

Meta-Analysis: Effectiveness of ICT Learning Media Implementation in Entrepreneurship Subjects

Meta-Analysis: Efektivitas Implementasi Media Pembelajaran Menggunakan TIK Pada Mata Pelajaran Kewirausahaan

<https://doi.org/10.24036/pakar.v22i2.572>

Yulia Fitri Ananda^{1*}, Ganefri¹, Asmar Yulastri¹,

¹ Universitas Negeri Padang, Padang, Indonesia

*E-mail: fyulia944@gmail.com

Abstract

The learning process is a fundamental aspect that supports the development of knowledge, skills and attitudes among learners. Along with the advancement of digital technology, there has been a substantial integration of ICT-based learning tools that aim to improve student engagement and educational outcomes. Despite the availability of innovative tools, many educators still use conventional methodologies, often resulting in passive and less effective learning environments. Recent empirical studies emphasize the importance of ICT-based educational tools in entrepreneurship education. Tools such as educational videos, electronic modules and interactive platforms facilitate direct interaction between educators and learners. In addition, simulations and multimedia resources can be utilized to explain complex concepts, enhancing student understanding. The study used a meta-analysis approach to assess the efficacy of ICT-based educational media in improving learning outcomes in entrepreneurship education. By analyzing secondary data from pre-test and post-test results featured in ten scholarly articles retrieved from Google Scholar, the study calculated effect sizes and conducted hypothesis testing through paired sample t-tests. The analysis revealed a two-tailed significant p-value of 0.000, lower than the threshold value 0.05, leading to the acceptance of the alternative hypothesis. Consequently, there was a marked increase in the mean score from 61.793 to 84.131, indicating an increase of 19.5%. The findings suggest that ICT-based educational tools enhance student learning and are specifically effective in entrepreneurship education, with a Cohen effect size of 1.58.

Keywords: entrepreneurship, ITC, effectiveness, meta-analysis.

Abstrak

Proses pembelajaran merupakan aspek mendasar yang mendukung pengembangan pengetahuan, keterampilan dan sikap di antara peserta didik. Seiring dengan kemajuan teknologi digital, telah terjadi integrasi substansial alat pembelajaran berbasis TIK yang bertujuan untuk meningkatkan keterlibatan siswa dan hasil pendidikan. Meskipun tersedia alat inovatif, banyak pendidik masih menggunakan metodologi konvensional, sering kali menghasilkan lingkungan belajar yang pasif dan kurang efektif. Studi empiris terbaru menekankan pentingnya alat pendidikan berbasis TIK dalam pendidikan kewirausahaan. Alat seperti video pendidikan, modul elektronik, dan platform interaktif memfasilitasi interaksi langsung antara pendidik dan peserta didik. Selain itu, pemanfaatan simulasi dan sumber daya multimedia untuk menjelaskan konsep-konsep yang kompleks, sehingga meningkatkan pemahaman siswa. Penelitian menggunakan pendekatan meta-analisis untuk menilai efikasi media pendidikan berbasis TIK dalam meningkatkan hasil belajar dalam pendidikan kewirausahaan. Dengan menganalisis data sekunder dari hasil *pre-test* dan *post-test* yang ditampilkan dalam sepuluh artikel ilmiah yang diambil dari *Google Scholar*, studi tersebut menghitung ukuran efek dan melakukan pengujian hipotesis melalui t-test sampel berpasangan. Analisis mengungkapkan nilai p-signifikan dua ekor sebesar 0,000, yang lebih rendah dari nilai ambang 0,05, mengarah pada penerimaan hipotesis alternatif. Akibatnya, terdapat peningkatan yang nyata dalam skor rata-rata dari 61.793 menjadi 84.131, menunjukkan peningkatan sebesar 19,5%. Temuan tersebut menunjukkan bahwa alat pendidikan berbasis TIK tidak hanya meningkatkan pembelajaran siswa tetapi secara khusus efektif dalam pendidikan kewirausahaan, dengan ukuran efek Cohen sebesar 1,58.

