

Development of a Wordwall-Based Interactive Assessment in the Fundamentals of Marketing Subject for 10th Grade Digital Business

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Article History: Submission: 2026-06-07 || Accepted: 2026-09-12 || Published: 2026-09-20

Abstract

Digital assessment provides opportunities to make evaluation activities more interactive and responsive to the characteristics of vocational students. This study aimed to develop and evaluate a Wordwall-based interactive assessment for the Marketing Fundamentals course in the Grade X Digital Business program. The study employed a Research and Development (R&D) approach using the ADDIE model, comprising Analysis, Design, Development, Implementation, and Evaluation. The product was validated by subject-matter, media, and language experts and piloted with 35 Grade X Digital Business students at SMK Negeri 10 Surabaya. Data were collected through observations, interviews, expert-validation sheets, student-response questionnaires, and pretests and post-tests. The results showed validation scores of 97.5% for subject matter, 95.0% for media, and 92.0% for language, indicating that the product was highly feasible. Student responses reached 92.5%, indicating highly positive acceptance of the assessment. The mean learning score increased from 64.4 on the pretest to 92.1 on the post-test, with an N-Gain of 72.29%, classified as Effective according to the criterion adopted in the study. These findings demonstrate that the developed Wordwall-based interactive assessment is feasible, positively received by students, and accompanied by substantial score improvement during pilot implementation. However, given the single-group design, the findings provide preliminary rather than causal evidence of effectiveness.

Keywords: Interactive assessment, Wordwall, Digital assessment, Marketing Fundamentals, Vocational education.

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I. INTRODUCTION

Education plays a fundamental role in developing the quality of human resources by strengthening knowledge, skills, and character. The rapid advancement of digital technology associated with the Fourth Industrial Revolution and the transition toward Society 5.0 has further transformed how teaching, learning, and assessment are designed and implemented. Educational institutions are increasingly expected to provide learning experiences that are innovative, interactive, and responsive to the characteristics of students growing up in digitally mediated environments (Zahroh et al., 2024). Within this transformation, digital technology is relevant not only as a means of delivering instructional content but also as a resource for creating more engaging and responsive assessment practices.

Assessment constitutes an integral component of the learning process because it provides information about students' understanding and achievement of intended learning outcomes. Advances in educational technology have expanded opportunities to move beyond conventional assessment formats by incorporating interactive digital environments that allow students to respond directly to questions and receive more engaging learning experiences (Nisaurasyidah et al., 2021). Interactive media can also facilitate content delivery and support students' motivation to participate in learning activities (Permana & Kasriman, 2022). Accordingly, the integration of digital technology into assessment has the potential to transform assessment from a predominantly measurement-oriented activity into a more participatory component of the learning process.

Interactive assessment refers to an evaluation process in which learners actively interact with digital media while completing assessment tasks. Unlike conventional paper-based or teacher-directed assessment, digital interactive assessment can incorporate immediate responses, visual elements, game-like activities, and varied question formats. Such features can reduce monotonous assessment experiences and provide students with greater opportunities to participate actively in evaluation activities (Rosa et al., 2023). Interactive learning environments have also been associated

with increased student engagement during the learning process (Baharuddin et al., 2024). These characteristics are particularly relevant to vocational education, where assessment should not only measure students' knowledge but also reflect the digital and applied nature of the competencies being developed.

This need is evident in the Marketing Fundamentals course within the Digital Business vocational program at vocational high schools. The course is intended to provide students with foundational knowledge and competencies related to marketing and digital business processes. However, preliminary observations at SMK Negeri 10 Surabaya indicated that classroom instruction and assessment continued to rely substantially on teacher-centered explanations and limited learning media. Students demonstrated relatively low classroom participation and difficulties in understanding the learning material. These conditions were also reflected in the Mid-Semester Summative Assessment (Sumatif Tengah Semester [STS]) results for Grade X Digital Business 1, as presented in Table 1.

Table 1. Mid-Semester Summative Assessment Results in Marketing Fundamentals for Grade X Digital Business 1

Score Range	Number of Students	Percentage
70–100	0	0.00%
60–69	3	8.57%
50–59	5	14.29%
<50	27	77.14%
Total	35	100.00%

As shown in Table 1, 27 of the 35 students (77.14%) scored below 50, while only eight students (22.86%) obtained scores of 50 or higher. Notably, none of the students achieved a score within the 70–100 range. These results indicate substantial difficulties in students' achievement of the assessed Marketing Fundamentals competencies and provide an empirical basis for reconsidering how learning and assessment activities are designed. Rather than attributing the low scores exclusively to a particular teaching method, the preliminary evidence suggests a need for assessment resources that can provide more interactive opportunities for students to engage with the course content.

