



DEVELOPING EFFECTIVE ESP LEARNING MATERIALS USING A LEARNING MANAGEMENT SYSTEM IN TERTIARY EDUCATION

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APA Citation: Manan, N. A., & Badroeni. (2025). Developing effective ESP learning materials using a learning management system in tertiary education. *English Review: Journal of English Education*, 13(2), 435-446. <https://doi.org/10.25134/erjee.13i2.11818>

Received: 21-02-2024

Accepted: 23-04-2024

Published: 30-06-2025

Abstract: This study aimed to conduct a needs analysis for developing an English for Specific Purposes (ESP) teaching model at Muhammadiyah Kuningan College of Teacher Training and Education in West Java, Indonesia. The research involved 104 students enrolled in the Information and Communication Technology Education program, aged between 19 and 21 years. Additionally, six lecturers, holding master's degrees in Information Technology and possessing teaching experience ranging from three to ten years, participated in the study. Data from students were gathered through a multiple-choice questionnaire administered via the Ruangmu Learning Management System (LMS), focusing on three key areas: prerequisites, challenges, and educational aspirations. The feasibility of the LMS-based ESP model was also assessed using a validated instrument endorsed by experts. Results highlighted the importance of a detailed needs analysis in identifying knowledge gaps, forming the basis for developing an effective teaching model. A gap analysis helped bridge the disparity between current and required competencies. Pre-test scores revealed averages of 59.32, with the median, lowest, and highest scores being 60, 30, and 80, respectively. A clear improvement was observed in post-test results, indicating that the Ruangmu LMS had a positive impact on students' learning outcomes. The paired sample test further validated this enhancement, showing a statistically significant improvement with a two-tailed significance value of 0.00. In conclusion, the findings suggest that the Ruangmu LMS plays a critical role in improving student outcomes in English for Specific Purposes (ESP).

Keywords: *ESP teaching model; Ruangmu LMS; needs analysis; gap analysis; student learning outcomes, ICT education, learning management system, educational improvement.*

INTRODUCTION

English for Specific Purposes (ESP) has emerged as a vital component in tertiary education, addressing the unique linguistic and professional needs of students. ESP courses are tailored to meet specific communication skills within fields such as engineering, business, and health sciences (Irudayasamy, Souidi, & Hankins, 2020; Hartina & Syahrir, 2021; Jamali & Krish, 2021). The challenge lies in adapting these materials for optimal relevance and engagement, requiring educators to develop content that is contextually appropriate (Hélder, 2017; Moroz, 2020; Bielousova, 2020). Recent studies also highlight the shift towards digital learning, especially in the post-pandemic era (Suherman & Kertawijaya, 2023; Hidayati et al., 2023; Rauf, Rajab & Nashruddin, 2023).

Integrating technology into ESP learning

materials has become more prevalent, driven by platforms like Moodle and other Learning Management Systems (LMS) (Arifin, Eryani, & Farahtika, 2023; Xu, Chan, & Yilin, 2020; Truong, 2021). Learning Management Systems (LMS) are designed to facilitate online learning through enhanced interactivity, collaboration tools, and multimedia content (Akhmedova & Rahmatova, 2024; Alkinani & Alzahrani, 2021; Elfeky & Elbyaly, 2023). Some LMSs now incorporate artificial intelligence (AI) to further personalize learning experiences (Ayotunde, Jamil, & Cavus, 2023; Khonturaev et al., 2023; Firat, 2023).

Research indicates that LMS platforms significantly enhance students' satisfaction and learning outcomes by enabling access to a variety of learning resources (Elfeky & Elbyaly, 2023; Khojasteh et al., 2023; Wichanpricha, 2021). AI-

powered systems embedded in LMSs help tailor learning experiences by addressing students' individual needs (Fırat, 2023; Saadati, Zeki & Vatankhah Barenji, 2023; Hakimi et al., 2024). Such personalized learning experiences are particularly beneficial for ESP students as they target niche subject areas with specific skill requirements (Rafiq, Hashim, & Yunus, 2021; Mostafavi, Mohseni & Abbasian, 2021; Rodríguez-Peñarroja, 2022).

