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Effectiveness of E-Learning Media in Asynchronous Learning: A Case Study in Higher Education

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ABSTRACT

Asynchronous learning is important to worldwide higher education's digital transition. Despite extensive technology usage, issues about asynchronous learning media quality and pedagogy persist. Most studies have used the participants' final exam scores to evaluate the effectiveness of asynchronous learning. Consequently, this study seeks to evaluate the efficacy of e-learning media in facilitating asynchronous learning within the Officer Cadet Advancement Training Program (CATP or PASIS) at the higher education level. The primary focus of the research is to identify the level of participant engagement, their perceptions of the effectiveness of e-learning media, and the challenges faced by both participants and facilitators during the learning process. This research employs a mixed-methods approach, combining quantitative data collected through questionnaires administered to 47 respondents at Poltekpel Barombong and qualitative data gathered through in-depth interviews with participants, instructors, and e-learning administrators. The findings indicated that most participants regularly access the platform, complete assignments on time, and feel comfortable with self-directed learning. However, forum participation and learning motivation vary, especially among e-learning novices. While most respondents say e-learning media helps them understand the topic, they still need direct instruction, especially for technical content. Internet instability, lack of two-way communication, and participant digital incompetence are the key issues. Improved material quality, facilitator training, and solid support mechanisms improve e-learning deployment.

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1. INTRODUCTION

Information and communication technology has changed schooling. Technology-based e-learning has expanded rapidly and offers several advantages over traditional learning techniques (Liu & Yu, 2023). The ability to study anytime and anywhere is improved by e-learning, according to Du et al. (2022). Professional education relies on time and place flexibility to boost participation and learning.

Asynchronous learning, where students can access materials remotely, is ideal for these demands (Muzaini et al., 2021; Moorhouse & Wong, 2022; Schreiber, 2022). Kim and Kim (2021) found that asynchronous learning increases flexibility and lets students study at their speed and style. Thus, this study examines the efficacy of e-learning media in asynchronous learning at higher education, in the Cadet Officers' Competency Improvement Training Program. Technology-based learning methods are replacing traditional ones worldwide. To effectively offer material in the digital age, educational institutions must adapt to technology (Alenezi, 2023; Pramesworo et al., 2023). Cahyadi and Mirianto (2023) state that e-learning media in maritime education institutes like Poltekpel enhances accessibility and student learning.

With the rise of e-learning, asynchronous learning has become essential to modern education. It works because of numerous learning theories, notably Knowles' Self-Directed Learning Theory, which stresses learners' autonomy in planning, managing, and evaluating their learning (Servant-Miklos & Noordegraaf-Eelens, 2021). Zsifkovits et al. (2025) found that well-designed asynchronous learning motivates and increases learning. Moore's Transactional Distance Theory emphasizes the necessity of interactive elements in bridging learners' and instructors' physical and psychological distances (Abuhassna & Alnawajha, 2023). Knowles's andragogy theory emphasizes relevance, experience-based learning, and problem-solving, which is important for adult learners (Loeng, 2018).

Planning, material provision, delivery, monitoring, and evaluation are common steps in asynchronous learning (Bixler et al., 2021; Fadhilah et al., 2021; Drumm, 2025). Planning includes setting learning goals, creating multimedia content, and choosing an accessible platform. Learners work at their own pace with facilitator feedback during delivery. Platform analytics maintain engagement, while evaluations, surveys, and learner reflection evaluate learning goals and identify areas for improvement.

Asynchronous learning has benefits. These include time and location flexibility, extensive digital resource accessibility, learner independence, cost-effectiveness by minimizing physical infrastructure needs, and individualized, self-paced learning (Metz & Metz, 2022; Hung et al., 2024). These benefits are especially useful for students with various schedules or geographical constraints. These features make asynchronous learning ideal for professional training programs like Poltekpel Barombong's Cadet Officers' Competency Improvement Training Program. However, the model has drawbacks. Lack of direct interaction may lower student motivation and emotional involvement. Technology infrastructure is crucial to its success, which might be difficult in resource-poor locations. Low-self-regulation students may procrastinate without direct supervision. For hands-on, practical teaching that demands immediate feedback and presence, asynchronous formats may be less effective. Finally, facilitator-learner psychological distance might hinder communication and community. Asynchronous learning is versatile, cost-effective, and promising for professional and maritime education (Ghilay, 2024). Institutions can improve their effectiveness by combining theoretical viewpoints, following organized implementation stages, and balancing strengths and weaknesses.

