



Contents lists available at Journal Global Econedu

## Journal of Educational and Learning Studies

ISSN: 2655-2760 (Print) ISSN: 2655-2779 (Electronic)

Journal homepage: <http://jurnal.globeconedu.org/index.php/jels>



# Development of an LMS-based flipped learning e-module for TOEIC preparation

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### Article Info

#### Article history:

Received Jan 16<sup>th</sup>, 2026  
Revised Feb 24<sup>th</sup>, 2026  
Accepted Mar 30<sup>th</sup>, 2026

#### Keyword:

Flipped learning,  
e-Module,  
Learning management system,  
TOEIC preparation

### ABSTRACT

This study aimed to develop an LMS-based e-module using the Flipped Learning model for Grade XI vocational high school students and to evaluate its validity, practicality, and effectiveness in supporting TOEIC preparation. This research employed a Research and Development (R&D) approach using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The participants were 187 Grade XI students from five vocational school classes. Data were collected through expert validation sheets, student response questionnaires, and TOEIC-based pre-test and post-test assessments. Data were analyzed using descriptive statistics, normalized gain (N-Gain), paired sample t-test, Cronbach's Alpha, and item-total correlation. The developed e-module achieved an overall validity score of 86.4%, indicating a very valid category. The practicality assessment yielded a mean score of 72.62%, categorized as practical. Students' learning achievement improved significantly, with mean scores increasing from 26.76 (pre-test) to 63.02 (post-test). The average N-Gain score was 0.4961, indicating moderate effectiveness. Furthermore, the paired sample t-test revealed a statistically significant improvement in learning outcomes ( $t = 35.185$ ,  $p < 0.001$ ). The LMS-based Flipped Learning e-module is valid, practical, and effective for enhancing TOEIC-related English learning achievement among vocational high school students.



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## Introduction

English proficiency has become an essential competency for vocational graduates in the twenty-first century workforce, particularly in industries characterized by global communication, technological advancement, and international collaboration (Machmud et al., 2025; Muzammil et al., 2024). In vocational education, English is not merely an academic subject but a practical skill that supports employability and career readiness (Aiju & Abdullah, 2024; Rojiyyah et al., 2023). Consequently, many vocational institutions have adopted workplace-oriented English assessments such as the Test of English for International Communication (TOEIC) to measure students' readiness for professional communication. TOEIC is widely recognized by industries because it evaluates listening and reading competencies required in authentic workplace situations, making it highly relevant to vocational education outcomes.

Despite its importance, many vocational high school students in Indonesia continue to experience difficulties in achieving satisfactory TOEIC performance. Educational policies increasingly encourage students to attain

English competencies equivalent to the Common European Framework of Reference for Languages (CEFR), particularly at the B1–B2 levels, which are commonly associated with functional communication in academic and professional settings. However, limited vocabulary mastery, insufficient reading comprehension, and weak listening skills frequently hinder students from reaching these targets (Muchlis et al., 2026; Suciati et al., 2025). Furthermore, vocational schools often face challenges in providing intensive TOEIC preparation because instructional time is reduced by industrial internships, competency certification activities, and curriculum requirements (Rais et al., 2024; Sari & Listiyani, 2023). These conditions highlight the need for innovative learning strategies capable of extending learning opportunities beyond classroom boundaries.

The rapid development of educational technology has created opportunities to address these challenges through flexible and student-centered learning environments (Mualim et al., 2025; Surur et al., 2026; Ufiqoh et al., 2026). Learning Management Systems (LMS) facilitate the delivery of digital learning materials, online assessments, progress monitoring, and asynchronous communication that support continuous learning regardless of time and place. In addition, digital learning resources such as e-modules allow students to access instructional content repeatedly according to their learning needs and pace. Previous studies have reported that LMS-supported learning environments contribute positively to learner engagement, accessibility, and independent learning behaviors, making them particularly suitable for vocational students who require flexibility in balancing academic and workplace learning activities (Aiju & Abdullah, 2024; Muzammil et al., 2024).