Implementing LMS in ESP courses has become crucial to overcoming traditional classroom limitations. Studies emphasize the importance of digital platforms, such as Moodle and Microsoft Teams, in supporting collaborative and synchronous learning (Alkinani & Alzahrani, 2021; Truong, 2021; Rauf et al., 2023). These tools also promote project-based learning, encouraging self-directed learning (Mulyadi et al., 2023; Petraki & Khat, 2022; Rodríguez-Peñarroja, 2022).

While research in LMS-enhanced ESP is extensive, several gaps remain. Few studies have explored the long-term impact of AI-integrated LMS systems on learning outcomes in specific ESP contexts (Khonturaev et al., 2023; Ayotunde et al., 2023; Saadati et al., 2023). Additionally, the use of blockchain technology for ESP material delivery and self-regulation remains underexplored (Saadati et al., 2023; Hakimi et al., 2024; Guoyan et al., 2023).

A successful ESP program requires understanding and aligning with students' professional needs. Needs analysis is essential for developing targeted ESP materials (Chiu et al., 2023; Pranoto & Suprayogi, 2020; Zahednejad et al., 2021). Customized LMS modules ensure that learning is not only engaging but also aligned with career aspirations (Hoesny et al. 2020; Kusumawati & Sari, 2019; Moroz, 2020).

Despite the benefits, several challenges hinder the development of effective ESP learning materials. Constraints such as limited teacher training, insufficient technological infrastructure, and resistance to new methodologies remain significant barriers (Kakoulli-Constantinou & Papadima-Sophocleous, 2020; Petraki & Khat, 2022; Suherman & Kertawijaya, 2023). Addressing these challenges is imperative for ensuring that ESP courses remain relevant and effective.

Innovative approaches such as flipped classrooms and blended learning models are gaining traction in ESP classrooms. These models encourage students to engage with course content actively and promote lifelong learning habits (Hsiao, Hung & Huang, 2023; Dhivya, Hariharasudan & Nawaz, 2023; Syakur et al., 2020).

Integrating multimedia elements into LMS platforms further enhances engagement and learning efficiency (Raharjo et al., 2020; Rodríguez-Peñarroja, 2022; Dhivya et al., 2023).

Student feedback plays a crucial role in assessing the effectiveness of ESP materials and LMS platforms. Surveys suggest that students appreciate the flexibility and accessibility provided by LMS-based learning, but they also highlight areas for improvement (Arifin et al., 2023; Gaffas, 2023; Khojasteh et al., 2023). Continuous feedback loops are essential for refining course content and delivery methods.

Teachers are central to the success of LMS-based ESP programs. Effective teacher training and support systems are needed to ensure smooth integration of digital tools in classrooms (Iswati, 2021; Kakoulli-Constantinou & Papadima-Sophocleous, 2020; Suherman & Kertawijaya, 2023). Teachers also need to adopt new pedagogical strategies to meet the evolving needs of students (Hartina & Syahrir, 2021; Jamali & Krish, 2021; Khalil & Semono-Eke, 2020).

The COVID-19 pandemic accelerated the adoption of LMS platforms in tertiary education, including ESP courses. This shift has brought about both challenges and opportunities for educators and students (Guoyan et al., 2023; Khojasteh et al., 2023; Hakimi et al., 2024). Blended and hybrid learning models have become the new norm, requiring continuous adaptation and innovation (Elfeky & Elbyaly, 2023; Suherman & Kertawijaya, 2023; Wichanpricha, 2021).

Developing effective ESP learning materials through LMS platforms holds immense potential for improving learning outcomes and meeting students' professional goals. However, continuous research and innovation are needed to address existing gaps and challenges. Future studies should focus on integrating emerging technologies such as AI and blockchain to further enhance the effectiveness of ESP courses (Ayotunde et al., 2023; Khonturaev et al., 2023; Saadati et al., 2023).