One digital platform that can potentially address this need is Wordwall, a web-based application that provides various interactive activity and quiz formats that can be used for both instructional and assessment purposes (Oviliani & Susanto, 2023). Wordwall allows teachers to design activities in game-like formats and can be accessed through smartphones and computers, making it practical for digitally supported classroom environments (Okta Nadia & Desyandri, 2022). Previous research has also associated the use of Wordwall with student motivation, participation, and engagement (Sya et al., 2024). These features make the platform potentially relevant to Digital Business students, whose vocational learning environment increasingly requires familiarity with digital technologies.

Previous studies provide evidence supporting the educational potential of Wordwall. Ningrum et al. (2024) reported that interactive Wordwall-based learning media were considered suitable for instructional use based on validation by media, subject-matter, and language experts as well as positive student responses. Similarly, Aulia (2025) indicated that Wordwall could support students' enthusiasm for learning. Nevertheless, existing applications have largely been situated in subjects such as Islamic education and office management. Consequently, evidence concerning its development for vocationally oriented subjects, particularly Marketing Fundamentals within the Digital Business program, remains comparatively limited. Differences in subject matter and educational context are important because an assessment resource developed for general academic content cannot automatically be assumed to address the competencies and learning characteristics of vocational students.

A further gap concerns the function assigned to Wordwall in previous research. Existing studies have predominantly positioned Wordwall as instructional media or a game-based learning resource, whereas its systematic development as an interactive digital assessment tool tailored to vocational learning remains less extensively examined. This distinction is important because instructional media and assessment tools serve related but different pedagogical purposes. An assessment tool requires deliberate alignment among learning outcomes, assessment content, question formats,

feedback, usability, and the characteristics of the intended learners. For students in the Digital Business program, such alignment is particularly relevant because assessment can simultaneously provide opportunities to engage with marketing concepts through a digital environment consistent with their field of study.

Against this background, the present study focuses on the development of a Wordwall-based interactive assessment tool for the Marketing Fundamentals course in the Digital Business vocational program. The novelty of the study lies not merely in employing Wordwall as a game-based digital platform, but in systematically positioning it as an assessment resource designed around the content and learner characteristics of vocational education. By integrating interactive assessment with Marketing Fundamentals content, the study seeks to provide a contextually relevant digital assessment resource that can support evaluation activities while encouraging students' active participation. Thus, the study contributes to the emerging literature on digital assessment in vocational education by extending the application of Wordwall from a general learning medium toward a subject-specific interactive assessment tool for Digital Business students.

II. METHOD

This study employed a Research and Development (R&D) approach to develop a Wordwall-based interactive assessment for the Marketing Fundamentals course in Grade X of the Digital Business program at SMK Negeri 10 Surabaya (Rindrayani et al., 2025). The development process followed the ADDIE model, consisting of Analyze, Design, Development, Implementation, and Evaluation phases (Hidayat et al., 2021). The product incorporated several Wordwall activity formats, including Quiz, Match Up, True or False, Anagram, and Open the Box, which were adapted to the learning outcomes and content of Marketing Fundamentals.

The Analyze phase involved classroom observations and teacher interviews to identify assessment practices, learning needs, student characteristics, and learning objectives. The Design phase included mapping learning outcomes, preparing assessment items, selecting appropriate Wordwall formats, and developing expert-validation sheets and a student-response questionnaire. During the Development phase, the assessment was created and validated by subject-matter, media, and language experts, and their feedback was used to revise the product. The Implementation phase involved 35 students of Grade X Digital Business 1 (X BD 1), who completed the developed assessment as part of the pilot implementation. Finally, the Evaluation phase examined product feasibility, student responses, and changes in learning outcomes as the basis for evaluating and refining the product.

Data were collected through observations, interviews, expert-validation sheets, student-response questionnaires, and pretests and post-tests. Qualitative data from validators' comments were used to guide product revisions, whereas validation scores and student responses were analyzed descriptively using Likert-scale percentages to determine product feasibility (Hastuti, 2022). Changes in learning outcomes were analyzed using the normalized gain (N-Gain) based on pretest and post-test scores (Wahab et al., 2021). Given the single-group pilot design, the N-Gain was interpreted as an indicator of score improvement rather than as evidence of a causal effect of the developed assessment.

