Trends in E-Learning Usage in Vocational High Schools (SMK)

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article info

abstract

Data innovation is currently progressing very rapidly in the field of education. As a result, Vocational High Schools (SMK) utilize e-learning and also information technology in carrying out teaching and learning activities. For this reason, a Systemic Literature Review (SLR) was conducted which examines what and how e-learning is researched. This research uses PRISMA (Preferred Reporting Items for Systemic and Meta-Analysis) guidelines, by searching for scopus indexed articles in the 2019-2023 range involving a total of 193 articles. After the screening process, 20 articles were obtained which were then analyzed in accordance with the Research Question (RQ) that had been formulated. The objectives of this examination are (1) To assess and describe the effect of e-learning implementation through Edmodo Stage (2) To determine the factors that influence the continuity of e-learning at work on students' understanding and learning achievement in the Edmodo field. These results have limitations in terms of the scope of data sources and the depth of study on the material discussed. So this research provides opportunities for further researchers both in development design and SLR.

abstrak

Inovasi data saat ini mengalami kemajuan yang sangat pesat dalam bidang pendidikan. Oleh karena itu, Sekolah Menengah Kejuruan (SMK) memanfaatkan e-learning dan juga teknologi informasi dalam melaksanakan kegiatan belajar mengajar. Untuk itu, dilakukan Systemic Literature Review (SLR) yang mengkaji tentang apa dan bagaimana e-learning diteliti. Penelitian ini menggunakan pedoman PRISMA (Preferred Reporting Items for Systemic and Meta-Analysis), dengan mencari artikel terindeks scopus dalam rentang tahun 2019-2023 yang melibatkan total 193 artikel. Setelah proses penyaringan, diperoleh 20 artikel yang kemudian dianalisis sesuai dengan Research Question (RQ) yang telah dirumuskan. Tujuan dari pemeriksaan ini adalah (1) Untuk menilai dan mendeskripsikan pengaruh implementasi e-learning melalui Edmodo Stage (2) Untuk mengetahui faktor-faktor yang mempengaruhi keberlangsungan e-learning di tempat kerja terhadap pemahaman dan prestasi belajar mahasiswa bidang Edmodo. Hasil penelitian ini memiliki keterbatasan dalam hal cakupan sumber data dan kedalaman kajian terhadap materi yang dibahas. Oleh karena itu, penelitian ini memberikan peluang bagi peneliti selanjutnya baik dalam desain pengembangan maupun SLR.

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1. Introduction

The development of information technology has brought major changes in the world of education in this digital era (Elyas, 2023; Hartanto, 2023; Umaliyahati, 2020). The COVID-19 pandemic has become a catalyst in accelerating technology adoption, including the implementation of e-learning at various levels of education. One sector that has been significantly affected is vocational education, especially Vocational High Schools (SMK) (Irwanto, 2020; Restu Ningsih *et al.*, 2021; Hardifa, 2020). SMK as a vocational education institution has unique characteristics, namely focusing on students' readiness to enter the world of work. In this context, e-learning becomes a strategic alternative to support competency-based learning, increase learning flexibility, and bridge 21st century skills needs. The use of web-based e-learning platforms such as Moodle has become a solution in maintaining learning continuity amid the limitations of face-to-face learning (Edi *et al.*, 2019; Kurnia and Tumini, 2023). However, the implementation of e-learning is not free from challenges, ranging from limited internet access, low digital literacy, to variability in learning motivation of vocational students (Restu Ningsih *et al.*, 2021; Aryani, 2020). The role of teachers in creating interesting and adaptive learning is a determining factor for success.

In addition, students' work readiness as the main output of vocational education also depends on the effectiveness of e-learning implementation and its connection with the evolving needs of the industrial world. Through this literature review, it is important to understand the trends, supporting factors and barriers, as well as the implications of using e-learning in the context of SMK in Indonesia. This SLR was conducted to summarize related research results, identify important patterns, and provide recommendations for further development. Learning is a process of change that occurs through practice and experience so as to acquire measurable abilities and skills. Learning theory is an effort made to provide an overview of how humans learn things so as to get a view of the complex and inherent evaluation process. E-Learning integrates images, learning videos, animations, and other manipulative learning media such as Augmented Reality (AR).