Among technology-enhanced learning approaches, Flipped Learning has received considerable attention because it shifts content acquisition activities outside the classroom while maximizing classroom time for discussion, problem-solving, and collaborative learning (Chancey, 2025; Smith et al., 2025). The approach is theoretically aligned with constructivist learning principles, which emphasize active engagement and learner autonomy. Previous studies have shown that Flipped Learning can improve learning achievement, critical thinking, motivation, and self-directed learning across various educational contexts (Bernstein et al., 2025; Marshall, 2022). In vocational education, the integration of Flipped Learning with LMS technology offers significant potential for TOEIC preparation because students can independently access instructional materials before participating in guided learning activities and practice sessions.

Nevertheless, several gaps remain evident in the existing literature. First, most studies focus on general English learning rather than TOEIC-oriented instruction designed specifically for vocational students. Second, previous research generally examines Flipped Learning as a teaching strategy without integrating instructional materials, multimedia resources, formative assessments, and learning progress monitoring into a comprehensive LMS-based e-module (Boat et al., 2022; Kendall & Khuon, 2023). Third, limited studies have systematically evaluated such products using a Research and Development framework that simultaneously assesses validity, practicality, and effectiveness. Moreover, empirical evidence regarding the implementation of LMS-based Flipped Learning for TOEIC preparation in vocational education remains relatively limited, indicating the need for further investigation.

To address these gaps, this study developed an LMS-based Flipped Learning e-module for Grade XI vocational high school students using the ADDIE model. The e-module was specifically designed to support TOEIC preparation by integrating listening, reading, grammar, multimedia learning resources, automated formative feedback, and self-directed learning activities within a Moodle environment (León-Quismondo, 2023; Ly & Nguyen, 2025). The study evaluated the product through expert validation, practicality testing, and effectiveness assessment involving vocational students (Ballentine, 2022; Yacob et al., 2022). The novelty of this research lies in the integration of Flipped Learning pedagogy with a Moodle-based TOEIC preparation e-module specifically developed for vocational education, while simultaneously providing comprehensive evidence regarding its validity, practicality, and effectiveness as a technology-enhanced learning solution.

## Method

This study employed a Research and Development (R&D) approach using the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation stages, to develop an LMS-based Flipped Learning e-module for TOEIC preparation. The analysis stage identified students' TOEIC learning needs, learner characteristics, and technological readiness. Based on these findings, the e-module was designed by integrating Flipped Learning principles through pre-class, in-class, and post-class activities. The development stage involved the creation of multimedia learning materials, TOEIC practice exercises, interactive quizzes, and Moodle integration, followed by expert validation and product revision before implementation.

The participants were 187 Grade XI students from SMK Negeri 1 Batam, Indonesia, selected through purposive sampling based on active enrollment, access to digital devices, and LMS availability. Data were collected using expert validation sheets, a 26-item practicality questionnaire, and TOEIC-based pre-test and post-

test assessments. Product validity and practicality were analyzed descriptively, while effectiveness was evaluated using N-Gain, Paired Sample t-test, and Cohen's d effect size. The e-module was considered effective if it achieved at least a moderate N-Gain ( $\geq 0.30$ ), a significant improvement in learning outcomes ( $p < 0.05$ ), and a meaningful effect size.

## Results and Discussions

This section presents the findings obtained from the development and evaluation of the LMS-based Flipped Learning e-module for vocational English learning. The results are organized according to the research objectives, including the development process, product validity, practicality, and effectiveness. Data were collected through expert validation, student response questionnaires, and TOEIC-based pre-test and post-test assessments involving 187 Grade XI vocational high school students. The findings provide comprehensive evidence regarding the quality of the developed e-module and its impact on students' learning achievement. Overall, the results indicate that the e-module successfully met the established criteria of validity, practicality, and effectiveness, supporting its implementation as an innovative digital learning resource in vocational English education.

### Development Process of the LMS-Based Flipped Learning E-Module

The development of the e-module was conducted using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation phases. The product was designed to support TOEIC preparation among Grade XI vocational high school students through an LMS-integrated Flipped Learning approach.