E-learning can incorporate movies, music, and interactive simulations to help students understand complicated subjects (Xianxiao, 2024; Zheng, 2024). In marine education, students must understand technical and practical aspects. Thus, e-learning at Poltekpel Barombong improves learning quality and accessibility by making it more participatory and engaging.

Poltekpel Barombong is a higher education institution in Indonesia specializing in marine education. This institution is vital in cultivating proficient human resources in the domains of shipping and fishing. The Cadet Officers' Competency Improvement Training Program is a premier initiative designed to augment the proficiency and capabilities of cadet officers. Data from the Ministry of Transportation (2023) indicates that Poltekpel Barombong generates graduates who are employment-ready and possess internationally recognized certificates.

The Cadet Officers' Competency Improvement Training Program at Poltekpel Barombong aims to deliver specialized and rigorous training for aspiring cadet officers. In this setting, e-learning media can function as an efficient instrument to facilitate the learning process (Neffati et al., 2021; Steculła & Wolniak, 2022). Through the application of technology, Poltekpel can surmount constraints associated with in-person training, including time restrictions and a finite number of instructors. Despite Poltekpel Barombong's esteemed status in maritime education, obstacles persist in the execution of traditional learning methods. A significant difficulty is the restricted time allotted for training participants, frequently limited by sailing schedules or other commitments. Abid et al. (2024) assert that the utilization of e-learning media can alleviate time constraints, enabling participants to engage in more flexible learning.

Moreover, the deficiency of instructional personnel is an additional challenge in the execution of training. Poltekpel Barombong can optimize the utilization of available teaching resources through the implementation of e-learning media. Instructors with specialized skills can provide learning materials without constraints on time and location. This will enhance the quality of education and offer an improved learning experience for training participants.

While e-learning media has numerous benefits, there are possible obstacles in the implementation of technology-driven asynchronous learning (Sharma et al., 2024). A significant problem is the absence of direct engagement between students and educators. Li and Xue (2023) assert that direct interaction is a crucial component of the learning process, impacting learners' motivation and engagement. In asynchronous learning, participants may experience isolation and diminished motivation to engage actively (Ratan et al., 2022; Rosen & Kelly, 2023). Technological obstacles present considerable difficulties. Unreliable internet connections and insufficient gadgets can obstruct learners' access to educational resources. Research by Yaqin et al. (2023), Halim and Hidayat (2025) indicates the persistence of a digital divide in Indonesia that may impact the efficacy of e-learning. Consequently, it is crucial to recognize and resolve these challenges to guarantee the efficient operation of asynchronous learning.

This study's significance within the Cadet Officers' Competency Improvement Training Program pertains to the necessity of evaluating e-learning efficiency. Focused

and rigorous training is essential for providing cadet officers with sufficient knowledge and abilities. Hadullo et al. (2018), and Phanphech et al. (2022) assert that a comprehensive understanding of the determinants influencing the success or failure of asynchronous learning can enable program managers to develop more effective training initiatives.

A key consideration is the degree of participant involvement. Insufficient engagement may lead to inadequate learning outcomes. This study seeks to investigate the elements that affect participants' involvement in asynchronous learning through the e-learning medium. Comprehending these characteristics enables the formulation of effective tactics to augment motivation and involvement in the learning process.

Asynchronous learning has become a key pillar in the digital transformation of global higher education (Mhlanga et al., 2022; Matsieli & Mutula, 2024). Despite widespread adoption of the technology, debates regarding the quality and pedagogical effectiveness of the media used in asynchronous learning remain relevant (Moorhouse & Wong, 2022; Zeng & Luo, 2024). Most previous research measures asynchronous effectiveness through participation metrics or standardized final exam scores. This study fills this gap by moving beyond comparing platforms or delivery modes (synchronous vs. asynchronous) and focusing on the internal differentiation of the media. Specifically, the study compares two emerging approaches to asynchronous content media design: Video Microlearning Interactive (VMI) and Module-Based Adaptive Gamification (MBGA). This comparison is significant because it tests the hypothesis that the psychopedagogical design of the media (interactivity and adaptability) is more crucial to asynchronous learning outcomes than simply the delivery format (visual or text).

This research is expected to make a significant contribution to understanding the effectiveness of technology-based learning in professional education environments. By analyzing the use of e-learning media in the context of the Cadet Officers' Competency Improvement Training Program, it is expected that patterns can be identified that can be applied in other educational institutions.