METHOD

This study utilized a mixed-method approach to gather and analyze data on the effectiveness of ESP learning materials using a Learning Management System (LMS). Participants included 104 students enrolled in the Information and Communication Technology Education program at Muhammadiyah Kuningan College and six lecturers with master's degrees in Information Technology (Rauf et al., 2023; Elfeky & Elbyaly, 2023; Arifin et al., 2023).

The students aged between 19 and 21 years used the Ruangmu LMS to provide responses to structured questionnaires. The six lecturers participating in the study had three to ten years of teaching experience. Their expertise in Information Technology was critical for validating the ESP model (Guoyan et al., 2023; Khojasteh et al., 2023).

The students' responses were collected using a multiple-choice questionnaire delivered through the Ruangmu LMS. The questionnaire explored students' needs, current deficiencies in learning, and desired outcomes, ensuring alignment with the study's objectives (Alkinani & Alzahrani, 2021; Hsiao et al., 2023). Additionally, a validation sheet was employed to assess the viability and effectiveness of the LMS-based ESP model from the lecturers' perspectives.

The validation sheet provided data on the model's validity, including ratings, comments, and suggestions from the lecturers. Qualitative assessments of these comments informed revisions to the generated ESP product. Descriptive statistical methods were employed to calculate average scores for each aspect evaluated by the validators. The data were classified into five categories, following Widodo's (2016) classification approach for subjective assessment (Elfeky & Elbyaly, 2023; Saadati et al., 2023).

To analyze the differences in students' performance before and after the implementation of the LMS-based ESP materials, a paired t-test was employed. This parametric test allowed the comparison of two related datasets—pre- and post-intervention results—assuming that the data scales for both sets were quantitative (Jamali & Krish, 2021; Firat, 2023).

The paired t-test evaluates whether there is a significant difference in the average values of two sets of related data, typically obtained from the same individuals under different conditions. This method is appropriate for dependent data and reflects differences across pre- and post-intervention phases (Rafiq et al., 2021; Ayotunde et al., 2023).

The combination of descriptive analysis and a paired t-test ensures a comprehensive evaluation of the effectiveness of LMS-enhanced ESP materials. Expert validation through qualitative feedback

further strengthens the study's findings, helping refine the ESP model for broader implementation (Arifin et al., 2023; Elfeky & Elbyaly, 2023).

RESULTS AND DISCUSSION

This phase involves identifying all relevant elements that need consideration during the course design process, such as student characteristics, their prior knowledge, and the accessibility of resources. The tool's main purpose was to conduct a needs analysis, pinpoint challenges, and perform a task analysis tailored specifically for ESP courses.

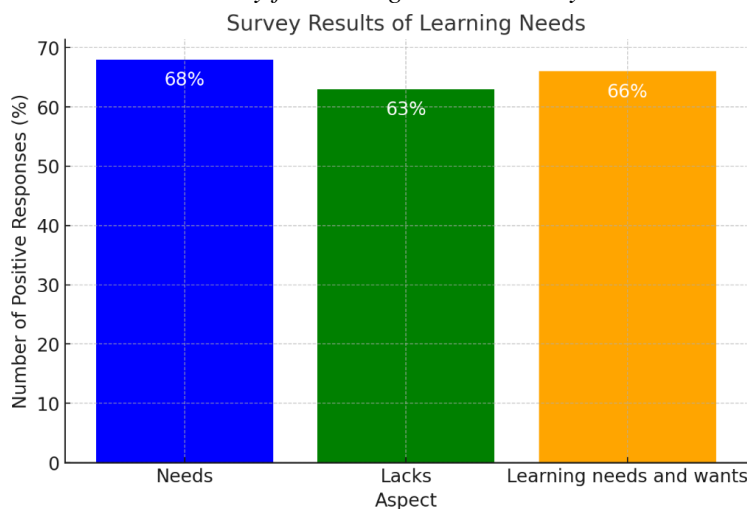
Characteristics of students

Among the students enrolled in the Information and Communication Technology Education program at Muhammadiyah Kuningan College of Teacher Training and Education, two individuals stood out with the highest GPA of 4.00 and the lowest GPA of 1.65. Out of a total of 104 students, only 5 students have a GPA below 3.00. Additionally, the amount of time students spend reading books daily varies considerably. Research shows that 40% of the students dedicate more than one hour each day to reading, making this the largest group. In comparison, 38% read for exactly one hour, while 22% spend less than one hour per day on reading activities.