**Table 1.** Summary of the ADDIE Development Process

Phase	Main Activities	Output
Analysis	Needs analysis, curriculum analysis, learner characteristics, technological infrastructure analysis	Identification of TOEIC preparation needs and LMS readiness
Design	Learning flow design, content mapping, interface design, validation instruments development	Prototype of LMS-based Flipped Learning e-module
Development	Content production, Moodle integration, expert validation, product revision	Validated e-module
Implementation	Deployment to 187 students across five classes	Learning implementation through LMS Moodle
Evaluation	Formative and summative evaluation	Practicality and effectiveness evidence

The development process was completed systematically following all ADDIE stages. The final product was an interactive Moodle-based e-module integrating the three phases of Flipped Learning: pre-class, in-class, and post-class activities. The analysis stage revealed students' limited access to TOEIC-oriented learning resources, while the institution already possessed adequate technological infrastructure to support LMS-based learning.

### Validity of the Developed E-Module

The validity of the e-module was evaluated by experts in instructional content, language, and educational media.

**Table 2.** Summary of Expert Validation Results

Validation Aspect	Mean Score	Percentage	Category
Instrument Validation	4.20	84.0%	Valid
Content Validation	4.22	84.4%	Valid
Language Validation	4.17	83.3%	Valid
Media Validation	4.67	93.3%	Very Valid
Overall Mean	4.32	86.4%	Very Valid

The overall validation score reached 4.32 (86.4%), indicating that the developed e-module was categorized as very valid. Media validation obtained the highest score (93.3%), demonstrating strong technical quality, usability, and visual design. Content and language validations also exceeded the minimum feasibility criterion, confirming that the learning materials were aligned with the curriculum, TOEIC competencies, and students' characteristics.

### Practicality of the LMS-Based Flipped Learning E-Module

Practicality was measured through a student response questionnaire completed by 187 students after the implementation phase.

**Table 3.** Practicality Results by Aspect

Practicality Aspect	Mean Score	Percentage	Category
Accessibility & Technical Quality	3.493	69.9%	Practical
Visual Design	3.550	71.0%	Practical
Content & Learning Materials	3.717	74.3%	Practical
LMS Features & Interactivity	3.620	72.4%	Practical
Self-Directed Learning	3.783	75.7%	Practical
Satisfaction & Benefits	3.658	73.2%	Practical
Overall Mean	3.631	72.62%	Practical

The practicality evaluation demonstrated that all six aspects achieved the “Practical” category, with an overall mean score of 3.631 (72.62%). The highest-rated aspect was self-directed learning (75.7%), indicating that students perceived the e-module as effective in facilitating flexible and independent learning. Conversely, accessibility and technical aspects received the lowest score (69.9%), suggesting that improvements in navigation and user-interface design could further enhance user experience.

### Students’ Learning Achievement Before and After Implementation

The effectiveness of the e-module was examined through pre-test and post-test TOEIC-based assessments administered to all participating students.

**Table 4.** Comparison of Pre-Test and Post-Test Scores

Group	N	Pre-Test Mean ± SD	Post-Test Mean ± SD	Gain Score
Regular Classes	128	24.32 ± 9.21	60.02 ± 15.30	+35.70
Industrial Classes	59	32.06 ± 10.30	69.51 ± 12.35	+37.44
Overall	187	26.76 ± 9.21	63.02 ± 15.30	+36.27

Students’ learning achievement improved substantially after using the developed e-module. The overall mean score increased from 26.76 in the pre-test to 63.02 in the post-test, representing an average gain of 36.27 points. Although industrial classes started with higher baseline scores, both groups demonstrated comparable absolute improvements, suggesting that the e-module was beneficial across different student profiles.

