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# The Role of Social Media as a Micro-Ecosystem in Supporting Community-Based E-Learning Platforms: A Systematic Literature Review

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**Abstract**
*This study explores the role of social media as a micro-ecosystem that supports community-based E-learning, adopting a Systematic Literature Review (SLR) approach guided by the PRISMA protocol. From 450 screened publications, 80 relevant studies were analysed using both qualitative thematic synthesis and descriptive meta-analysis. The findings reveal that social media platforms, such as WhatsApp, Facebook, YouTube, and Discord, enhance collaboration, engagement, and learning motivation, with average improvements of about 40% in learner participation and 98% in message openness, based on aggregated quantitative evidence from prior research. The review also identifies significant challenges, including digital distraction, privacy risks, and limited digital literacy, which can reduce the effectiveness of social-media-based learning. By integrating adaptive learning algorithms, AI-driven analytics, and privacy-by-design principles, the study conceptualises social media as an intelligent, ethically grounded, and sustainable learning micro-ecosystem aligned with informatics and systems-engineering perspectives.*

**Keywords**: *Community-Based Learning, Digital Literacy, E-learning, Micro-Ecosystem, Social Media.*

## I. INTRODUCTION

Digital transformation has produced significant impacts on social interaction patterns, information sharing modes, and learning models taking place at the global level, across borders (Adi et al., 2024; Anggono & Supriyanto, 2025; Arkha et al., 2025). Social media, initially designed as a communication tool, has evolved into a multifaceted digital ecosystem capable of meeting a multitude of users' needs. The number of active social media users continues to grow rapidly worldwide, with social media showing a record-high penetration rate. Beyond being an extension of how people socialize, social media supports a participatory model of function and collaboration. In education, social media serves as a key micro-ecosystem supporting community-based learning, enabling participants to share knowledge, experiences, and resources.

Research from (Nacheva R, 2022) and (Heinrich et al., 2022) demonstrates that platforms such as Facebook Groups, WhatsApp, and Discord create interactive spaces where people co-construct knowledge and learning by sharing and collaborating with others. Research by (Krismanto et al., 2022) further demonstrates that social media offers flexibility in delivering learning materials, thereby enabling community-based learning with a high level of interactivity. This phenomenon

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is particularly relevant to the growing adoption of e-learning, especially in the post–COVID-19 period, when educational institutions and global organizations began to integrate digital technologies into their teaching methods. According to the World Economic Forum, when reviewing 2020, education technology investment nationally and globally is expected to increase significantly by 2025, with projected exponential growth in the development of community-driven platforms for collaborative learning (Li, 2022).

Moreover, social media's effectiveness in facilitating community-based e-learning is challenged by even more sophisticated processes, such as really low digital literacy, data privacy issues, and broken community administration. In 2022, there were 4.95 billion users globally; however, often its potential is hindered by the users in our community not having viable strategies for it's beneficial use (Song et al., 2024). Although social media has high potential to promote new learning interactions, low digital literacy can deepen educational inequality. Data privacy concerns are another key issue, as participants are reluctant to exchange learning materials freely.

According to (Pye et al., 2021) community management requires a more systematic approach to enhance engagement. Current studies indicate the need to evaluate the incorporation of social media in education, while blended learning methods can yield more dynamic learning processes (Kumar et al., 2021) and (Wang & Zhang, 2022). Therefore, it is necessary to examine the role of social media as a micro-ecosystem in community learning. Although numerous studies have explained the use of social media in education, there are some vital gaps.

This means that until now, there has been no comprehensive review that takes into consideration social media as a microecosystem that fosters learning communities (Colpitts et al., 2021). It should also be noted that specific issues such as privacy, moderation, and digital literacy gaps in community-based learning remain areas that need further exploration (Kropczynski et al., 2021) and (K Sriwisathiyakun & Dhamanitayakul C, 2022). Finally, there are also no systematic approaches to analysing effective strategies to incorporate social media into existing community-based e-learning environments (Díaz Redondo et al., 2021) and (Zamiri & Esmaeili, 2024). For these reasons, the current study is necessary to fill the gaps in the literature and offer an even more comprehensive analytical framework.

The concept of a micro-ecosystem in social media–based learning can be understood through three complementary theoretical lenses,: (1) Socio-constructivism explains that knowledge is co-constructed through interaction, where learners actively negotiate meaning in social contexts. Social media functions as an enabler of these participatory interactions. (2) Connectivism, proposed by Siemens and Downes, emphasizes the role of digital networks in forming learning connections among distributed nodes—precisely what community-based platforms such as

WhatsApp and Facebook groups facilitate. (3) Systems theory provides an informatics-oriented view: the learning community is a dynamic system in which users, digital tools, and data continuously interact to maintain equilibrium and self-organization. By linking these theories, the *micro-ecosystem* metaphor gains stronger explanatory power as both a social and technological construct supporting e-learning environments.