Learning videos are not only related to material explanation, but can also be integrated with videos of real phenomena related to the material being discussed. In addition, e-learning can also be integrated with manipulative media such as AR. AR is one of the media that can display 3D animation. For Mathematics material known to have a high level of abstraction, AR media is considered capable of providing real simulation.

2. Research Methodology

This study used the *Preferred Reporting Items for Systematic and Meta-Analysis* (PRISMA; Moher, 2009) guidelines. These guidelines include SLR steps, such as describing clear criteria, information sources, search strategies for the selection process and analysis of search results. The search process was carried out with the help of the *Publish or Perish* application by searching for *scopus* indexed articles from 2019-2023. The keywords used in the article search process include "E-learning".

Table 1. Summary of E-Learning Statistics

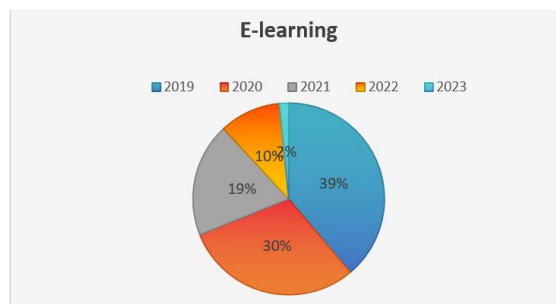| Description	Results
Time Period	2019-2023
Journal Source	193
Journal 2019	620
Journal 2020	18
Journal 2021	217
Journal 2022	6
Journal 2023	5

Figure 1. Summary of E-learning Statistics

The table above shows the search results after being filtered in excel for the topic of the article obtained as many as 193 articles, and for the keyword "E-learning as a learning medium" there are 113 articles. The selection criteria of the articles obtained are very

much needed to maintain the eligibility of an article. The inclusion criteria required are as follows, (1) published in English; and (2) clearly describes the type of E-learning used/developed. While the required exclusion criteria are (1) the method used is not clearly described; (2) is a preliminary research of another research; (3) the E-learning used / developed is not E-learning; (4) the article obtained is incomplete; (5) not published in English.
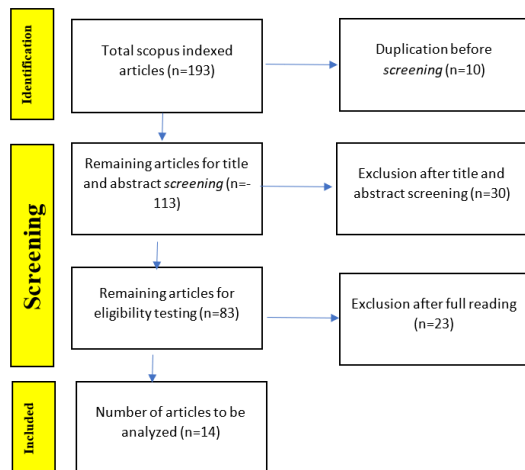

Figure 2. Diagram of the search and selection process

The number of articles identified as being indexed by Scopus was (n=193). In the first stage, duplication was checked on the identified articles, which resulted in the exclusion of (n=80). So that the number of articles remaining for title and abstract *screening* is (n = 113). Exclusions after screening titles and abstracts were (n=30) and 83 articles remained for feasibility testing by reading the entire content of the article. The exclusion of the feasibility test reduced the number of articles by 23. So the number of articles analyzed was 14.

RQ1: What research methods were used?

The first formulation of the problem tested is about the most used research design in the 2019-2023 time span, which is related to the use/development of E-learning. Of the 14 articles that were output from the *screening* process, *the* results of the analysis regarding the research designs used can be presented as follows.