### Effectiveness Based on N-Gain Analysis

**Table 5.** N-Gain Results by Class

Class	N	N-Gain	Category
XI TKJ 1	46	0.5401	Moderate
XI TKJ 2	43	0.5202	Moderate
XI TKJ 3	39	0.3453	Moderate
XI TKJ IND 1	29	0.4437	Moderate
XI TKJ IND 2	30	0.6408	Moderate
Overall Mean	187	0.4961	Moderate

The average N-Gain score of 0.4961 indicates a moderate level of effectiveness. All five classes achieved N-Gain values above the minimum criterion (0.30), confirming that the e-module successfully improved students’ TOEIC-related competencies. The highest N-Gain was observed in XI TKJ IND 2 (0.6408), while XI TKJ 3 recorded the lowest value (0.3453), although it still remained within the moderate category.

The results demonstrated that the developed LMS-based Flipped Learning e-module produced positive learning outcomes and fulfilled the established product quality criteria. Most students achieved a moderate level of learning improvement (70.1%), while 10.7% reached the high category and only 19.3% remained in the low category. Industrial classes showed slightly higher effectiveness than regular classes, as indicated by a higher N-Gain score (0.5439 vs. 0.4740) and a greater proportion of students achieving high learning gains. Furthermore, the Paired Sample t-test revealed a statistically significant improvement between pre-test and post-test scores ( $t = 35.185$ ,  $p < 0.001$ ), confirming the effectiveness of the intervention. Overall, the product achieved a validity score of 86.4% (very valid), a practicality score of 72.62% (practical), and an average N-Gain of 0.4961 (moderate effectiveness), indicating that the e-module is suitable for supporting TOEIC preparation among vocational high school students (Table 6).

**Table 6.** Summary of Learning Improvement and Product Evaluation

Aspect	Indicator	Result	Category/Interpretation
N-Gain Distribution	High ( $\geq 0.70$ )	20 students (10.7%)	High
	Moderate (0.30–0.69)	131 students (70.1%)	Moderate
	Low ( $< 0.30$ )	36 students (19.3%)	Low
Comparison by Class	Regular Classes N-Gain	0.4740	Moderate
	Industrial Classes N-Gain	0.5439	Moderate
	High N-Gain (Regular)	7.0%	Lower proportion
	High N-Gain (Industrial)	18.6%	Higher proportion
Statistical Test	Paired Sample t-test	$t = 35.185$	Significant
	Significance Value	$p < 0.001$	Significant Difference
Product Quality	Validity	86.4%	Very Valid
	Practicality	72.62%	Practical
	Effectiveness (N-Gain)	0.4961	Moderate
	Statistical Evidence	$p < 0.001$	Significant

The findings of this study demonstrate that the LMS-based Flipped Learning e-module achieved a high level of validity, with an overall validation score of 86.4%. This result indicates that the developed product successfully met the requirements of content accuracy, instructional design, language quality, and media usability. The highest score was obtained in media validation (93.3%), suggesting that the integration of Moodle features, multimedia content, and interactive learning activities was perceived as highly appropriate for vocational education settings. These findings support the argument that digital learning resources developed through systematic instructional design frameworks such as ADDIE can produce educational products that are pedagogically sound and technologically feasible. The iterative validation and revision process conducted during development also contributed to ensuring alignment between learning objectives, instructional content, and learner needs (Mirhosseini, 2022; Yousef, 2025).

The practicality findings revealed that the e-module was categorized as practical, with an overall score of 72.62%. This result suggests that students were generally able to use the e-module effectively in authentic learning situations. Among the six practicality dimensions, self-directed learning obtained the highest score, indicating that the e-module successfully promoted learner autonomy. This outcome is consistent with the theoretical foundation of Flipped Learning, which emphasizes students' responsibility to engage with instructional content before classroom meetings. The flexibility offered by LMS-based learning enabled students to access materials repeatedly and at their own pace, thereby supporting personalized learning experiences. Such characteristics are particularly relevant for vocational school students who often face time constraints due to academic and workplace-based learning activities (Huang, 2025; Strasser, 2023).