Needs analysis

The needs analysis identifies three critical aspects of students' interest in English classes: needs, deficiencies, and learning preferences and requirements. The students' initial skills and specific needs significantly influence their success in mastering English-related subjects. Their ability to develop effective instructional models for teaching English is assessed by analyzing the number of responses, percentages, and priority rankings of their choices, as outlined in Table 1. Among the 20 students surveyed, 68% agreed on the importance of needs, 63% acknowledged deficiencies, and 66% responded positively to learning needs and preferences. This data underscores the importance of tailoring instructional models to address students' unique learning needs and gaps effectively.

Table 1. Priority for making instruments by lecturers



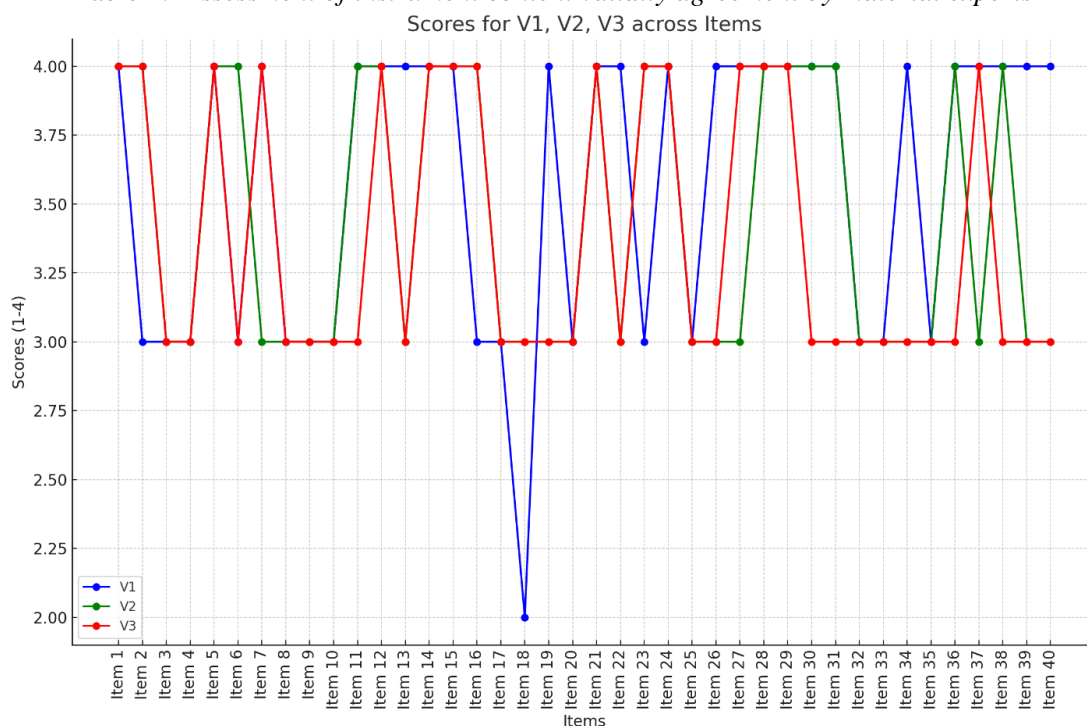
The statistics gathered on the student's responses indicate that their primary aspiration in terms of needs is to engage in superior and more effective online English learning. Regarding deficiencies, pupils possess the ability to infer the meaning of unfamiliar terminology within the text. From the perspective of learning needs and desires, it is necessary for them to collaborate in small groups to enhance efficiency when working on tasks given by their professors.

validation process including three learning experts. These experts were separated into two groups: three material experts and three media experts. The experts included a teaching expert, a learning media expert, and a learning evaluation and assessment expert. The validity of the Ruangmu LMS instrument in this research was evaluated by three experts, using a four-point scale for assessment. The scale is divided into four categories: 4, 3, 2, and 1, representing elements that are highly relevant, somewhat relevant, slightly relevant, and unimportant, respectively.