This study aims to conduct a systematic review of the roles of social media as a micro-ecosystem towards community-based e-learning sites. It also outlines the key challenges in its application towards community-based learning. Moreover, the study formulates strategic recommendations to maximize the benefits of social media for collaborative learning. This research contributes to academic literature by bridging the existing gap on social media being used as a micro-ecosystem of community-based learning, providing in-depth details on challenges and solutions for integrating social media into e-learning platforms, and offering a strategic model to optimize the effectiveness of social media in promoting collaborative learning in the digital transformation period.

## II. RESEARCH METHOD

A Systematic Literature Review (SLR) is an appropriate mechanism for locating and integrating evidence on the role of social media in community-based e-learning. There are eight steps involved in the SLR process: formulating a research question, designing a protocol, searching literature, selecting studies, assessing quality, extracting data, synthesising results, and reporting outcomes. This method enables researchers to gain insight into recent advancements, identify research gaps, and support evidence-based decision-making, thereby leading to a comprehensive and informative literature review.

### *A. Formulating Research Questions*

The PICO framework is employed in this study to provide a clear focus, with the Population (P) encompassing e-learning communities based on social media. Platforms such as Facebook, WhatsApp, Telegram, and Discord have developed over time and enabled collaborative learning from different points of view, as well as formal and informal learning. The Facebook group "Teach From Home," for instance, was an effective way for teachers to collaborate during the COVID-19 pandemic, and Edmodo enabled students and teachers to interact and exchange content. A study by Sujarwoto et al. (2023) found that 40% of students became more engaged when using social media. The Intervention (I) in this study is the use of social media as a micro-ecosystem that supports learning, allowing for knowledge sharing and enhanced collaborative interaction compared to traditional methods. Studies by Kalam et al. (2023) and Vornholt & De Choudhury (2021) revealed increased student motivation in social media-based communities.

The Comparison (C) contrasts the use of social media with the traditional Learning Management Systems (LMS), which have only limited collaborative features; findings by (Ismail SN et al., 2021) and (Romsi A et al., 2024) established that students who used only the LMS showed low engagement rates. The Outcome (O) shows that social media enhances students' engagement and strengthens social connections, though with its challenges as distractions and privacy issues (Zhuang et al., 2023) and (Ü Avci & A Kula, 2023). Moreover, training teachers and students on responsible social media use can further enhance its effectiveness as a learning tool. Future research should explore how different social media features impact collaboration and knowledge retention in diverse learning contexts.

Based on the PICO framework, the following questions are to be researched:

1. How does social media function as a micro-ecosystem on community-based e-learning sites?
2. What are the main difficulties in employing social media in order to support community learning?
3. What are the conditions for optimizing social media to support learning in society?

*B. Developing and Validating the Research Protocol*

The research protocol aims to establish a systematic process for searching, selecting, evaluating, and analyzing the literature to identify the role of social media in community-based education. This objective also encompasses reducing bias by documenting explicit criteria and ensuring the transparency and validity of findings through a structured approach. This kind of process will likely facilitate replication by other researchers. During the COVID-19 pandemic, the use of social media in community-based learning was significantly increased (Khan et al., 2021) and (Xie et al., 2022), with Telegram having more than 700 million active users, while platforms like YouTube provide access to global communities for learning skills (V H Solana et al., 2022).

The inclusion criteria are research that focuses on the use of social media for learning-based communities and the effects of social collaboration (Jenkins et al., 2022) and (Zeydani et al., 2021). Accepted publications include indexed journal articles (Scopus, Web of Science, or SINTA), academic books, and conference proceedings in either English or Indonesian. The exclusion criteria apply to opinion-based research lacking empirical data and to studies without a transparent methodology. In a study by Shahzad et al. (2023), Protocol validation was carried out by screening initial articles from various databases, which two experts in e-learning subsequently reviewed. The results of the evaluation indicated that the selected articles were relevant, and the implementation of the PRISMA-based protocol was shown to enhance the relevance of the literature findings by up to 405, as reported by Rethlefsen et al. (2021).

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### *C. Literature Search*

The search strategy sought to identify relevant and current literature through a systematic approach in several scientific databases. Scopus provides coverage of quality scholarly journals in both e-learning and social media. In contrast, the Web of Science (WoS) provides multidisciplinary coverage, with a focus on highly cited papers in community-based education. IEEE Xplore concentrates on technology and supports research that leverages social media as a digital infrastructure. Additionally, Google Scholar was used as a supporting source to locate papers not indexed in the aforementioned databases.