Table 2. Recap of research design

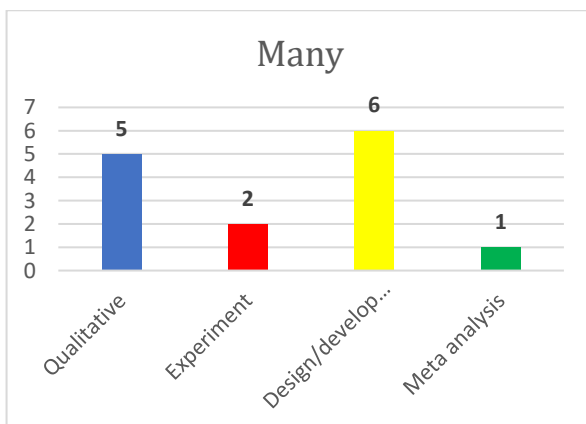| No.	Research Design	Source
1	Qualitative	(Kucirkova, 2021), (Ismail, 2021). (Yasa, 2021), Bus,2020), (Sawitri, 2021)
2	Experiment	(Siano, 2022), (Choi, 2020)
3	Design/development	(Budiman, 2021), (Saripudin, 2022), (Faizah, 2022), (Setiyani, 2022), (Setianingrum *et al.*, 2023), (Lee 2023)
4	Meta analysis	(Wijaya, 2022)

Figure 3. Scatter diagram of the research design

Based on the data presented in Table 1 and Figure 3, it is evident that the majority of research on e-learning falls into the design/development category, accounting for 42.86%. This is followed by qualitative research at 35.71%, experimental research at 14.29%, and meta-analysis research at 7.14%. The dominance of design/development research indicates a strong focus on creating and improving e-learning platforms, tools, and methodologies. This highlights the importance of practical applications and innovations in e-learning, as researchers aim to develop more effective and engaging learning solutions for various educational contexts.

RQ2: What are the content trends of the e-book media studied over the years?

The second problem formulation is about the aspects integrated in E-learning. The aspects that can be integrated are text, picture/table/photo/diagram, video, and animation/manipulative media. In E-learning, one or even all four aspects can be integrated.

Table 3. Recap of aspects integrated in e-learning

| No.	Aspects in the book	Description	Source
1	Text	E-learning that only contains text material	(Faizah, 2022), (Setiyani, 2022), (Fitriani, 2021), (Wijaya, 2022)
2	Picture/table/photo/diagram	E-learning equipped with images/tables/photos/diagrams of phenomena related to the concepts being discussed.	(Saripudin, 2022), (Ismail, 2021), (Faizah, 2022),
3	Video	E-learning that is equipped with videos, either learning videos that contain explanations of concepts or videos of phenomena that occur	(Budiman, 2021), (Awaludin, 2020), (Fitriani, 2021), (Siano, 2022),
4	Animation/manipulative media	E-learning equipped with media both in the form of animation and manipulative media	(Wijaya, 2022), (Awaludin, 2020), (Setianingrum *et al.*, 2023), (Lee, 2023)
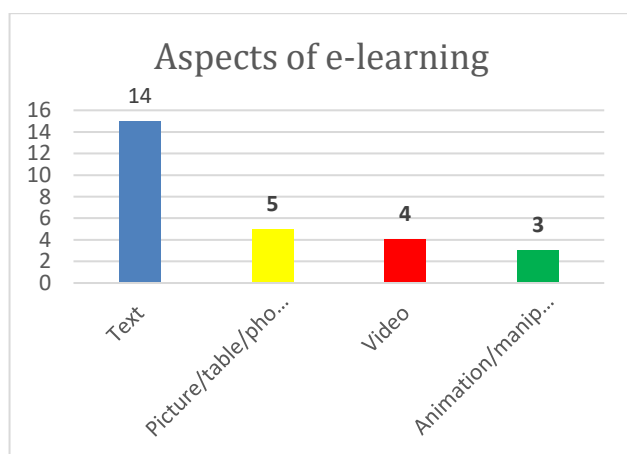
Figure 4. Aspects of the book under study