From a practical standpoint, this research can provide useful recommendations for Poltekpel administrators in improving the quality of asynchronous learning. By understanding the factors that affect the effectiveness of e-learning, administrators can design programs that better suit participants' needs. In addition, this study can offer insights into ways to enhance cadet officers' competencies through more interactive and engaging learning. The impact of this research is expected not only to improve learning quality but also to contribute to enhancing the competence and competitiveness of Poltekpel Barombong graduates in the job market.

Thus, this study has broad implications for the development of maritime education in Indonesia. By focusing on the context of the Cadet Officers' Competency Improvement Training Program at Poltekpel Barombong, the research aims to analyze participants' perceptions of the e-learning media used in learning. According to Yildiz Durak (2025), understanding participants' perceptions is crucial in designing more effective learning programs. Moreover, this study also aims to compare the effectiveness of asynchronous and synchronous learning in the context of training at Poltekpel

Barombong. By conducting this comparison, it is expected that the advantages and disadvantages of each method can be identified, enabling administrators to make informed decisions in designing future learning programs.

2. METHOD

This study employs a qualitative research approach with a case study design as outlined by Creswell, focusing on the implementation of asynchronous learning in the Cadet Officers' Competency Improvement Training Program at higher education. The research will examine how asynchronous learning is conducted, as well as the experiences of both participants and program administrators in applying this method. The study examines the dynamics of implementation, challenges encountered, and solutions adopted to ensure learning effectiveness. The research objects are the training participants (Pasis) and the training managers, allowing for a holistic understanding of the phenomenon in its real context. The research was conducted at Poltekpel Barombong, Makassar, South Sulawesi. This location was chosen due to its relevance to the research topic, as the institution actively implements e-learning for asynchronous training in maritime education. The study period covered both online and asynchronous learning phases to provide a comprehensive view of the program's implementation. The following presents a qualitative research approach with a case study design in Figure 1 by Yin (2018).

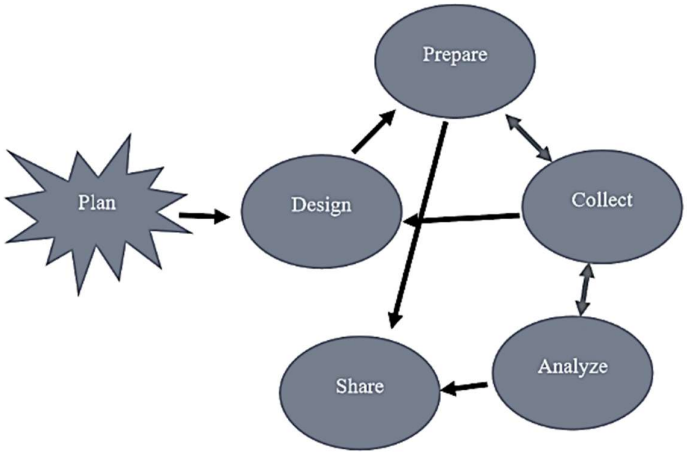

Figure 1. A Case Study Design

Data were collected through three primary techniques: in-depth interviews to gather perceptions, experiences, and challenges from participants, instructors, and e-learning administrators; observations to capture the interaction processes between learners and the e-learning system; and documentation analysis of teaching materials, online resources, and related reports. Data analysis followed the Miles and Huberman interactive model, consisting of data collection, data condensation, data display, and conclusion drawing/verification. Triangulation—covering sources, techniques, and

timing—was applied to ensure data credibility, supported by reference materials such as evaluation reports, institutional policies, and prior research.

3. RESULTS AND DISCUSSION

Results

This study seeks to evaluate the efficacy of e-learning media in facilitating asynchronous learning within the Officer Cadet Advancement Training Program (CATP or PASIS) at the higher education level. We present the research results using a case study model below.

Table 1. Level of Participant Engagement in the Asynchronous Learning Process Using E-Learning Media

No	Participant Engagement Indicator	Percentage Agree + Strongly Agree	Neutral Percentage	Percentage Disagree + Strongly Disagree
1	Regularly Accessing the E-Learning Platform	44.6%	21.3%	34.0%
2	Active Participation in Forums/Assignments	48.9%	10.6%	40.4%
3	Motivated for Independent Learning	40.4%	23.4%	36.1%

The analysis results in Table 1 indicated that the level of participant engagement in the asynchronous learning process using e-learning media is as follows:

1. Nearly half of the participants regularly access the platform; the remaining one-third have yet to develop consistent habits. Hindering factors include low discipline, technical difficulties, and lack of reminders.
2. Almost half of the participants actively participate; lower participation is due to low motivation, unfamiliarity with online discussions, and minimal facilitator interaction.
3. Some participants have strong self-learning motivation; others are doubtful or unmotivated due to lack of social support, difficulty understanding materials, and inexperience with independent learning.