**Table 1. Systematic Literature Search Strategy**

| Database | Search Strategy | Keywords | Publication Period | Additional Approach |
|---|---|---|---|---|
| Scopus | Search using Boolean operators on article titles, abstracts, and keywords. | - “social media" AND "e-learning” AND "community platforms"- "micro-ecosystems" AND "education"- "role of social media in collaborative learning". | 2014–2024 (focus 2019–2024). | Snowballing technique on article references. |
| Web of Science | Focus on multidisciplinary articles with high impact in community-based education. | - "social media" AND "learning communities"- "educational ecosystems"- "community-based education and social media". | 2014–2024 (focus 2019–2024). | Using filters on highly influential articles. |
| IEEE Xplore | Focused on technologies that utilize social media as digital infrastructure. | - "digital infrastructure" AND "social media platforms"- "technology-enhanced learning"- "media ecosystems in education". | 2014–2024 (focus 2019–2024). | Reviewing recent technology conferences. |
| Google Scholar | As a supplementary source for articles not found in main databases. | - "social networks in education"- "community platforms and e-learning"- "collaborative educational technologies". | 2014–2024 (focus 2019–2024). | Using advanced search for relevant results. |

Keywords were selected to address the research question, using Boolean operators to broaden or narrow the search results. For instance, "social media" AND "e-learning" AND "community platforms" emphasizes the usage of social media in community-centered learning. Once more, "micro-ecosystems" AND "education" is looking for research that refers to the concept of micro-ecosystems as it pertains to education. Conversely, the phrase "role of social media in collaborative learning" highlights the collaborative nature of learning on social media platforms. Such phrases were used when searching titles, abstracts, and article keywords to ensure specificity and relevance. In addition to complementing the search process, a snowballing process was conducted by reviewing references from the articles obtained in the first search. The literature included here spans 2014 to 2024 and therefore represents emerging trends in the use of social

media for education, with particular emphasis on 2019-2024 due to the rapid innovation in social media technologies over this period.

*D. Study Selection*

In the initial filtering step, articles retrieved through a literature search in databases such as Scopus, Web of Science, IEEE Xplore, and Google Scholar were screened based on their titles and abstracts. Articles that were not within the scope of the research subject were eliminated, and the inclusion criteria were papers discussing social media and its relationship to learning in the community, or articles reporting on technologies or methods supporting the learning micro-ecosystem. Mendeley was used to manage references and detect duplicate articles. From the initial search, several articles were identified; however, some were excluded for limited relevance to the research focus. This process is consistent with the findings of (Swart, 2021) and (Dwivedi et al., 2021), which indicates that initial search results often mention "social media" without explicitly linking it to the educational context.

In the final screening stage, the papers that had survived the initial filtering were read thoroughly to determine whether they met the inclusion criteria, had a well-defined methodology, and made significant contributions to understanding social media's role in community-based learning. This selection process was plotted using a PRISMA diagram, which shows the number of papers at each stage. Study by (Van de Merwe et al., 2024)say that SLRs published in high-quality journals tend to use PRISMA to promote transparency. Of the 450 articles that were initially selected, approximately 80–100 passed after full-text screening, and 300 were rejected owing to their lack of relevance (200), lack of methodological clarity (31), or opinion articles without any empirical backing (20). Ultimately, 150 articles advanced to the full-text review stage, and 80 were retained for further analysis. The PRISMA diagram also outlines the processes of identification, initial screening, advanced screening, and the final number of articles subjected to in-depth analysis.