From table 3 and figure 4 above, it can be concluded that the most researched aspect is text. Text is the dominant aspect for e-learning, so all articles used in this SLR are categorized as containing text aspects. Meanwhile, the least aspect integrated in E-learning is animation/manipulative media. E-learning is a learning resource that utilizes information technology in its development. E-learning has many advantages compared to conventional books. One of the advantages of E-learning is a good level of flexibility, where its use can be done anywhere and anytime. In addition, the use of E-learning can increase innovative thinking, practical information acquisition, learner creativity and learning motivation (Radovic, 2020; Budiaman, 2021). One of the manipulative media that can be integrated in E-learning is *augmented reality* (AR). Research on AR has been conducted with positive results. The use of AR media provides an experience for students who are able to visualize the abstract aspects of a concept (Faridi, 2020). Furthermore, learning with AR can also make a positive contribution to students' ability in modeling skills (Cahyono, 2020). Specifically on the topic of geometry, learning with AR contributes to the novelty of geometry learning (Hanid, 2022).

3. Results and Discussion

Results
The results of the analysis on the two problem formulations can be summarized as presented in the table below.

Table 4. Summary of research design and types of books studied

| No	Research Design	Aspects of the book	Source
1	Qualitative	Text	(Kucirkova, 2021), (Ismail, 2021). (Yasa, 2021), (Bus, 2020), (Sawitri, 2021)
		Picture/table/photo/diagram	(Ismail, 2021)
		Video	
		Animation/manipulative media	
2	Experiment	Text	(Siano, 2022), (Choi, 2020)
		Picture/table/photo/diagram	(Choi, 2020)
		Video	(Siano, 2022)
		Animation/manipulative media	
3	Design/development	Text	(Budiman, 2021), (Riyanto, 2020), (Saripudin, 2022), (Faizah, 2022), (Setiyani, 2022), (Awaludin, 2020), (Fitriani, 2021)
		Picture/table/photo/diagram	(Budiman, 2021), (Saripudin, 2022), (Faizah, 2022)
		Video	(Budiman, 2021), (Awaludin, 2020), (Fitriani, 2021)
		Animation/manipulative media	(Riyanto, 2020), (Awaludin, 2020)
4	Meta analysis	Text	(Wijaya, 2022)
		Picture/table/photo/diagram	
		Video	
		Animation/manipulative media	(Wijaya, 2022)
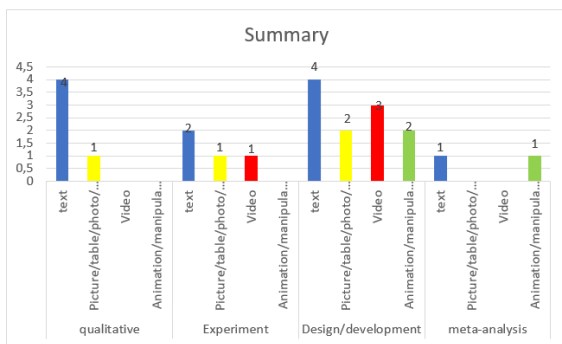
Figure 5. Summary diagram of research design and types of books studied

From the summary results in Table 4 and Figure 5, it can be concluded that for each research design is still dominated by text. It may be reasonable if text becomes the dominant aspect in the E-learning study, because text is the main element in a book. However, if we look deeper, the animation element is still minimally used in the E-learning for each research design.

Discussion
This study highlights the growing use of e-learning in Vocational High Schools (SMK) in Indonesia, driven by the increasing adoption of technology in education. As Elyas (2023) stated, the implementation of e-learning models holds significant potential in enhancing the quality of education by offering flexibility in terms of time and location for students. In the context of SMK, e-learning serves as an effective alternative to support competency-based learning that aligns with the demands of Industry 4.0. The use of web-based platforms such as Moodle and Edmodo has proven to maintain learning continuity amid the limitations of face-to-face interactions (Kurniawan *et al.*, 2023). However, despite the advantages offered by e-learning, the main challenges include limited internet access, low digital literacy, and varying student motivation (Restu Ningsih *et al.*, 2021). Therefore, the support of teachers is crucial in creating an engaging and adaptive learning experience