III. RESULTS AND DISCUSSION

A. Results

1. Development of the Wordwall-Based Interactive Assessment

The Wordwall-based interactive assessment was developed for Grade X students in the Digital Business program at SMK Negeri 10 Surabaya using the five stages of the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. Each stage produced information that informed the subsequent development process and contributed to the refinement of the final assessment product.

During the Analysis stage, classroom observations and interviews with the teacher and students identified two primary needs: the continued reliance on conventional assessment practices and the limited use of interactive digital assessment tools. These conditions indicated a need for an assessment format that was more consistent with the characteristics of Digital

Business students and their familiarity with digital environments. The analysis therefore provided the basis for developing an interactive, game-based assessment for Marketing Fundamentals. During the Design stage, the assessment content was mapped to the relevant learning objectives, followed by the preparation of assessment items, selection of appropriate Wordwall activity formats, and design of the interface and activity sequence. The assessment incorporated several formats, including Quiz, Match Up, True or False, Anagram, and Open the Box, to provide variation in how students interacted with the assessment tasks.

During the Development stage, the initial design was converted into a functional interactive assessment using the Wordwall platform. The content, language, visual presentation, and technical features were then reviewed by subject-matter, media, and language experts. Feedback obtained during this process was used to refine the product before classroom implementation. The resulting interface is illustrated in Figure 1.



Figure 1. Interface of the Wordwall-Based Interactive Assessment

During the Implementation stage, the developed assessment was piloted with 35 students in Grade X Digital Business 1 (X BD 1) at SMK Negeri 10 Surabaya. Students first completed a pretest, participated in activities using the Wordwall-based interactive assessment, and subsequently completed a post-test. Figure 2 illustrates the use of the assessment during classroom implementation.



Figure 2. Classroom Implementation of the Wordwall-Based Interactive Assessment

Finally, the Evaluation stage focused on examining three sources of evidence: expert-validation results, student responses, and changes between pretest and post-test scores. These data were used to evaluate the feasibility and user acceptance of the product and to provide preliminary evidence regarding score improvement following its implementation.

2. Expert Validation Results

The developed assessment was evaluated by subject-matter, media, and language experts before classroom implementation. The validation process examined the appropriateness of the

content, digital-media design, and language used in the assessment. The results are presented in Table 2.

Table 2. Summary of Expert Validation Results

No.	Validation Aspect	Percentage	Category
1	Subject-matter validation	97.5%	Highly Feasible
2	Media validation	95.0%	Highly Feasible
3	Language validation	92.0%	Highly Feasible

As shown in Table 2, all three validation components received scores above 90%. Subject-matter validation obtained the highest percentage (97.5%), followed by media validation (95.0%) and language validation (92.0%). Based on the feasibility criteria applied in the study, all three components were classified as Highly Feasible. These findings indicate that the developed product met the required criteria in terms of the relevance of Marketing Fundamentals content, media presentation and functionality, and clarity of language before being implemented with students.

Student Responses to the Wordwall-Based Interactive Assessment

Following classroom implementation, student responses were collected to examine their perceptions of the developed assessment. The questionnaire covered four indicators: feedback, ease of use, perceived benefits, and self-reflection. The results are summarized in Table 3.

Table 3. Summary of Student Response Questionnaire Results

No.	Indicator	Score
1	Feedback	817
2	Ease of use	649
3	Perceived benefits	476
4	Self-reflection	488
Total Score		2,43
Percentage		92.5%
Category		Highly Positive

The student-response questionnaire produced a total score of 2,430, equivalent to 92.5% of the maximum score. This result indicates a highly positive overall response to the Wordwall-based interactive assessment. Across the evaluated aspects, students responded positively to the assessment in terms of its usability, perceived benefits, feedback, and opportunities for self-reflection. These results complement the expert-validation findings by showing that the product was not only considered feasible by experts but was also positively received by its intended users.

Changes in Student Learning Scores

Pretest and post-test scores were compared to examine changes in students' learning outcomes during the pilot implementation. The magnitude of improvement was subsequently calculated using N-Gain. The results are presented in Table 4.