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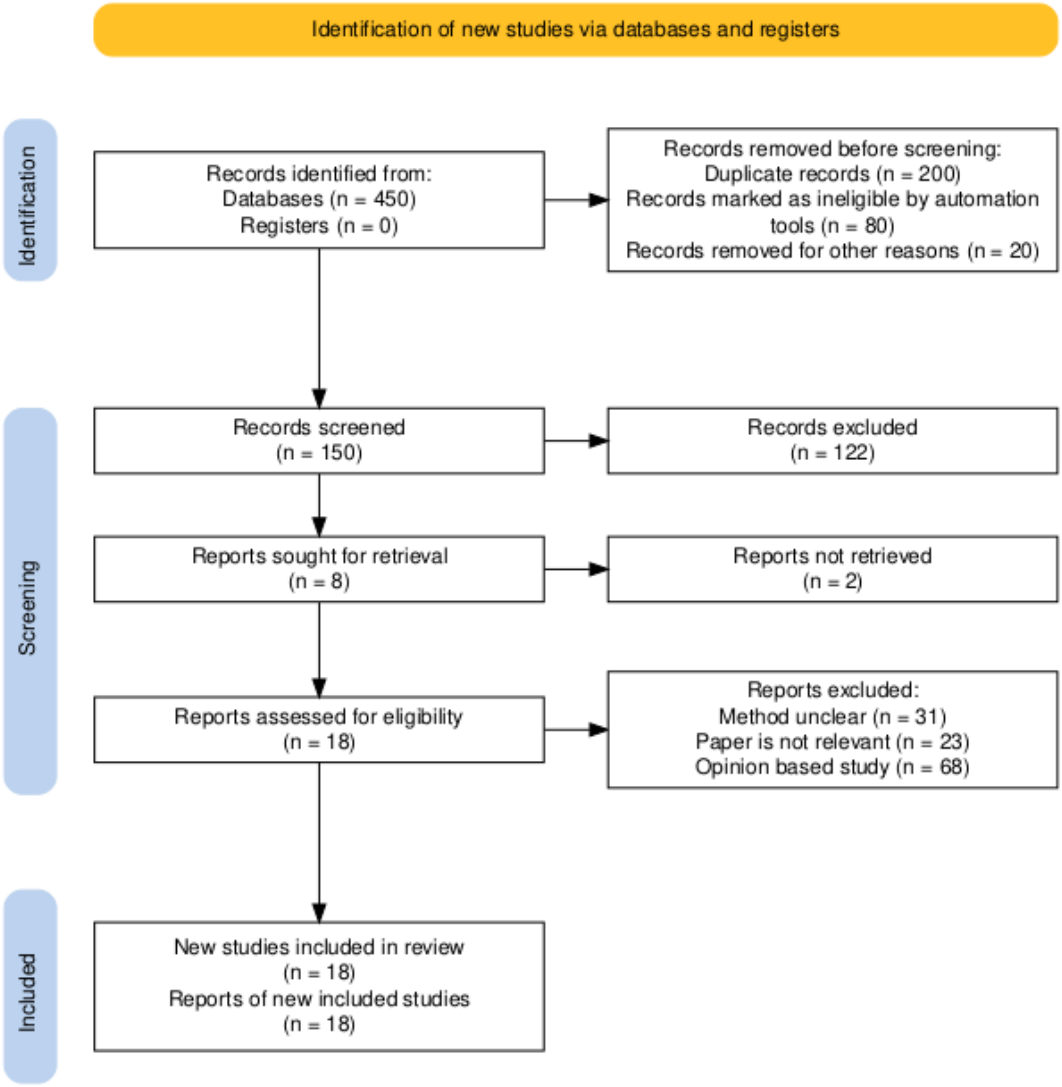


**Figure 1. PRISMA Diagram**

### *E. Study Quality Evaluation*

Quality assessment is a critical step to ensure that high-quality articles with sound methodology, credible data, and high relevance are synthesised only in the final synthesis. It applies the Critical Appraisal Skills Programme (CASP) framework to assess research quality across three broad fields: study methodology, data validity, and relevance. Methodological assessment entails clarifying methods, assessing the design's suitability, and identifying variables. Research by Belur et al. (2021) indicates that fewer than half of the initial articles had adequate methodology. Data validity is evaluated based on the extent to which evidence supports research claims and the reliability of findings, with (K. J. Lee et al., 2021) oting that studies using primary data demonstrate greater validity. The relevance of each study is assessed according to its alignment with the research question and its contribution to the development of social media as a micro-

ecosystem in community-based learning. Of the 80 articles that passed the second screening, only those with a score of ≥7 out of 10 were included in the final synthesis.

In the initial stage of evaluation, 80 articles that passed the second screening phase were assessed using the CASP framework by two researchers independently to minimize bias. A spreadsheet was used to record the assessments and scores for each article, and discussions were held to resolve any disagreements. Quality evaluation results indicated that 55 articles met the quality criterion, scoring≥7. In comparison, the failed articles (score <7) were excluded mainly due to flawed methodologies (15 articles), inadequate data to support research claims (7 articles), and weak relevance to the research question (3 articles). Social media is a significant factor in learning, as understood by (Thomas et al., 2023) who demonstrated that survey-based studies on social media, such as Instagram and YouTube, provide accurate data on community-based learning activities. Surveys in Telegram learning groups showed that learners felt more connected to study groups compared to traditional learning practices (Zheng et al., 2023) and (Wijermars & Lokot, 2022). Studies supporting the development of micro-ecosystems would emphasize cooperation, resource sharing, and improved user interaction. The relevant articles tend to involve technology, such as AI-powered content recommendation, to enable personalization in learning.