(Arianti, 2023). Furthermore, this research reveals that the most commonly used research design is design/development research (Budiman *et al.*, 2021), which aims to develop e-learning-based teaching media that is more interactive and relevant to the needs of students in SMK. The analysis shows that most research articles focus on developing platforms or applications that can enhance the effectiveness of teaching and adapt to current technological advancements. However, while design/development remains the primary focus, the use of interactive media like Augmented Reality (AR) is still limited. AR has the potential to provide a more tangible learning experience, especially for complex or abstract topics like mathematics and physics (Cahyono *et al.*, 2020; Faridi *et al.*, 2020). The use of AR allows students to visualize and interact with 3D objects that help clarify concepts that are difficult to grasp through text or static images (Hanid *et al.*, 2022).

Moreover, the study shows that text still dominates e-learning content, although images, videos, and animations are being introduced in some studies. This reflects that, despite the rapid development of technology, text remains the primary medium for delivering content, likely due to its ease of creation and presentation. However, research by Ismail *et al.* (2021) and Choi *et al.* (2020) suggests that integrating videos and manipulative media such as animations could enhance learning, as these media have the potential to improve students' understanding. On the other hand, AR, which has been proven to be effective in enhancing critical thinking skills and understanding of physics content (Faridi *et al.*, 2020), should be integrated more into e-learning practices. This study also emphasizes some of the challenges faced in the implementation of e-learning in SMK, including limited technological infrastructure and the low digital readiness of both students and teachers (Irwanto, 2020). However, research by Solihin *et al.* (2021) indicates that e-learning can increase student interest and learning outcomes, particularly when supported by high motivation and the use of appropriate media. Therefore, educators need to be given intensive training on how to use e-learning platforms and how to increase interactivity in their teaching practices. In conclusion, this study provides insights into how e-learning has been implemented in SMK and identifies various factors that influence its

success. While e-learning has brought many benefits, significant challenges remain, particularly in terms of infrastructure and digital literacy. Further research on the development of more interactive learning media and the use of advanced technologies such as AR is needed to enhance the effectiveness of education in the future.

4. Conclusion

This SLR research reveals what and how E-learning is researched. From the analysis of 14 articles that have passed the *screening* process, the results show that the most common research design that examines E-learning is design/development research. The aspects integrated in E-learning are still dominated by text, and quite a few integrate animation or manipulative media in the books studied. This result is certainly an asset in research, especially those that focus on researching E-learning. Suggestions that can be given by researchers after carrying out research are research on E-learning as a medium in the learning process at school can be further improved in researching. For students, interest in learning and learning motivation to improve learning outcomes in using E-learning and providing motivation to students in learning which in turn can foster student interest and motivation to learn and always familiarize themselves with learning media, and teachers are expected to use a variety of methods in learning, using learning media as optimally as possible in E-learning.

Teachers are advised to make the results of this study an insight into the influence of school culture, interest in learning and learning motivation on student learning outcomes, and can get to know students better and provide motivation to students in learning which in turn can foster student interest and motivation to learn and always familiarize themselves with positive school culture, and teachers are expected to use a variety of methods in learning, use learning media as optimally as possible, try to make the classroom atmosphere as active as possible, hold competitions for students so that students become enthusiastic in learning, and carry out regular and regular evaluations as selectively as possible so as to optimize student learning in the classroom; 2). To the principal, it is recommended to utilize the results of

this study as a supporting learning resource for teachers at school, so as to improve the quality of learning by fostering a positive school culture, fostering student interest and motivation to learn so as to produce quality students; 3) To the parents of students, it is suggested that they can better understand and support their children in learning so that their interest and motivation to learn will grow, besides that from an early age parents must know the learning style possessed by the child so that the child feels comfortable when learning, and can improve the achievement of their knowledge competencies; 4) It is suggested to other researchers that the results of this study can be used as a reference to conduct further research and be useful for all researchers who make it a reference.

5. Daftar Pustaka

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