Kata Kunci: kewirausahaan, TIK, efektivitas, meta-analisis.

1. Introduction

Education is essential in forming quality individuals and society (Purwati & Faiz, 2023; Subandowo, 2022). To obtain quality education results, of course, paying attention to the learning process applied to students is necessary (Agustina & Syafi'i, 2023; Naibaho, 2023). Because the learning process is the core of the educational experience, it can develop students' knowledge, skills and attitudes.

Learning media can be a tool that can increase student interest in the learning process. (Amani et al., 2021; Muskhir et al., 2023; Wulandari et al., 2023). However, most teachers still need to fully utilise the potential of learning media in the current technological era. Many still adopt traditional teacher-centred approaches or focus only on their role in the classroom. (Kuswandi, 2022). With the monotonous delivery of learning materials and a passive classroom environment, the teaching and learning process often needs to run more effectively, causing the enthusiasm for learning in students to decrease. This can have an impact on student learning outcomes.

The importance of learning media is reflected in its function as a teaching aid. Teachers can use multimedia presentations, learning videos, and simulations to explain the material more interestingly and interactively (Kusum et al., 2023; Waskito et al., 2024). This provides opportunities for students to participate more actively in their educational process. One effective tool to support such active engagement is interactive learning media. This educational media can be created using various supporting devices and applications that utilise Information and Communication Technology (ICT) (Wullur et al., 2023).

ICT-based learning media includes various forms, from learning videos, e-modules, e-learning, and educational applications to online platforms that allow direct interaction between learners and teachers. (Akbar et al., 2023; Mustari et al., 2024). The role of ICT-based learning media in education includes several dimensions that are very impactful. ICT-based learning media can enable a more visual and interactive presentation of learning materials, creating an environment that stimulates learners' interest and participation (Susanti, 2021). By utilising multimedia, animation, and simulation elements, ICT-based learning media can explain abstract concepts more quickly (Anwar & Murtopo, 2024).

Applying ICT as a learning medium in entrepreneurship education opens up new opportunities to increase student engagement and understanding of the material. ICT offers various tools and platforms that can enrich the learning experience. From online business simulations to discussion forums and e-learning platforms, ICT provides the means that allow students to experience real-world business situations, enhance their understanding of entrepreneurial concepts and encourage creativity and innovation (Iskandar et al., 2023; Z. Setiawan et al., 2023). In addition to opening up new opportunities, using ICT in entrepreneurship education also comes with challenges or problems that must be anticipated. Issues such as access to technology, teacher training, and effective curriculum design affect how well ICT can be integrated into entrepreneurship teaching and learning. As such, there is an urgent need to identify best practices and the most effective strategies to overcome these barriers.

ICT-based learning media also supports the development of learners' technological skills (Anwar & Murtopo, 2024). Mastery of technology is becoming a crucial skill in the world of work, and schools have a responsibility to ensure that graduates not only understand design and production concepts but also can integrate technology into their daily work processes. However, challenges such as adequate technology infrastructure and training of teaching staff still need to be overcome to optimize the benefits of interactive learning media. In facing the future of increasing

competition in the world of work, schools need to continue to utilize and develop interactive learning media as one of the keys to success in shaping the next generation who excel in entrepreneurship.

The advantages of interactive learning media are that they offer an effective solution to overcome the challenges faced in the learning process (Murtado et al., 2023). Therefore, this study aims to collect data and evaluate the effectiveness of interactive learning methods supported by ICT in entrepreneurship education. The findings from this study are expected to serve as a guide for other researchers in implementing learning approaches that use interactive media.