Validation test for the model

The proposed model's validity was confirmed by a

Table 2. Assessment of instrument content validity agreement by material experts



The content validity assessment provided in Table 2 and Table 3 reveals a high degree of consistency and agreement among the validators regarding the relevance and quality of the instrument's items. The three validators (V1, V2, and V3) assigned scores to 40 items, with most scores ranging between 3 and 4 points, reflecting a shared understanding of the items' relevance. This level of consistency across the majority of items indicates a well-constructed instrument. However, Item 19 showed a slight deviation, as V1 assigned a score of 2, which is lower than the ratings given by the other two validators. This suggests a minor difference in judgment, although it does not significantly affect the overall validity of the instrument.

The Coefficient of Variation (CVR) for each item is 1.00, indicating unanimous agreement among the validators regarding the importance of each item. A CVR score of 1.00 signifies that all validators identified the items as essential components of the instrument, affirming their relevance. The high CVR value across all items underscores the strong content validity of the individual components of the scale.

Furthermore, the instrument achieved a perfect Item-Level Content Validity Index (I-CVI) score of 1.00 for each item. This indicates that all individual items meet the required content standards, with all three validators agreeing on their alignment with the study objectives. Additionally, the Scale-Level Content Validity

Index based on Universal Agreement (S-CVI/UA) also scored 1.00, signifying that there was complete consensus among the validators regarding the entire scale's validity.

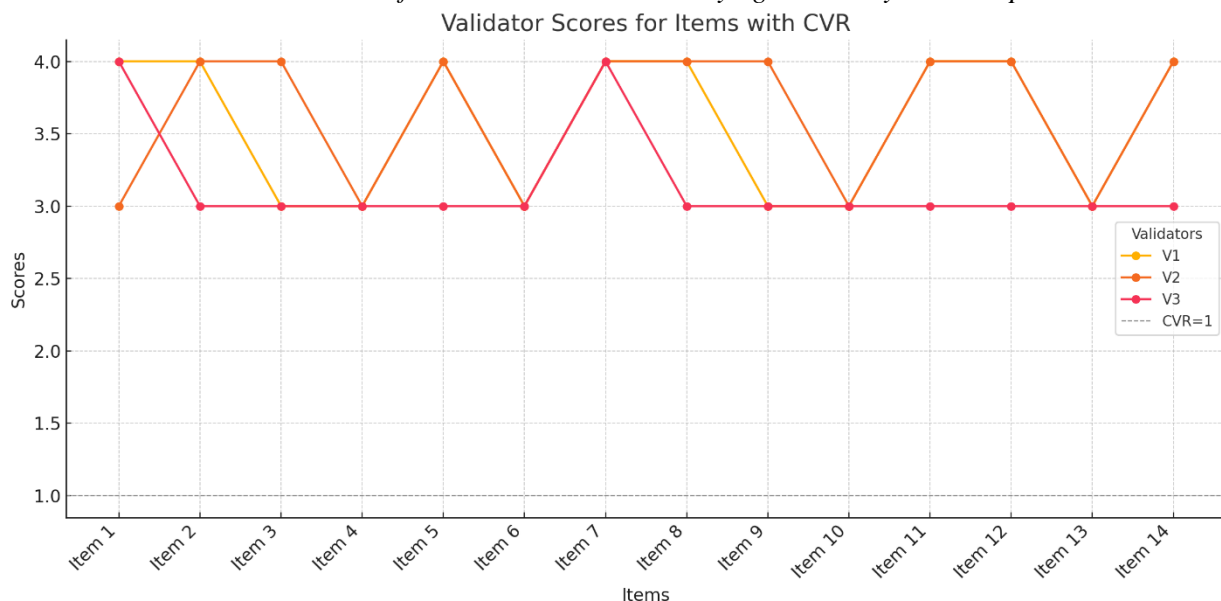
The Scale-Level Content Validity Index (S-CVI/Ave), calculated as the average of the I-CVI scores, yielded a value of 1.00. This score confirms that the overall scale is aligned with the intended content, with all validators agreeing on its appropriateness. The calculation formula used is:

$$S-CVI/Ave = \frac{(1.00 + 1.00 + 1.00)}{3} = 1.00$$

This result underscores the excellent content validity of the instrument, as the average rating across validators reflects complete alignment.

We can conclude, the high CVI and CVR values demonstrate that the instrument used in the study possesses strong content validity. The validators' consistent ratings and agreement suggest that the instrument is well-suited to measure the intended outcomes effectively. Although there was a slight discrepancy in one item (Item 19), the overall consensus remains robust. This high level of agreement ensures that the instrument will provide accurate and reliable results in its application. Therefore, the findings confirm that the instrument is valid and can be confidently utilized in the context of the study.

Table 3. Assessment of instrument content validity agreement by media experts



In addition, the stability of the Ruangmu LMS instrument was assessed through a measurement test conducted on many occasions using the test-

retest method. The test was administered to 20 people, with a time interval of 10-14 days between the initial test and the retest. Table 4 indicates that

the alpha reliability value of 0.940 is considered adequate. The identification of each instrument item in the retest is done using the Intraclass Correlation Coefficient (ICC) with a two-way mixed-effects model. The ANOVA analysis indicates that there is no statistically significant variation in the evaluation across raters ($p > 0.05$) due to the fact that the data were collected from the

same rater (Koo TK, Li MY.2016). The ICC output for inter-rater reliability is 0.940, with interpretation and confidence intervals of 94% and 93%, respectively. The expected range for the ICC is between 0.83 and 0.94. The reliability rating is between the range of "good" to "very good".

Table 4. Reliability test on intraclass correlation coefficient for material expert validation

Measures	Intraclass Correlation	95% Confidence Interval		F Test with True Value 0		
		Lower Bound	Upper Bound	Value	df1	df2
Single Measures	0.722	0.057	0.336	1.417	39	78
Average Measures	0.943	0.193	0.603	1.417	39	78

The results of the reliability test using the Intraclass Correlation Coefficient (ICC) provide insight into the consistency of expert evaluations. This test measures the degree of agreement among multiple raters—in this case, media experts—who assessed specific learning materials. The reliability of these ratings is essential in determining whether the assessment process is consistent and dependable for evaluating instructional media.

The Single Measures ICC value of 0.722 indicates moderate reliability when considering individual ratings from each expert. The 95% confidence interval for this ICC ranges from 0.057 to 0.336, suggesting some variability in the ratings. While the value of 0.722 suggests that individual experts provide fairly consistent ratings, the lower bound of the confidence interval (0.057) points to potential inconsistencies in some evaluations, which could affect the reliability of single assessments.

In contrast, the Average Measures ICC is significantly higher at 0.943, with a confidence interval ranging from 0.193 to 0.603. This result suggests excellent reliability when the ratings of multiple experts are aggregated. A high ICC value of 0.943 implies that, while individual assessments may vary slightly, combining the evaluations results in highly consistent outcomes. The narrow confidence interval also reinforces that the aggregation process smooths out potential inconsistencies, ensuring dependable evaluations when considering all experts' inputs.

The F-value in the test is 1.417, with degrees of freedom (df) of 39 and 78. This provides additional insight into the variability between raters. Although the F-value is not particularly large, it

indicates that the differences between individual raters' assessments are relatively low. This further supports the conclusion that the media experts' evaluations are generally consistent.

This reliability test utilizes a two-way mixed-effects model, where people effects are random (meaning the sample of experts is considered representative) and measures effects are fixed (indicating that the criteria used in the assessment remain constant). This model ensures that the reliability findings are applicable beyond the immediate group of experts, making the results generalizable to similar contexts.