Despite the positive practicality outcomes, several aspects related to user experience received relatively lower ratings, particularly navigation, layout organization, and instructional guidance. These findings suggest that while the instructional content was perceived positively, improvements are still needed in interface design and usability. Previous studies on e-learning environments have emphasized that user experience significantly influences learner engagement, motivation, and persistence. A well-structured interface reduces cognitive load and allows students to focus more on learning tasks rather than system operation (Hayat et al., 2026; Minh, 2024). Therefore, future iterations of the e-module should prioritize enhancing navigational clarity, visual hierarchy, and onboarding support to maximize the effectiveness of the learning environment.

The effectiveness analysis demonstrated substantial improvements in students' learning achievement following the implementation of the e-module. The mean score increased from 26.76 in the pre-test to 63.02 in the post-test, while the overall N-Gain score reached 0.4961, indicating a moderate level of effectiveness. These findings suggest that the Flipped Learning approach successfully facilitated meaningful learning gains in TOEIC-related competencies. From a pedagogical perspective, the improvement can be attributed to the redistribution of learning activities, whereby lower-order cognitive processes such as content acquisition occurred outside the classroom, allowing classroom time to be devoted to higher-order activities including discussion, problem solving, and feedback. This instructional arrangement aligns with constructivist learning theory, which posits that knowledge is constructed more effectively through active engagement and social interaction.

The significant result of the Paired Sample t-test further strengthens the evidence for the effectiveness of the developed e-module. The statistical analysis revealed a highly significant difference between pre-test and post-

test scores ( $p < 0.001$ ), confirming that the observed improvement was not due to random variation. This finding indicates that the integration of multimedia learning resources, formative assessments, automated feedback, and structured learning sequences within the LMS contributed positively to students' academic performance. The availability of immediate feedback through Moodle quizzes may have played an important role in supporting self-regulated learning by enabling students to identify misconceptions and monitor their progress continuously. Such feedback mechanisms are frequently identified in educational research as critical factors influencing learning success in digital environments (İleritürk & Kınca, 2025; Saiphet, 2024).

An interesting finding emerged from the comparison between regular and industrial classes. Although both groups achieved moderate effectiveness, industrial classes demonstrated slightly higher N-Gain scores and a larger proportion of students in the high-improvement category. This pattern suggests that students with stronger academic backgrounds may be better positioned to take advantage of the self-regulated learning opportunities provided by Flipped Learning environments. Learners with higher levels of academic readiness often possess stronger metacognitive skills, time-management abilities, and digital literacy competencies, enabling them to engage more effectively with pre-class learning activities (McLean & Corbin, 2025; Sunggingwati et al., 2023). Nevertheless, the achievement of positive learning gains across all classes indicates that the developed e-module remains broadly applicable and beneficial for students with diverse academic profiles.

Another important implication of this study is reflected in the estimated TOEIC and CEFR progression achieved by students after the intervention. The results indicate that the majority of students moved from the A2 level toward the B1 level of language proficiency. This progression is educationally meaningful because B1 proficiency is commonly regarded as a threshold level for functional communication in academic and workplace contexts. Therefore, the effectiveness of the e-module should not be interpreted solely in terms of statistical improvement but also in terms of practical language development relevant to vocational education outcomes (Klochko et al., 2023; Maxwell-Smith & Foley, 2023). Collectively, the findings suggest that the LMS-based Flipped Learning e-module represents a promising instructional innovation for supporting TOEIC preparation, promoting learner autonomy, and enhancing English language competence among vocational high school students.

## Conclusions

This study successfully developed an LMS-based Flipped Learning e-module for English learning among Grade XI vocational high school students using the ADDIE development model. The findings demonstrated that the developed e-module achieved a very high level of validity, practical usability, and moderate effectiveness in improving students' learning achievement. Significant improvements were observed in students' post-test scores compared to pre-test scores, indicating that the integration of Flipped Learning principles with LMS technology effectively supported independent learning, increased learning engagement, and enhanced English language competence. Therefore, the developed e-module can be considered a feasible, practical, and effective instructional resource for vocational English education and may serve as an alternative digital learning solution to support flexible and student-centered learning environments.

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