2. Literature Review

2.1. Entrepreneurship Learning

Entrepreneurial learning is becoming increasingly important in today's fast-paced, innovation-oriented society (Fauzi et al., 2023; Mohungo, 2024). This learning aims to prepare learners with the skills, knowledge and attitudes required to start and manage new ventures. Educational institutions have adopted ICT-based learning media to make entrepreneurship education more effective and engaging (Bustam et al., 2024; Mukhid, 2023). These media include, but are not limited to, e-learning platforms, educational applications, business simulations, and serious games designed to enhance the learning experience through interactivity, flexibility, and accessibility.

Studies have shown that integrating ICT in entrepreneurship education can increase student motivation, deepen conceptual understanding, and develop critical and creative skills essential to entrepreneurship (Maulida et al., 2024; Montes-Martínez & Ramírez-Montoya, 2023). For example, ICT-based learning media allow students to experience real-life simulations of business situations and practice decision-making and problem-solving in a safe and controlled context.

2.2. Meta-analysis

Meta-analyses and systematic reviews in this field have attempted to consolidate the findings from various studies to assess the overall effectiveness of ICT-based learning media (Kustanti, 2023; A. Setiawan et al., 2023). Although there are methodological challenges in bringing together data from multiple studies with diverse contexts and designs, these reviews generally support the idea that technology can improve learning outcomes in entrepreneurship education. However, research also emphasises the importance of a personalised and contextualised approach in designing and implementing ICT-based learning media, suggesting that their effectiveness may vary depending on subject discipline, student characteristics, and learning conditions.

Meta-analysis has emerged as a powerful tool to assess the effectiveness of Information and Communication Technology (ICT) implementation in entrepreneurship learning. As educational practices evolve, integrating ICT in teaching entrepreneurship subjects is seen as crucial to preparing students for today's digital economy. A literature review on this topic may discuss the overall significance of ICT in an educational context, citing studies such as (Lynch et al., 2021), highlighting the potential of technology to enhance the learning experience.

This potential must be utilized as much as possible. To obtain maximum results in the entrepreneurship learning process. ICT tools in entrepreneurship courses include interactive e-learning platforms, digital simulations, and business planning software. Other research, such as (Secundo et al., 2021), provides a comprehensive insight into various digital resources that can facilitate entrepreneurship learning. Furthermore, related pedagogical approaches in ICT implementation include flipped classrooms, blended learning, and online discussion forums.

Educators such as (Kumar et al., 2021) argue that blended teaching methods that combine traditional teaching with ICT can foster a more engaging and flexible learning environment.

In addition to using ICT in the learning process, there are challenges and barriers to effective ICT implementation, such as access to resources, teacher training, and the digital divide. Authors such as (Xiao, 2023) discuss how socio-economic factors can affect the accessibility and effectiveness of technology-based education, particularly in developing regions. The impact of ICT in fostering entrepreneurial attitudes and skills among students, concerning studies such as (Seethamraju & Murthy, 2023) which found that technology-supported learning can improve students' problem-solving ability, creativity and readiness to start a business.

3. Research Methods

This research uses a quantitative meta-analysis method to review statistical data from previous studies examining the effectiveness of learning media utilising ICT in entrepreneurship education. The effects of the variables studied were measured using effect size as a quantitative indicator. In the meta-analysis process, data were collected from national journals and studies accessed through electronic repositories and Google Scholar searches, resulting in 10 relevant articles. The data analysed included the mean values of the pre-test and post-test results.

Data analysis using parametric methods, specifically paired sample t-tests, was conducted with a quantitative approach using SPSS for Windows software. This aimed to test the hypotheses and verify the validity of the results. The quantitative descriptive data analysis process includes several essential steps, as shown in Figure 1 below.