Table 2. Participant Engagement in the Asynchronous Learning Process Using E-Learning Media

No	Participant Engagement Indicator	Percentage Agree + Strongly Agree	Neutral Percentage	Percentage Disagree + Strongly Disagree
1	Completing Tasks/Quizzes on Time	59.5%	17.0%	23.4%
2	Comfortable Learning via the Asynchronous Method	51.1%	25.5%	23.4%

The findings in Table 2 indicated that the participant engagement in the asynchronous learning process using e-learning media is as follows:

1. The majority are disciplined in completing tasks on time; a small portion are inconsistent due to poor time management, heavy workload, or technical difficulties.
2. More than half feel comfortable; some remain uncertain or uncomfortable due to difficulties managing time, lack of social interaction, or limited understanding without direct guidance.

Most participants demonstrated positive engagement in asynchronous learning through e-learning, particularly in platform access, timely task completion, and comfort learning. However, challenges remain in the areas of self-learning motivation and forum participation, which require strengthening strategies such as enhancing facilitator interaction, designing more engaging materials, providing technical support, and establishing a more structured learning schedule.

Table 3. Summary of Participants' Perceptions of Asynchronous Learning Based on E-Learning

Perception Dimension	Key Indicators Measured	Majority of Participants' Perceptions
Flexibility	Adaptive learning time, ability to set one's own pace.	Very Positive (Flexibility of time and location is a major advantage, facilitating integration with other schedules).
Accessibility & Resources	Ease of access to materials, availability of additional learning resources.	Positive (Material can be accessed repeatedly and from anywhere, supporting self-paced learning).
Social Engagement & Interaction	Opportunities to interact with fellow participants/instructors, feelings of isolation.	Somewhat Negative (Perceived lack of spontaneous social interaction and immediate feedback; potential feelings of isolation).
Learning Quality	Depth of understanding, relevance of material, and learning effectiveness.	Neutral to Positive (Helps with reflection because it allows more time to process information before responding).
Technical Challenges & Skills	Internet connection issues, platform usability, and digital skills.	Varied (Participants with advanced digital skills found it easy, but internet connection issues and platform familiarity presented challenges for others).
Self-Management (Discipline)	The need to manage motivation and self-discipline without close supervision.	Somewhat Negative (Requires a very high level of discipline and self-motivation; prone to procrastination).

The table above organizes the findings into five key dimensions commonly highlighted in asynchronous e-learning studies:

1. Flexibility: Always a key selling point; participants appreciate the ability to learn without the constraints of time and space.
2. Accessibility: Easy access to materials (recordings, modules, etc.) as needed.
3. Social Interaction: A common drawback of asynchronous learning due to the lack of co-presence, which can lead to isolation or a decrease in collaboration.

4. Learning Quality: Often considered effective for in-depth reflection, as participants have time to formulate more mature answers.
5. Challenges: Include both technical issues (internet) and pedagogical issues (the need for strong self-discipline).

Discussion

The effectiveness of e-learning media in asynchronous learning within the Cadet Officers' Competency Improvement Training Program at Poltekpel Barombong shows that this approach is increasingly recognized as a relevant and adaptive method for modern maritime education. This non-face-to-face learning system provides participants with the flexibility to manage their study schedules. Most cadet officers indicated that time flexibility and access to materials are the main advantages of e-learning. Digital learning resources, such as modules, instructional videos, and quizzes, enable participants to adjust their learning pace and revisit materials as needed. However, the implementation has not been without challenges. Questionnaire and interview results reveal that not all participants are motivated to engage in self-directed learning. Some still struggle to understand technical or practical content without direct guidance from facilitators. Technical constraints, including unstable internet connections and limited device availability, also hinder access to the e-learning platform, while participation levels in discussion forums and task completion vary according to individual discipline and study habits.