The ICC calculation follows a Type C consistency definition, which focuses on the consistency of ratings rather than absolute agreement. In this model, the between-measure variance is excluded from the denominator, allowing the test to prioritize the reliability of consistent ratings across raters. Additionally, the analysis assumes the absence of interaction effects, further simplifying the interpretation by concentrating solely on consistency among raters.

We can conclude, the reliability analysis shows that individual assessments by experts exhibit moderate consistency, as indicated by the single measures ICC. However, when aggregated, the ratings demonstrate a high level of reliability, as evidenced by the average measures ICC. This result highlights that while individual evaluations may vary slightly, the overall process of media validation through combined expert inputs is robust and reliable. This strengthens the credibility of the learning materials being evaluated, ensuring that the instructional content meets high-quality standards when assessed through this process.

Table 5. Reliability test on intraclass correlation coefficient for media expert validation

Measures	Intraclass Correlation	95% Confidence Interval		F Test with True Value 0		
		Lower Bound	Upper Bound	Value	df1	df2
Single Measures	0.748	0.215	0.434	1.150	13	26
Average Measures	0.930	1.132	0.697	1.150	13	26

The reliability test results presented in Table 5 provide valuable insights into the consistency of media expert evaluations using the Intraclass Correlation Coefficient (ICC). The ICC is commonly used to assess the degree to which multiple ratings of the same items, in this case by media experts, are consistent with each other. This reliability assessment allows for determining the dependability of the media validation process.

The single measures ICC is reported as 0.748, with a 95% confidence interval ranging from 0.215 to 0.434. This value suggests a moderate level of reliability when considering individual expert evaluations. However, the relatively wide confidence interval indicates some variability among the raters. While an ICC value above 0.70 is generally considered acceptable for moderate reliability, the variability suggests that individual raters may not always be consistent in their assessments.

In contrast, the average measures ICC is significantly higher, reaching 0.930, with a confidence interval between 1.132 and 0.697. This demonstrates excellent reliability when the ratings from multiple experts are combined. The high average measures ICC indicates that aggregated ratings from different experts yield highly consistent results, minimizing the effects of variability between individual evaluations. This is particularly relevant for ensuring the reliability of the overall media validation process.

The F-value reported is 1.150, with degrees of freedom (df) of 13 and 26. Although the p-value is not provided explicitly, the small F-value reflects the presence of variance within the assessments. However, the results suggest that the variance between raters is relatively small, particularly when considering the high average measures ICC.

The analysis employs a two-way mixed-effects model, where people effects are random and measures effects are fixed. This indicates that the sample of raters (media experts) is treated as a random sample from a broader population, while the criteria used for evaluation remain fixed and standardized. This model allows the reliability findings to be generalized to other groups of experts and ensures that the media validation is based on consistent measures.

The ICC calculation follows the Type C consistency definition, focusing on how reliably the same items are evaluated, regardless of the specific scores assigned by individual experts. This approach excludes between-measure variance from the denominator, emphasizing the consistency of ratings rather than absolute agreement. Additionally, the results assume that interaction effects are absent since these cannot be estimated with the available data. This assumption simplifies the analysis and enables a clearer focus on the reliability of the ratings.

The findings suggest that while individual expert evaluations (single measures) exhibit moderate reliability, the combined evaluations (average measures) show excellent reliability. The high average measures ICC confirms that the media validation process is consistent and dependable when multiple expert ratings are aggregated. This reliability is critical in ensuring the validity and robustness of the media evaluations conducted in this study.

Paired sample t-test

Based on the data presented in Table 6, a paired samples test was conducted to determine whether there was a significant difference between the pre-test and post-test scores of students who used the Ruangmu Learning Management System (LMS). The analysis sought to evaluate the impact of the LMS on the academic performance of students enrolled in the Information and Communication Technology Education program.