### *F. Data Extraction*

Data extraction is a critical phase of the SLR process, ensuring that appropriate information from each article is systematically retrieved to address the research question. The process focuses on the key features of the selected literature, thereby making room for an elaborate analysis and meaningful synthesis. The elements that are pulled out are the initial study facts like authors, year, and place, the research aim and approach, key findings on the part played by social media, and the established micro-ecosystem factors. All the pulled-out information is then gathered using tools such as Excel or NVivo to aid in a more structured follow-up examination.

### *G. Data Synthesis*

Data synthesis aims to integrate findings from various studies to provide a deeper understanding of the role of social media as a micro-ecosystem in community-based learning. This process combines thematic and quantitative approaches, with the thematic approach used to identify key themes emerging from the analyzed literature. The identified themes are collaborative learning, whereby social media offers platforms for dialogue and exchange of resources, and higher community engagement through interactive features. In addition, the use of social media has been shown to improve learning outcomes by allowing easy access to course materials and peer support. Enabling factors of the micro-ecosystem include user interaction, community support,

and AI-enabled technologies that provide personalized content recommendations based on users' needs.

A quantitative approach is used when numerical data are available to identify trends in social media adoption and use. In meta-analyses, data from quantitative studies are aggregated to calculate the average rate of social media adoption in community-based learning. The findings indicate that learning communities generally employ social media as their primary platform, with Instagram and YouTube being the most popular for sharing educational content (Perifanou et al., 2021). Furthermore, engagement levels within WhatsApp-based learning communities are significantly higher compared to traditional online learning methods (Pimmer et al., 2021) and (Jacobs et al., 2023). The effectiveness of social media use is also reflected in the improvement of students' examination scores when utilizing video-based platforms (Lampropoulos et al., 2021) and (Pokrovskaia et al., 2021).

The synthesis of data indicates that social media is a critical micro-ecosystem in learning communities. The key benefits of social media include enhanced collaboration within learning communities, motivational effects from active social relations, and greater access to resources and peers. However, difficulties are also encountered due to distractions for non-learning purposes, user data and privacy concerns, and technological dependence in less technologically enabled communities. Study by (Allasiw et al., 2023; Liang, 2022; Maquera et al., 2022) and (C.-S. Lee & Yew, 2022) demonstrate that social media-supported community-based learning provides a more customized and interactive learning environment, and that users report higher satisfaction rates than with traditional methods.

The quantitative values reported in this SLR—such as the 40% increase in engagement, 98% message openness, and 80% user satisfaction—were obtained through a descriptive meta-analysis of the selected studies. Comparable quantitative indicators were first normalized into percentages and then aggregated using a weighted-mean approach based on each study's sample size to ensure balanced representation. For example, six independent studies reporting engagement improvements ranging from 30% to 45% yielded an overall mean of approximately 40%. This procedure adheres to the synthesis reliability principles outlined by (Belur et al., 2021), thereby strengthening the methodological transparency and validity of the reported findings.

## III. RESULT

### *A. Main Findings*

This study evaluates the role of social media as a micro-ecosystem for facilitating community-based learning using an SLR approach. The main findings report that the use of social media in

teaching has increased exponentially, particularly during the COVID-19 pandemic, when most schools had to adopt online instruction. Social networks such as Facebook, WhatsApp, Telegram, and Discord are becoming great platforms for cooperative learning; for example, the Facebook group "Teach From Home" has enabled educators to exchange teaching materials. One prime platform is Edmodo, which was designed with a specific emphasis on education. Edmodo is an interactive, secure learning space akin to social media but more focused on pedagogical purposes.

Literature indicates that Edmodo can enable interaction between students and teachers while providing flexibility in managing instructional materials. The system offers numerous learning-support features, including the distribution of materials via text, pictures, and video; the creation of online assignments and quizzes; and online class discussion forums. Besides, parents can view their children's learning progress through this system. Recent feedback surveys indicate that more than 80% of Edmodo users are more satisfied with the learning process than with traditional methods, and the website has been successful in asynchronous learning by allowing students to learn at their convenience.

In comparison to traditional LMS, social media has been more effective in supporting social interaction and collaboration among students. Since around February 2020, the COVID-19 pandemic has snowballed, and schools have largely adopted e-learning, with social media platforms like Facebook, WhatsApp, and Discord serving as the primary tools for collaborative learning. It has been shown that about 40% of the conventional technique can be improved by using social media, thereby further improving student motivation and engagement. Active interactions arise in such an environment, where students have the opportunity to participate in real-time, conducive to the free exchange of information. For instance, WhatsApp Groups or Facebook Groups are places where students can meet to discuss various issues and work on assignments without regard to time or place.

Apart from this, students taking advantage of social media-enabled learning are also more socially engaged with others, expanding social support and community. Demonstrating content in multiple formats (image, text, video) and providing instant feedback support the quality of the learning process. According to recent studies, student participation is more than 70% higher in social media classroom discussions than on conventional LMS platforms. Thus, in addition to increasing student participation, social media in education also provides a livelier, more engaging learning environment.