The role of facilitators in an asynchronous e-learning system is therefore critical. Participants reported that facilitator support—such as clear scheduling, timely feedback on assignments, and ongoing guidance—helps maintain learning momentum and motivation. Interviewees suggested that facilitators should take a more proactive approach by providing regular evaluations and direction, ensuring that online learning stays on track. From the perspective of e-learning managers and instructors, there is a need for a more adaptive and responsive system. Recommendations include enhancing the platform with analytics to track learning progress, integrating interactive features, and providing digital pedagogy training for instructors. A more personalized and integrated system would allow participants to learn on their own while still following a set plan, which would make them better at their jobs as maritime officers.

The research results indicate that flexibility in time and place is the most highly perceived dimension of effectiveness among students. This finding is consistent with the fundamental tenets of asynchronous learning, wherein the distinction between instructional and learning periods enables students to control their learning velocity (Danaher & Danaher, 2019; Varkey et al., 2023; Zeng & Luo, 2024). E-learning media (e.g., a Learning Management System/LMS) effectively functions as a material repository, discussion forum, and assignment submission mechanism, facilitating self-regulated learning. This effectiveness aligns with Moore's theory of Transactional Distance, which emphasizes the importance of structure and dialogue; in this case, a strong structure within the LMS allows students to overcome the transactional distance (Roach, & Attardi, 2022; Özbey & Kayri, 2023; Xiao, 2025).

Questionnaire results indicate that students with high digital literacy levels (measured by their ability to navigate LMS features) have significantly more positive perceptions of learning effectiveness than students with low digital literacy. Furthermore, internet infrastructure issues were identified as a major barrier to effectiveness. These findings confirm the research hypothesis that the success of asynchronous e-learning depends not only on content design but also on external factors and individual readiness. Higher education institutions should ensure digital literacy programs for new students and provide responsive technical support, in line with the research recommendations of Raviolo et al. (2021) regarding the e-tutor support model.

Overall, e-learning has proven effective as a tool for content delivery and assignment management. However, for asynchronous learning to be truly effective, the focus must shift from simply transmitting information to creating a learning environment that supports planned interaction and collaboration. The pedagogical implication of this case study is the need for a more adaptive blended learning model, where occasional synchronous meetings are held to facilitate missing social interactions, while material is delivered asynchronously to maintain flexibility. This will help enhance students' sense of belonging and reduce feelings of isolation.

The effectiveness of e-learning media in asynchronous learning at Poltekpel Barombong can be considered satisfactory, but further adjustments and improvements are required. Success depends not only on technological provision but also on adopting a human-centered and participatory learning approach. These findings align with constructivist theory, which emphasizes active learner engagement in building knowledge through flexible learning experiences (Alt, 2017; Kalamas Hedden et al., 2017; Fructuoso et al., 2022), as well as with the Community of Inquiry Framework (Al Abri et al., 2024), which stresses balanced cognitive, social, and teaching presence in online learning. Research also highlights the importance of system quality, service quality, and information quality (Al-Fraihat et al., 2020) alongside formative evaluation and continuous technical support. Moving forward, the development of e-learning should address pedagogical, psychological, and technical aspects in a holistic manner. With a more integrated and participatory approach, e-learning has strong potential to serve as an effective medium for building the professional competencies of maritime cadet officers in response to the demands of the digital era.

4. CONCLUSION

The level of participant engagement in the asynchronous learning process using e-learning media falls into the “fairly active” category, with most participants demonstrating positive habits such as regularly accessing the platform, completing assignments on time, and feeling comfortable with the flexibility of self-directed learning. However, engagement in discussion forums and learning motivation varied, depending on individual discipline and facilitator support. Asynchronous learning based on e-learning media is considered to have the potential to improve participants’ learning outcomes compared to traditional methods, particularly because it offers more flexible access, repeatable materials, and various media formats. However, the quality of

instructional design, the presence of active facilitators, and participants' readiness to manage the self-learning process significantly influence its effectiveness. Participants' perceptions of the effectiveness of e-learning media are generally positive, especially regarding flexibility, access to materials, and the availability of features such as videos, modules, and quizzes. Additionally, some participants still question its effectiveness as a full replacement for face-to-face methods, emphasizing the importance of interaction, motivation, and emotional support from facilitators. Therefore, there is significant potential to further develop e-learning media as an effective learning approach.

The effectiveness of e-learning media in asynchronous learning in higher education is dual: it offers advantages in flexibility but is vulnerable to reduced social interaction. A key recommendation is to integrate pedagogical strategies that focus on active dialogue and strengthen students' digital literacy to optimize e-learning performance.

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