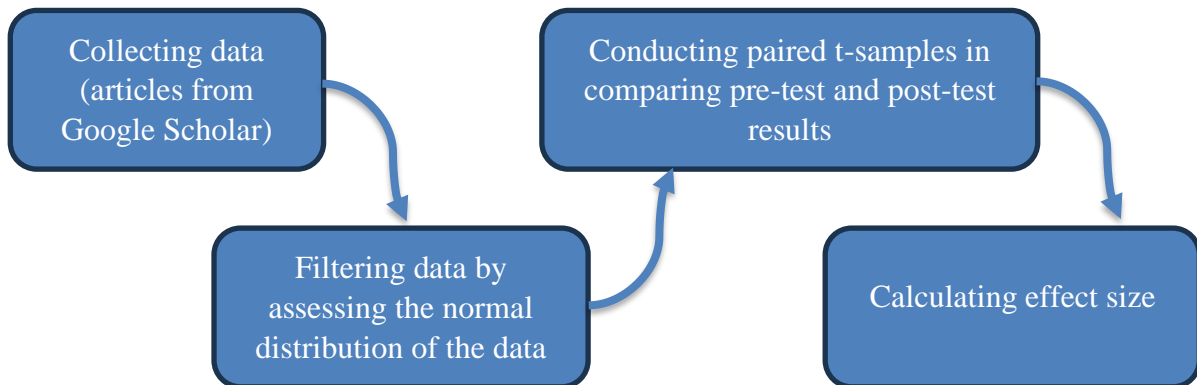


Figure.1. Research procedure

In Figure 1, there are 4 stages of the research, namely: (1) Collecting and evaluating sample data from articles that report the mean scores before and after the implementation of ICT-based learning media; (2) Assessing the normal distribution of the data to ensure its suitability for further analysis; (3) Conducting a paired sample t-test in comparing the results of the pre-test and post-test, which is the basis for hypothesis testing; (4) Calculating the effect size using Cohen's d in assessing the magnitude of the impact of the variable under study.

The calculation formula used in this process is as follows;

$$d = \frac{M_{\text{posttest}} - M_{\text{pretest}}}{\sqrt{\frac{(SD_{\text{pretest}}^2 + SD_{\text{posttest}}^2)}{2}}} \quad (1)$$

Description:

- d = Effect Size
- M_{posttest} = Average value (mean) post-test
- M_{pretest} = The mean value (mean) of the pre-test
- SD_{post-test} = Post-test standard deviation value
- SD_{pre-test} = Pre-test standard deviation value

The impact of using learning media on students' learning outcomes can be measured through Effect Size (ES). In this study, the measurement is done using Cohen's d Effect Size. A higher ES value indicates a more significant influence of the learning media on improving learners' learning outcomes. In Table 1, the effect size is categorized based on a predetermined scale, classifying various levels of influence based on the ES value achieved.

Table.1. Effect Size Criteria

No	Effect Size Value Range	Effect Level Description
1.	d > 0,8	Very Large
2.	0,5 < d ≤ 0,8	Great
3.	0,2 < d ≤ 0,5	Medium

4. Results and Discussion

After reviewing ten research articles that discuss the use of learning media using ICT in entrepreneurship education, it was found that there was an increase in learning outcomes that included pre-test, post-test, and gain data. The data obtained came from Google Scholar. The data is presented in Table 2, which consists of the number, author, title, and learning outcomes improvement.

Table.2. Meta-Analysis Data

No	Author	Title	Improved Learning Outcomes		
			Pre-test	Post-test	Gain
1.	Perdana, S., Arwansyah, A., & Hasyim, H.	Development of Android-based Interactive Learning Media to Improve Student Learning Outcomes in Creative Product and Entrepreneurship Subjects	75,37	88,57	13,2
2.	Wijaya, A., Kertih, I. W., & Pageh, I. M.	Development of Audio Visual Media in Learning Creative Products and Entrepreneurship (PKK)	73,3	88,8	15,5
3.	Mustafa, E., Sukardi11, S., & Asmar Yulastri, M. A.	Development of online entrepreneurship learning media for Padang State University students	41,67	91,67	50