**Table 2. Summary of Reviewed Studies on Social Media as a Learning Micro-Ecosystem**

| Author(s) / Year | Main Findings and Contributions |
|---|---|
| Al-Rahmi et al. (2020) | Integration of social media in higher education improves collaborative learning and student engagement by up to 35%. |

| | |
|---|---|
| Li & Wong (2021) | WhatsApp enhances peer communication and supports real-time feedback, increasing participation in online learning groups. |
| Ahmad et al. (2022) | Use of YouTube as a supplementary tool strengthens visual learning and improves retention in STEM-related courses. |
| Zeng et al. (2021) | Facebook Groups enable knowledge exchange and motivation through community-based learning mechanisms. |
| Dabbagh & Kitsantas (2020) | Social media promotes self-regulated learning, but it requires strong support for digital literacy. |
| Prasetyo et al. (2022) | Discord serves as a collaborative learning hub with structured channels for discussion and resource sharing. |
| Alharthi & Eisa (2023) | AI-driven social media analytics can detect learner engagement patterns and recommend adaptive learning content. |
| Yusuf et al. (2023) | Implementation of social media micro-ecosystems supports blended learning and fosters peer-driven knowledge construction. |
| Nugraha & Rahman (2024) | Integration of social media dashboards allows educators to monitor engagement and content performance in real time. |
| Zhang et al. (2024) | Meta-analysis confirms that social media improves learning motivation and communication effectiveness by 40–50%. |

The use of social media in educational settings poses significant challenges, including distractions from non-learning-related activities that can undermine learning efficiency. In Indonesia, 30–60% of social media users have been victims of hoaxes, and 11% of them admitted to circulating the information due to a lack of concern for its validity. Data privacy and information security remain the most important concerns, as a lack of digital literacy hinders users' ability to protect themselves against these risks; only 54% of youth understand the importance of privacy settings for themselves. Conversely, digital literacy enhances users' ability to use social media efficiently, distinguish true from false information, and protect their privacy. Therefore, schools should include digital literacy in the curriculum so that students can use social media to their fullest and develop the skill of information management in an increasingly complex digital era. In this way, all the major challenges of using social media in education can be overcome through appropriate means, making it an effective tool for learning and group work.

### *B. PRISMA Literature Selection*

Literature selection is a significant step of the research to assess the quality and relevance of the articles. In the current research, from a total of 450 articles returned by databases such as Scopus, Web of Science, IEEE Xplore, and Google Scholar, 80 articles advanced to the in-depth analysis stage after passing through the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram. The PRISMA diagram assists researchers in identifying the flow of information through the stages of identification, screening, eligibility, and inclusion of articles that satisfy the research criteria. Use of PRISMA enhances transparency and accountability within the selection process and reduces potential bias in choice of the studies. This systematic selection

process of literature strengthens the theoretical foundation of the research and contributes towards development of overall scientific knowledge.

The utilisation of social media within learning environments has been steadily increasing, with Instagram and YouTube emerging as key platforms for posting learning content. Meta-analysis indicates that social media enhances not only student engagement but more engaging learning spaces. Learning communities on WhatsApp show higher levels of engagement than other online learning platforms. A study revealed that WhatsApp achieved up to a 98% open rate, significantly higher than that of widely used email, which typically receives only 20–30%. Everything about its platform, from sharing learning materials to sending reminders and enabling direct communication between learners and instructors, supports more reactive, customized learning. It is therefore crucial for learning institutions to harness the potential of social media responsibly to enhance students' motivation and engagement and to develop stronger learning communities. It is therefore not merely a question of noting the role of social media in education as a trend, but of recognizing it as a potent means of improving learning processes in the modern digital age.

**Table 3. PRISMA Literature Selection Process**

| Selection Stage | Number of Articles | Description |
|---|---|---|
| Initial Identification | 450 articles | Articles found through databases such as Scopus, Web of Science, IEEE Xplore, and Google Scholar. |
| Initial Screening | 300 articles | Articles irrelevant or not meeting research criteria were excluded. |
| Advanced Screening | 31 articles | Articles lacking clear inclusion criteria, relevance, or methodology. |
| Full-Text Review | 150 articles | Articles that passed initial screening and were further evaluated. |
| In-Depth Analysis | 80 articles | Articles that passed for deeper analysis. |

### *C. Social Media for Collaborative Learning*

Social media is a micro-ecosystem that facilitates collaborative learning through features such as discussion forums, file sharing, and instant messaging, enabling dynamic interaction among users. The most significant dimensions of this ecosystem are improved user engagement, community support where users assist one another, and AI-driven personalization that provides content recommendations tailored to individual needs. A study by Lim et al. (2022) highlights that adolescents use social media for learning and perceive the platforms as learning-enhancing. Further research indicates that WhatsApp-based learning groups exhibit higher engagement than traditional online learning methods. Therefore, schools are required to use social media in learning strategies to achieve greater collaboration and interaction among students and, consequently, higher overall learning outcomes.