Table 4. Pretest, Post-test, and N-Gain Results

Pretest Mean	Post-test Mean	N-Gain	Interpretation
64.4	92.1	72.29%	Effective*

The mean score increased from 64.4 on the pretest to 92.1 on the post-test, representing a descriptive increase of 27.7 points. The N-Gain analysis yielded 72.29%, which was classified as Effective according to the N-Gain interpretation criteria adopted in the study. Thus, students demonstrated substantial score improvement between the measurements taken before and after the pilot implementation. However, this result should be interpreted within the study design. Because the implementation involved a single group without a control or comparison group, the increase in scores and the N-Gain value demonstrate improvement during the

implementation period but do not independently establish that the Wordwall-based assessment caused the improvement. Accordingly, the findings provide preliminary evidence of score improvement and product performance in the pilot context, while stronger claims regarding comparative effectiveness would require an experimental or quasi-experimental design with an appropriate comparison group.

B. Discussion

Development of the Wordwall-Based Interactive Assessment

The development of the Wordwall-based interactive assessment for the Marketing Fundamentals course followed the ADDIE framework through the stages of Analysis, Design, Development, Implementation, and Evaluation. The systematic structure of ADDIE enabled the product to be developed from identified classroom needs rather than from technological features alone. The initial analysis revealed that assessment practices remained largely conventional and made limited use of interactive digital tools. This condition was accompanied by relatively low student participation, indicating a need for assessment activities that were more responsive to the characteristics of students in the Digital Business program. The development process therefore positioned Wordwall not merely as supplementary learning media but as an interactive assessment environment aligned with the course learning objectives.

During the Design and Development stages, assessment items were aligned with the learning outcomes and objectives of Marketing Fundamentals and presented through several Wordwall activity formats. This approach is consistent with constructivist principles, which emphasize learners' active involvement in constructing understanding through interaction and experience (Nurhuda et al., 2023). Rather than responding only to conventional assessment formats, students interacted directly with questions, challenges, and game-based activities. The development was also consistent with Game-Based Learning, in which game elements are incorporated into educational activities to encourage participation and engagement. In this respect, the systematic use of ADDIE helped connect identified learner needs, assessment content, digital features, and classroom implementation, consistent with the role of ADDIE in developing structured educational products (Nasution et al., 2025).

Feasibility of the Wordwall-Based Interactive Assessment

Expert validation provided strong evidence regarding the feasibility of the developed product. Subject-matter validation obtained 97.5%, media validation 95.0%, and language validation 92.0%, with all components classified as Highly Feasible. The particularly high subject-matter score indicates that the assessment content and items were considered appropriately aligned with the intended Marketing Fundamentals competencies. This alignment is important because the quality of digital assessment depends not only on its technological attractiveness but also on whether the tasks adequately represent the learning objectives being assessed.

The media and language validation results further indicate that the product met the expected criteria for presentation, usability, interactivity, clarity, and readability. Clear instructions and comprehensible language are essential in interactive assessment because difficulties in interpreting an item or instruction may interfere with students' ability to demonstrate their knowledge. Likewise, an organized interface and functional interactive features can facilitate students' interaction with assessment tasks. These findings are consistent with Fadilah et al. (2023), who emphasized the role of interactive media in facilitating information delivery and attracting learners' attention. They also support Husna and Kusumadewi (2025), who highlighted Wordwall as an interactive digital medium that can support more creative and technology-responsive learning practices.

Student Responses to the Wordwall-Based Interactive Assessment

The student-response questionnaire yielded an overall percentage of **92.5%**, indicating a highly positive response to the developed assessment. Positive responses were recorded across feedback, ease of use, perceived benefits, and self-reflection. This finding is particularly relevant because feasibility from the expert perspective does not necessarily guarantee acceptance by

intended users. In this study, the combination of high expert-validation scores and positive student responses suggests that the product was both technically and pedagogically acceptable in the pilot context.

The positive responses can also be interpreted through the characteristics of Game-Based Learning. Wordwall transformed assessment activities into a more interactive experience by combining questions with game-like formats and direct interaction with digital content. Such features may help make assessment less monotonous and provide greater opportunities for students to participate. This interpretation is consistent with Zakaria et al. (2025), who reported that game-based learning media can support motivation and active engagement, and with Aulia (2025), who found that Wordwall's interactive features can foster students' enthusiasm for learning. Nevertheless, the present findings specifically demonstrate positive student perceptions of the developed product; they should not be interpreted as independent evidence that Wordwall itself caused increased motivation or engagement because these variables were not tested using a comparative design.