4.	Andayani, E., Agustina, R., & Sya'roni, I.	Vocationalogy Media for Creative Product and Entrepreneurship (PKK) Subjects: Learning Outcomes of Smk Students in Malang Regency	39,6	68,6	29
5.	Khasanah, K., & Rusman, R.	Development of Learning Media Based on Smart Apps Creator	58	86	28
6.	Kholifah, S., & Koerniawan, I.	Design of Marketing Information System for Student Entrepreneurship Products of Accounting Computerization Study Program of Stekom Semarang University Based on Web and Mobile	85	90	5
7.	Supriyono, U.	Development of Sakpore Application at Smk Negeri 2 Pekalongan	73,37	80,68	7,31
8.	Ratna Pancawati	Implementation of Digital Marketing Project-Based Entrepreneurship Learning to Improve the Competence of Prospective Vocational Education Graduates	75	89,12	14,12
9.	Mega Ayu Prastikawati	Development of WebQuest-Based Learning Media in Basic Accounting Subject Kd 3.11 Financial Statement Material in Class X Study Group in Kebak Wirun Village	46,62	83,87	8,87
10.	Ernawati, E., Rosalina, L., & Dewi, M.	The Effectiveness of E-Learning of Entrepreneurship Courses at the State University of Padang during the COVID-19 Pandemic	50	74	24
		Average (Mean)	61.793	84.131	19,5

Table 2 in the reviewed studies indicates the effectiveness of ICT-based learning media in improving students' cognitive learning outcomes in entrepreneurship learning. The analysis shows an increase in learning outcomes, as seen from the increase in the score on the post-implementation test compared to the previous test after implementing ICT-based learning media. The minimum improvement recorded in this study was 5 points, while the maximum improvement was 50 points. The average initial score of learners was 61.793, which increased to 86.131 after implementing ICT-based learning. Table 3 presents the results of the Paired Samples Statistics processed using SPSS software to assess the data further.

Table.3. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	61.793	10	16.482	5.212
	Post-Test	84.131	10	7.579	2.397

Based on the data in Table 3, Paired sample statistics confirm that using ICT-based learning media significantly improves student learning outcomes. The mean score of students before applying ICT-based learning media was 61.793, which increased to 84.131 after the application.

Statistical analysis shows that the mean value of the post-test is higher than the pre-test, which indicates a significant difference in learning outcomes. Table 4 will provide further paired samples test analysis to verify that this difference is not simply due to sampling error but rather a natural effect of using ICT-based learning media.

Table.4. Paired Samples Test

		Paired Differences					T	df	Sig.(2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of The Difference				
					Lower	Upper			
Pair 1	Pre-Test - Post-Test	-22.338	14.107	4.461	-32.429	-12.247	-5.007	9	0.0007 31

According to Table 4, a paired sample test is the crucial result of this study, which assesses the effectiveness of ICT-based learning media in improving students' cognitive learning outcomes in entrepreneurship. The rules for accepting or rejecting a hypothesis based on the significance value in the paired sample test are set out as follows: (1) if Sig. (2-tailed) > 0.05, then the alternative hypothesis (H_a) is rejected, and the null hypothesis (H_0) is accepted; (2) if Sig. (2-tailed) < 0.05, then H_a is accepted, and H_0 is rejected. The result of the analysis shows Sig. (2-tailed) of 0.000, which is significantly below 0.05, signifying the acceptance of H_a , which states that there is a significant difference between the mean scores of the post-test and pre-test. This finding confirms that there has been an improvement in students' learning outcomes since the application of Information and Communication Technology (ICT)-based learning media.

Furthermore, Table 4 records a mean value of Paired Differences of -22.338, indicating the mean difference between post-test and pre-test scores due to the application of ICT-based learning media. The data also shows that the confidence interval for the difference ranges from -32.429 to -12.247, with a 95% confidence level. This proves that the difference in students' learning scores before and after the treatment, with a 95% confidence level, is within the range, confirming that implementing ICT-based learning media improves learning outcomes in entrepreneurship education.