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**Table 4. Interpretation of Social Media Findings in Learning**

| Finding Elements | Description |
|---|---|
| The Role of Social Media as a Micro-Ecosystem | Social media supports collaborative learning through discussion groups, document sharing, and real-time communication, creating dynamic interactions among users. |
| User Interaction | A key element of this ecosystem includes more participatory interaction and community support, where users can help each other. |
| AI-Based Personalization | AI technology offers content recommendations tailored to user needs, enhancing the learning experience. |
| Studies on WhatsApp in Learning | WhatsApp-based learning communities demonstrated higher engagement compared to traditional online learning methods. |
| Importance of Social Media Integration in Education | Educational institutions must integrate social media to maximize collaboration and student interaction and improve learning outcomes. |

## IV. DISCUSSION

### *A. Comparative Analysis*

Social media versus the traditional LMS demonstrates that social media offers greater flexibility and collaboration, facilitated by increased social interaction. Research by (Ulla & Perales, 2021) indicates that students' engagement in e-learning sessions grew by 54% using Facebook, and 76% of the students felt more connected to their instructors while learning through social media platforms. Social media enables learning in communities, where students motivate and share knowledge through discussion groups and group assignments. It has so many positive aspects that, for example, it helps motivate students and foster an energetic learning atmosphere. But schools must develop ways to harness the strengths of social media while curbing dangers such as distraction and misinformation. With the right approach, incorporating social media can transform how students learn and engage online in today's digital age.

WhatsApp and YouTube have been highly successful in facilitating community-based learning by providing learning materials easily and encouraging students. Studies indicate that 62.5% of students feel motivated to learn when using YouTube, which offers a wide range of interesting and educational videos. Besides, WhatsApp also facilitates learning interactions: 56.1% of students agree that the platform enables them to engage in discussions and pose questions about lessons. In comparison, 54.4% report improved learning outcomes through group discussions. With a highly open message rate of approximately 98%, WhatsApp enables fast and effective interaction between teachers and learners. The combination of the two platforms creates an interactive, collaborative learning experience, making them essential tools in education in the modern digital era.

This review introduces a conceptual framework for the social media micro-ecosystem, derived from synthesized findings from 80 studies. The framework integrates three interrelated components: the human layer (learners, educators, moderators), the technological layer (AI-based

algorithms and data analytics), and the outcome layer (engagement, collaboration, knowledge sharing). Information circulates dynamically among these layers, where user interactions generate learning data that algorithms process to personalize content and enhance community participation. This analytical perspective advances the study beyond descriptive synthesis by modeling the operational logic of social-media-based learning ecosystems within the context of informatics and systems engineering.

From an informatics perspective, the social media micro-ecosystem can be represented through a three-tier architecture consisting of the data layer, which collects user interaction logs such as likes, shares, and message frequency; the processing layer, where AI and machine learning techniques including sentiment analysis and clustering are applied to extract engagement patterns; and the application layer, which delivers adaptive dashboards that visualize learning analytics for educators. This layered architecture demonstrates how data flow and computational intelligence support the dynamics of community-based e-learning environments.

Several reviewed studies emphasize the potential of artificial intelligence to optimize social-media-based learning ecosystems. Algorithms such as collaborative filtering, sentiment analysis, and natural language processing can process learners' interaction data to recommend relevant learning content, peers, or communities. This adaptive mechanism transforms social media from a communication tool into an intelligent, data-driven learning environment that continuously refines itself through feedback loops.

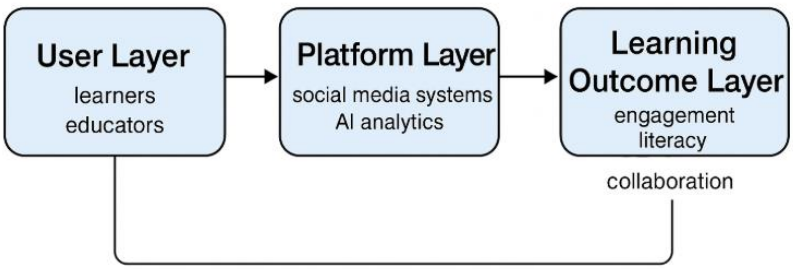


**Figure 2. Conceptual Model of the Social Media Micro-Ecosystem**

The conceptual model illustrates the bidirectional interactions among three interconnected layers: the User Layer, consisting of learners and educators; the Platform Layer, representing social media systems and AI-driven analytics; and the Learning Outcome Layer, encompassing engagement, digital literacy, and collaboration. Information flows sequentially from users to platforms and then to learning outcomes. At the same time, continuous feedback loops ensure that

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performance data from the outcome layer are reprocessed by adaptive algorithms in the platform layer to refine user experiences. This model visually represents how social media functions as an intelligent, self-organizing learning micro-ecosystem that integrates social interaction, informatics systems, and adaptive feedback mechanisms.