Changes in Learning Outcomes Following Implementation

The learning-score results provide additional evidence regarding the performance of the developed assessment during classroom implementation. Students' mean scores increased from 64.4 on the pretest to 92.1 on the post-test, representing a descriptive increase of 27.7 points. The corresponding N-Gain of 72.29% was classified as *Effective* according to the interpretation criterion adopted in the study. These results demonstrate substantial improvement in students' scores during the implementation period and complement the expert-validation and student-response findings.

From a pedagogical perspective, the observed improvement can plausibly be understood in relation to the active-learning opportunities provided during implementation. Wordwall required students to respond to questions, complete interactive activities, and engage directly with Marketing Fundamentals content. Such activities are compatible with constructivist principles, in which learners actively process information through interaction with learning tasks rather than functioning solely as recipients of teacher explanations (Nurhuda et al., 2023). The game-based characteristics of the platform may also provide an environment conducive to repeated participation and engagement. This interpretation is consistent with Widiana (2022), who emphasized the potential of game-based learning to support learning interest and conceptual understanding, and Purba and Simanullang (2025), who reported positive learning outcomes associated with students' active involvement in game-based learning environments.

However, the improvement should be interpreted cautiously. The study employed a single-group pretest-post-test pilot involving 35 students without a control group. Consequently, the N-Gain demonstrates the magnitude of score improvement between the two measurements but cannot establish that the improvement was caused exclusively by the Wordwall-based assessment. Other influences occurring during the learning process cannot be ruled out. Therefore, the term *Effective* in the present study refers specifically to the adopted N-Gain classification rather than to experimentally established causal effectiveness. Future research employing a control or comparison group would provide stronger evidence regarding whether Wordwall-based interactive assessment produces learning gains beyond those achieved through conventional assessment practices.

Taken together, the findings demonstrate three complementary qualities of the developed product: high expert-assessed feasibility, highly positive student responses, and substantial pretest-post-test score improvement during pilot implementation. The contribution of this study therefore lies in extending Wordwall beyond its common use as general instructional media by developing it as a subject-specific interactive assessment tool for Marketing Fundamentals in the Digital Business vocational context. The findings suggest that digital assessment can be designed not only to measure learning outcomes but also to provide an interactive assessment experience aligned with students' technological environment. Nevertheless, further comparative testing is required before stronger conclusions can be drawn regarding its causal effectiveness in improving learning outcomes.

IV. CONCLUSION

This study developed a Wordwall-based interactive assessment for the Marketing Fundamentals course in the Grade X Digital Business program using the ADDIE model. The development process resulted in an assessment product that met the required feasibility criteria, with validation scores of 97.5% from the subject-matter expert, 95.0% from the media expert, and 92.0% from the language expert, all classified as Highly Feasible. Students also demonstrated a highly positive response to the assessment, with an overall percentage of 92.5%, particularly in terms of feedback, ease of use, perceived benefits, and self-reflection. Learning scores increased from a pretest mean of 64.4 to a post-test mean of 92.1, with an N-Gain of 72.29%, classified as Effective according to the criterion adopted in the study. These findings indicate that the developed Wordwall-based assessment is feasible, positively received by students, and accompanied by substantial improvement in learning scores during pilot implementation. The study extends the use of Wordwall from general learning media to a subject-specific digital assessment tool for vocational education. However, because the implementation involved a single group of 35 students without a comparison group, the score improvement should not be interpreted as definitive evidence of a causal effect. Further studies using experimental or quasi-experimental designs are recommended to examine its comparative effectiveness.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this study.

AUTHOR CONTRIBUTIONS

Dwi Ayu Silvia: *Conceptualization, Methodology, Investigation, Data Collection, Formal Analysis, and Writing – Original Draft.*

Angga Martha Mahendra: *Conceptualization, Supervision, Validation, and Writing – Review & Editing. Both authors reviewed and approved the final manuscript.*

FUNDING

This research received no specific funding from any public, commercial, or not-for-profit funding agency.

ACKNOWLEDGMENT

The authors thank Universitas Negeri Surabaya and SMK Negeri 10 Surabaya for their support during the research process. Appreciation is also extended to the validators, teacher, and students who participated in the study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES

AI-assisted tools were used solely for language editing, proofreading, and improving manuscript readability. All content was reviewed and verified by the authors, who take full responsibility for the final manuscript.

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