In this study, the Effect Size (ES) value was calculated using the data from Table 2. The mean score for the pre-test was 61.793, with a standard deviation of 16.482, while the mean score for the post-test was 84.131, with a standard deviation of 7.579. After obtaining the results from the paired samples test, further analysis was conducted according to the details in Table 4, where the mean value of the paired samples test obtained was -22.338, divided by a standard deviation of 14.107. This results in an ES value of 1.58, which, according to the classification in Table 1, is above 0.8, proving that the implementation of ICT-based learning media can affect improving students' academic grades in entrepreneurship learning.

Technology in education, particularly in entrepreneurship learning, improves learning outcomes and changes the paradigm of how students acquire knowledge. The application of ICT in the learning process improves academic scores and enriches the learning experience through more engaging and interactive interactions. With a significant ES value, this confirms that technology plays a vital role as a catalyst in supporting the achievement of higher learning outcomes. Therefore, integrating ICT into the entrepreneurship curriculum is relevant and essential to prepare learners for the challenges of the digital age.

Implementing learning media using ICT in entrepreneurship subjects in schools is a strategic step that aims to improve the quality of education and equip students to succeed in the growing fashion industry (Damisa & Sc, 2023). Furthermore, aspects related to the effectiveness of ICT-based learning media and its impact on entrepreneurship learning are also discussed (Rahmadan et al., 2023).

Implementation of ICT-based learning media affects learners' engagement in entrepreneurship learning (Ananta et al., 2023). More active participation, interaction with design simulations, and the attractiveness of digitally presented learning materials can provide additional motivation for students. The effectiveness of learning media using ICT can be measured through students' understanding of entrepreneurship learning (Wijaya et al., 2022). This includes the role of technology in conveying abstract concepts, providing practical examples, and facilitating more profound learning.

5. Conclusion

Analysis of 10 articles retrieved from Google Scholar supports the initial hypothesis that there is a significant difference between the mean scores of pre-test and post-test results after implementing ICT-based learning media in entrepreneurship education. The results of the paired sample test and effect size calculation reinforce this conclusion. These two testing methods confirm that ICT-based learning media substantially improves students' academic performance. The average score before implementation was 61.793, which increased to 84.131, showing an increase of 19.5%. Implementing ICT-based learning media in entrepreneurship education effectively improves learners' learning outcomes.

6. References

- Agustina, F., & Syafi'i, I. (2023). Peran Guru Dalam Meningkatkan Stabilitas Mutu Pembelajaran LPI Di Era Globalisasi. *Jurnal Penelitian Medan Agama*, 14(2), 94–99.
- Akbar, M. R., Ningtyas, S., Aziz, F., Rini, F., Putra, I. N. A. S., Adhicandra, I., Novita, R., Metra, R., & Junaidi, S. (2023). *MULTIMEDIA: Teori dan Aplikasi dalam Dunia Pendidikan*. PT. Sonpedia Publishing Indonesia.
- Amani, R., Luthfi, A., Qomari, V. A., Mahdi, A., & Langputeh, S. (2021). The Innovation of Maruo's Popup Book to Help Children with Special Needs in Memorizing Alquran. *Khalifa: Journal of Islamic Education*, 5(2), 176. <https://doi.org/10.24036/kjie.v5i2.155>
- Ananta, I. B. G. S., Sujana, I. W., & Wulandari, I. G. A. A. (2023). Pengembangan Media Tutorial Pembelajaran Berbasis Proyek Kewirausahaan Kegiatan Daur Ulang Sampah Pada Materi IPAS Siswa Kelas 4 di SD Negeri 5 Peguyangan. *Jurnal Media Dan Teknologi Pendidikan*, 3(2).
- Anwar, K., & Murtopo, M. (2024). Pemanfaatan Teknologi Informasi dan Komunikasi (ICT) dalam Mengembangkan Media Pembelajaran. *EDU-RILIGIA: Jurnal Ilmu Pendidikan Islam Dan Keagamaan*, 8(1).
- Bustam, B. M. R., Astari, R., Yulianto, N., Aisyah, U. N., & Ali, N. S. (2024). *Inovasi media pembelajaran bahasa Arab berbasis pemanfaatan teknologi*. UAD PRESS.
- Damisa, E., & Sc, M. B. (2023). *Nigeria School of Postgraduate Studies (SPGS) Information and Communication Technology and The Management of Secondary School Entrepreneurship Education in Kogi State*.
- Fauzi, A. A., Nugroho, F., Firdaus, R., & Amin, M. (2023). *Kewirausahaan di era society 5.0*. Publica Indonesia Utama.