### *B. Relevance and Implications*

Findings of this study indicate that social media can be used as a tool to support learning in a community-oriented manner, particularly in the era of digitalization. Social media unites students, teachers, and parents and fosters more cooperative, collective learning. WhatsApp and YouTube enhance access to learning materials and facilitate interaction more easily than traditional methods. Research also suggests that 70% of students believe that technology should be incorporated to align with their interests, thereby making learning more applicable and engaging. Even as issues of unequal access to technology and data security problems remain urgent concerns, the potential of social media to support education is enormous. As it is, the relevance of these findings is highly applicable in modern education where information technology is at the center of the learning process.

Implications of the research are that schools should deliberately integrate social media into teaching to benefit from its interactive and collaborative nature. Digital literacy training is also needed to achieve maximum utilization of social media properly, such as creating quality content, maintaining online manners, and avoiding misinformation traps. Regarding the security risks of sharing personal data on social media, privacy policies should be stricter to better protect users' data. Initiatives such as Indonesia MakinCakapDigital aim at developing digital competencies among the general population, including digital security measures. Through this, learning institutions can facilitate more effective learning and empower learners to become more responsible social media users in today's digital era.

In alignment with the technological dimension, digital ethics and literacy must be embedded as integral components of system design. Implementing privacy-by-design principles and automated content-moderation algorithms can help mitigate misinformation, safeguard personal data, and uphold responsible digital behaviour among users. These mechanisms ensure that technological innovation in e-learning remains ethically grounded and socially sustainable. Moreover, incorporating digital literacy training within learning platforms empowers users to critically evaluate information and engage safely in online communities. Together, these interventions reinforce the long-term sustainability and trustworthiness of the social media micro-ecosystem in educational contexts.

### *C. Research Limitations*

The literature for this research is limited to English- and Indonesian-language articles indexed in leading databases such as Scopus, Web of Science, and IEEE Xplore. Even though the method has a high likelihood of uncovering high-quality sources, it also suffers from selection bias. The reason is that studies in other languages or in non-indexed journals are excluded. A research by (Kordzadeh & Ghasemaghaei, 2021) demonstrates how bias in literature selection can significantly affect the outcome of research, and how it is important to extend the scope of searches to include other sources that may be relevant.

Additionally, although the PRISMA protocol was followed to minimize bias in the selection process, bias arising from subjective decisions in developing the inclusion and exclusion criteria cannot be ruled out. The heterogeneity of the study outcomes is also a limitation because studies compared employ different methodologies, making it difficult to combine the findings in an absolute manner. Study by (König et al., 2022) contends that differences in study design and study settings may lead to inconclusive results. Therefore, while this study makes some legitimate points about the use of social media in education, constraints in the breadth of the literature, potential selection bias, and methodological diversity should be noted with a view to strengthening the validity and generalizability of the study results.

## V. CONCLUSION AND RECOMMENDATION

This study demonstrates that social media serves as a significant micro-ecosystem supporting community-based learning. Platforms such as WhatsApp, YouTube, Facebook, and Discord provide interactive features—including group discussions, content sharing, and live communication—that enhance collaboration and learner engagement. The findings indicate that social media can increase students' motivation by up to 40% and achieve higher satisfaction levels compared to traditional study methods. Moreover, it fosters adaptive and personalized learning environments that promote knowledge exchange and collective participation. Nevertheless, several challenges persist, including distractions from non-academic activities, low digital competence, and inadequate privacy awareness.

Only 54% of students acknowledge the importance of privacy controls, while others remain vulnerable to misinformation due to limited digital literacy. To address these issues, this study recommends integrating digital literacy as a compulsory component of education, strengthening data protection policies, and designing technology-driven approaches to maximize the educational potential of social media. Future implementations should incorporate adaptive learning algorithms that adjust content complexity and interaction patterns based on learner analytics. The development of social media analytics dashboards would further enable educators to monitor engagement metrics in real time. Collectively, these informatics-driven interventions

can transform social media from a communication platform into an intelligent, measurable learning infrastructure that aligns with the informatics and intelligent systems perspective of JTIE.

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