

Revi, dkk. (2018). Pengembangan Media Video Tutorial dalam Pembelajaran Komputer untuk Keterampilan Membuat Server di SMK. S2 TEP, Universitas Tanjungpura Pontianak.

Sari, Purnama. (2018). Pengembangan Model Pembelajaran Berbasis IDI (Intructional Development Institute). STMIK Royal-AMIK Royal, hlm. 573–576. https://jurnal.stmikroyal.ac.id/index.php/senar/article/view/244

Subroto, Anthony Seno. (2010). Analisis Kelayakan Perpanjangan Lisensi Software CAD/CAM/CAE (Studi Kasus di Dieshop Dmd, PT. AHM)

Sugiyono. (2011). Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: Alfabeta.

Sugiyono. (2014). Metode Penelitian Kuantitatif, Kualitatif dan R &. D. Alfabeta.

Syahril, dan Mandalika. (2020). Pengembangan Media Pembelajaran Berbasis Video Tutorial untuk Meningkatkan Efektifitas Pembelajaran Pada Mata Kuliah Tata Rias. Jurnal Inovasi Vokasional Dan Teknologi, 20(1), 85–92. http://repository.unp.ac.id/id/eprint/26595

Watrianthos, R., Ambiyar, A., Rizal, F., Jalinus, N., & Waskito, W. (2022). Research on vocational education in indonesia: a bibliometric analysis. JTEV (Jurnal Teknik Elektro dan Vokasional), 8(2), 187-192. https://doi.org/10.24036/jtev.v8i2.117045

Zeda, F. R., & Muliati, I. (2022). Praktikalitas Media Pembelajaran Berbasis Wordwall pada Mata Pelajaran Pendidikan Agama Islam Kelas V di SDN 19 Kampung Jawa Kota Solok. AS-SABIQUN, 4(4), 859-873. 10.36088/assabiqun.v4i4.2085