- Iskandar, A., Parnawi, A., Sagena, U., Kurdi, M. S., Fitra, D., Haryati, S., Riska, F. M., Arianto, T., Kurdi, M. S., & Putra, P. (2023). Transformasi Digital Dalam Pembelajaran. *PT. Literasi Nusantara Abadi Grup*.
- Kumar, A., Krishnamurthi, R., Bhatia, S., Kaushik, K., Ahuja, N. J., Nayyar, A., & Masud, M. (2021). Blended Learning Tools and Practices: A Comprehensive Analysis. *IEEE Access*, 9, 85151–85197. <https://doi.org/10.1109/ACCESS.2021.3085844>
- Kustanti, E. W. (2023). From ICT-Based Learning Media to Gamification Optimization: Learning Media Research Projection Based on Bibliometric Analysis. *Proceedings of the 7th Progressive and Fun Education International Conference (PROFUNEDU 2022)*, 711, 21.
- Kusum, J. W., Akbar, M. R., & Fitrah, M. (2023). *Dimensi Media Pembelajaran (Teori dan Penerapan Media Pembelajaran Pada Era Revolusi Industri 4.0 Menuju Era Society 5.0)*. PT. Sonpedia Publishing Indonesia.
- Kuswandi, D. (2022). *Konstruksi Learning Content Management System (LCMS) (Vol. 1)*. Academia Publication.
- Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2021). Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process. *Technological Forecasting and Social Change*, 164. <https://doi.org/10.1016/j.techfore.2019.06.015>
- Maulida, F. H., Noviani, L., & Sudarno, S. (2024). How Entrepreneurship Education Can Help Student Thrive in the Digital Age?: The Implications of Creative and Innovative Learning. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, 10(1), 218–229.
- Mohungo, Y. (2024). *Orientasi Kewirausahaan, Orientasi Pasar dan Inovasi Estetika: Pengaruhnya terhadap Kinerja UKM*. Penerbit NEM.
- Montes-Martínez, R., & Ramírez-Montoya, M. S. (2023). Pedagogical models and ICT integration in entrepreneurship education: Literature review. *Cogent Education*, 10(2), 2264026.
- Mukhid, M. P. (2023). *Disain Teknologi Dan Inovasi Pembelajaran Dalam Budaya Organisasi Di Lembaga Pendidikan*. Pustaka Egaliter. Com.
- Murtado, D., Hita, I. P. A. D., Chusumastuti, D., Nuridah, S., Ma'mun, A. H., & Yahya, M. D. (2023). Optimalisasi pemanfaatan media pembelajaran online sebagai upaya meningkatkan hasil belajar siswa di sekolah menengah atas. *Journal on Education*, 6(1), 35–47.
- Muskhir, M., Luthfi, A., Julian, R., & Fortuna, A. (2023). Exploring iSpring Suite for Android-Based Interactive Instructional Media in Electrical Lighting Installation Subject. *International Journal of Interactive Mobile Technologies*, 17(22), 67–84. <https://doi.org/10.3991/IJIM.V17I22.42625>
- Mustari, M., Zainuri, H., Krisnaesanti, A., Eprillison, V., Aritonang, M. A. S., Nasori, A., Safii, M., Erita, E., Khoiriya, R. M., & Puspitasari, R. (2024). *Pengantar Teknologi Pendidikan*. Yayasan Tri Edukasi Ilmiah.
- Naibaho, D. P. (2023). Strategi Pembelajaran Berdiferensiasi Mampu Meningkatkan Pemahaman Belajar Peserta Didik. *Journal of Creative Student Research*, 1(2), 81–91.
- Purwati, P., & Faiz, A. (2023). Peran Pendidikan Karakter dalam Membentuk Sumber Daya Manusia yang Berkualitas. *Jurnal Pendidikan Dan Konseling (JPDK)*, 5(2), 1032–1041.
- Rahmadan, L. A., Zakir, S., Efriyanti, L., & Supriadi, S. (2023). Perancangan Media Pembelajaran Kewirausahaan Berbasis Android Menggunkan Kodular Pada Kelas XII MAN 1 Agam. *JATI (Jurnal Mahasiswa Teknik Informatika)*, 7(3), 1932–1938.
- Secundo, G., Mele, G., Vecchio, P. Del, Elia, G., Margherita, A., & Ndou, V. (2021). Threat or opportunity? A case study of digital-enabled redesign of entrepreneurship education in the