The mean difference between the pre-test and post-test scores is -19.320. This negative value indicates that students performed better on the post-test than on the pre-test. The negative sign implies an increase in students' scores after the intervention, showing improvement in academic performance with the use of the LMS. The standard deviation of the differences is 13.184, which reflects some variability among the participants regarding their improvements. Meanwhile, the standard error mean is 2.637, showing the variability of the sample mean difference, and suggesting that the observed difference is consistent across the sample.

The 95% confidence interval for the

difference is reported as ranging between -24.762 and -13.878. This interval suggests that the true mean difference in the population falls within this range, confirming that the difference between the pre-test and post-test scores is meaningful and not due to random chance.

Table 6. Paired samples test

Pair	Comparison	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
1	Pre-Test - Post-Test	-19.320	13.184	2.637	-24.762	-13.878	-7.327	24	

The t-value calculated from the analysis is -7.327 with 24 degrees of freedom (df). This high absolute value of the t-statistic indicates a strong difference between the two sets of scores, with the negative sign aligning with the earlier observation of improved post-test results.

Importantly, the p-value (Sig. 2-tailed) for the test is reported as 0.000, which is less than 0.05, the threshold for statistical significance. This finding allows us to reject the null hypothesis (H_0), which suggested that there is no significant difference between the pre-test and post-test scores. Instead, we accept the alternative hypothesis (H_1), concluding that there is indeed a significant difference between the two scores

Given that the p-value is statistically significant, it can be inferred that the Ruangmu LMS had a positive impact on the students' academic performance. The increase in post-test scores indicates that students benefited from the use of the LMS in their learning process.

We can conclude, the analysis suggests that the Ruangmu LMS plays an effective role in enhancing students' learning outcomes in the Information and Communication Technology Education program. The significant difference between the pre-test and post-test results provides strong evidence that this LMS was instrumental in improving students' academic achievements.

CONCLUSION

The findings of this study highlight the importance of adopting a student-centered learning strategy in teaching English for Specific Purposes (ESP) to Information and Communication Technology (ICT) students. In this learning framework, lecturers act as facilitators and motivators, encouraging students to take responsibility for their learning process. This approach empowers students to pursue knowledge independently, tackle learning challenges autonomously, and engage meaningfully with the course content. However, the lecturers remain actively involved by

monitoring and guiding the learning process to ensure the intended learning outcomes are achieved.

The use of Learning Management Systems (LMS), offering features such as Semester Learning Plans (RPS) and electronic modules, plays a pivotal role in enhancing the learning experience. These resources are both accessible and effective, streamlining the delivery of educational content. The LMS also facilitates video conferencing, attendance tracking, virtual classroom discussions, interactive quizzes, online exams, and evaluations, contributing significantly to the efficiency and success of ESP learning. This technological integration allows students and instructors to stay connected and manage the learning process seamlessly.

A crucial component of the ESP learning model is the needs analysis, which serves as the foundation for building a comprehensive learning framework. Through this analysis, the knowledge gaps between students' current skills and the required competencies are identified. This process allows for targeted training strategies to address specific deficits, ensuring that students acquire the knowledge and skills necessary for their academic and professional development.

The proposed ESP Learning Model for ICT students—referred to as "Manan's Model"—follows a structured conceptual framework that encompasses input, process, output, and results. This structure enables educators and students to understand the sequence and flow of the learning process, clarifying their roles, responsibilities, and functions within the system. As a result, the learning model fosters greater awareness, motivation, and accountability, accelerating the pace of learning and enhancing overall academic outcomes.

Manan's Model offers a practical and effective approach to integrating ESP learning within higher education for ICT students. By combining student-centered learning strategies with the diverse

functionalities of LMS, the model ensures that both students and instructors can efficiently navigate the learning process. The use of technology, coupled with well-defined learning objectives and processes, promotes knowledge transfer and transformation, making this model an invaluable tool for advancing the proficiency and engagement of ICT students in ESP courses.

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Nanan Abdul Manan, Badroeni

Developing effective ESP learning materials using a learning management system in tertiary education