- COVID-19 emergency. *Technological Forecasting and Social Change*, 166. <https://doi.org/10.1016/j.techfore.2020.120565>
- Seethamraju, R. C., & Murthy, V. S. (2023). *Impact of Technology-enabled Active Learning (TEAL) on Learning*.
- Setiawan, A., Nugroho, W., & Widyaningtyas, D. (2023). Development of interactive powerpoint learning media based on information and communication technologies to improve student learning outcomes. *Jurnal Pendidikan Dasar Nusantara*, 9(1), 75–86.
- Setiawan, Z., Pustikayasa, I. M., Jayanegara, I. N., Setiawan, I. N. A. F., Putra, I. N. A. S., Yasa, I. W. A. P., Asry, W., Arsana, I. N. A., Chaniago, G. G., & Wibowo, S. E. (2023). *Pendidikan Multimedia: Konsep dan Aplikasi pada era revolusi industri 4.0 menuju society 5.0*. PT. Sonpedia Publishing Indonesia.
- Subandowo, M. (2022). Teknologi Pendidikan di Era Society 5.0. *Jurnal Sagacious*, 9(1).
- Susanti, A. I. (2021). *Media Pembelajaran berbasis Teknologi Informasi dan Komunikasi (TIK)*. Penerbit NEM.
- Waskito, W., Fortuna, A., Prasetya, F., Wulansari, R. E., Nabawi, R. A., & Luthfi, A. (2024). Integration of Mobile Augmented Reality Applications for Engineering Mechanics Learning with Interacting 3D Objects in Engineering Education. *International Journal of Information and Education Technology (IJJET)*.
- Wijaya, A., Kertih, I. W., & Pageh, I. M. (2022). Pengembangan Media Audio Visual Dalam Pembelajaran Produk Kreatif dan Kewirausahaan (PKK). *Jurnal Pendidikan IPS Indonesia*, 6(1), 34–45. <https://doi.org/10.23887/pips.v6i1.1343>
- Wulandari, A. P., Salsabila, A. A., Cahyani, K., Nurazizah, T. S., & Ulfiah, Z. (2023). Pentingnya Media Pembelajaran dalam Proses Belajar Mengajar. *Journal on Education*, 5(2), 3928–3936.
- Wullur, P., Togas, P. V., & Heydemans, C. D. (2023). Pengembangan Multimedia Pembelajaran Interaktif Animasi 2D dan 3D Berbasis Mobile. *Eduatik: Jurnal Pendidikan Teknologi Informasi Dan Komunikasi*, 3(4), 512–521.
- Xiao, J. (2023). Critiquing Sustainable Openness in Technology-Based Education from the Perspective of Cost-Effectiveness and Accessibility. *Open Praxis*, 15(3), 244–254. <https://doi.org/10.55982/openpraxis.15.3.569>