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Improving Students' English Vocabulary Mastery through Interactive Flat Panel (IFP) at SD Tahfidz Griya Qurany

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Abstract

English vocabulary learning remains challenging for young learners, particularly in recognizing, remembering, spelling, and understanding unfamiliar words. Although digital and interactive media have been increasingly used in vocabulary instruction, evidence on the systematic integration of Interactive Flat Panel (IFP) into reflective classroom-based instruction for Grade 2 elementary learners remains limited. This study aimed to improve Grade 2 students' English vocabulary mastery through IFP-supported instruction within a reflective Classroom Action Research (CAR) framework at SD Tahfidz Griya Qurany, Bekasi. The study involved 18 second-grade students and employed the Kemmis and McTaggart CAR model through two cycles, each consisting of planning, action, observation, and reflection. Data were collected through vocabulary tests, classroom observations, and documentation. Vocabulary achievement was measured through students' ability to recognize, understand, match, spell, and use animal-related vocabulary. The findings showed progressive improvement in students' vocabulary achievement. The mean score increased from 55.4 in the pre-test to 70.4 in Cycle I and 80.7 in Cycle II. The proportion of students achieving the Minimum Mastery Criterion (KKM) of 70 increased from 0% in the pre-test to 61.1% in Cycle I and 100% in Cycle II. Classroom participation also increased from 76.67% in Cycle I to 91.67% in Cycle II. These findings indicate that IFP-supported instruction, when integrated with multimodal input, interactive tasks, collaborative activities, repeated practice, and reflective instructional adaptation, was associated with improved vocabulary mastery within the research context. The findings provide classroom-based evidence for integrating IFP as a multimodal and interactive medium in elementary English vocabulary instruction, while further comparative research is needed to establish its specific contribution.

Keywords: Interactive Flat Panel; Vocabulary Mastery; English Learning; Elementary School Students.

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INTRODUCTION

English vocabulary mastery is a fundamental concern in early English language learning because vocabulary knowledge provides an essential foundation for the development of listening, speaking, reading, and writing skills. However, vocabulary remains challenging for young learners, particularly when students are expected to recognize, remember, pronounce, spell, and understand unfamiliar English words. These difficulties require particular attention at the elementary-school level because young learners need concrete, repeated, meaningful, and engaging learning experiences rather than vocabulary instruction that depends primarily on memorization. Previous research has demonstrated that interactive learning activities can facilitate vocabulary development among young learners. Chamsuparoke and Charubusp (2021), for example, found that interactive games supported participation and vocabulary learning among Grade 2 young EFL learners. Similarly, technology-mediated games have been reported to improve English vocabulary learning achievement and motivation among Indonesian primary-school learners (Sukenasa et al., 2020). These findings indicate that vocabulary learning should provide opportunities for students to actively encounter and practice new words rather than merely memorize isolated vocabulary

The classroom context of the present study revealed a similar problem. Preliminary observations at SD Tahfidz Griya Qurany, Bekasi, showed that Grade 2 students experienced difficulties in recognizing, remembering, pronouncing, spelling, and understanding English vocabulary, particularly vocabulary related to animals. Students also demonstrated limited participation and confidence during oral vocabulary activities, while their daily learning results during the first semester of the 2025/2026 academic year indicated that their vocabulary

mastery had not yet reached the expected level. These conditions suggest that students need learning activities that provide repeated exposure to vocabulary while allowing them to see, hear, pronounce, recognize, spell, and understand words through meaningful classroom interaction. For young learners, such opportunities are particularly important because their attention and understanding can be strengthened when abstract linguistic forms are connected with concrete and engaging learning experiences.

The observed difficulties also highlight limitations associated with vocabulary instruction that relies predominantly on teacher explanation, textbook exercises, repetition, translation, or memorization. Although these practices can introduce students to new words, they may provide limited opportunities for learners to interact directly with vocabulary through different sensory and communicative modes. Elementary students can easily lose attention when classroom activities become monotonous, whereas varied and interactive activities can encourage more active participation. Games, songs, visual materials, quizzes, and interactive tasks therefore offer pedagogically relevant opportunities to make vocabulary practice more engaging. Rahayu and Utami (2023), for instance, demonstrated the potential of Wordwall-based interactive media to stimulate elementary students' interest and motivation in English vocabulary learning. Together with the findings of Chamsuparoke and Charubusp (2021), these studies suggest that the classroom problem is not merely low vocabulary achievement but also the need to transform vocabulary instruction from predominantly passive word learning into an interactive process involving recognition, pronunciation, spelling, meaning-making, and repeated practice.

Technology-assisted learning provides further opportunities to create such learning experiences because digital environments can integrate visual, auditory, textual, and interactive elements within a single instructional setting. Technology-assisted vocabulary learning has demonstrated substantial benefits compared with instruction without technological support. Hao et al. (2021), through a meta-analysis of 45 studies involving 2,374 EFL learners from preschool to college, reported a substantial overall effect of technology-assisted vocabulary learning and indicated its potential contribution to vocabulary retention. More recent research in Indonesian elementary-school contexts similarly demonstrates the relevance of multimodal and interactive digital media. Dewi et al. (2026) reported the integration of multimodal video to support vocabulary mastery among first-grade primary students, while Octhavia and Astutik (2026) found that interactive media encouraged participation, facilitated students' understanding of word meanings, and created a more engaging vocabulary-learning environment. These findings suggest that technology becomes pedagogically meaningful when it enables learners to experience vocabulary through multiple modes of representation and active participation.

One technology that provides these multimodal and interactive affordances is the Interactive Flat Panel (IFP). An IFP enables teachers to integrate text, pictures, audio, video, animation, and touch-based activities within a single classroom environment. In vocabulary instruction, these features can be used to present word-picture associations, provide audio-supported pronunciation, facilitate spelling activities, conduct interactive quizzes, and allow students to manipulate learning materials directly on the screen. Unlike conventional display media that primarily present information, an IFP can function as an interactive instructional space in which students actively respond to learning materials. Recent empirical evidence supports its potential. Arif and Hikmah (2026) reported an increase in English vocabulary scores among 33 early-childhood learners following IFP-based learning, with mean scores increasing from 10.36 in the pretest to 13.57 in the posttest. However, their study employed a pre-experimental one-group pretest-posttest design without a control group, meaning that the findings represent initial evidence of improvement rather than definitive causal evidence. More broadly, IFP has also begun to be implemented as an interactive medium in other educational contexts, indicating increasing pedagogical interest in this technology.

Nevertheless, the availability of IFP does not automatically ensure meaningful vocabulary learning. The more important scientific question concerns how its multimodal and interactive affordances are pedagogically integrated into classroom instruction to address young learners' vocabulary difficulties. This distinction is important because the educational contribution of technology depends not merely on the device itself but on the instructional activities designed around it. Recent evidence has already extended IFP research into

vocabulary-focused Classroom Action Research. Putra et al. (2026), for example, investigated IFP integration to improve vocabulary acquisition among 31 seventh-grade students through two Classroom Action Research cycles following the Kemmis and Taggart model. Their study was motivated by low initial proficiency and student motivation associated with conventional instructional approaches. This emerging evidence confirms the potential of IFP for vocabulary learning while simultaneously demonstrating that the use of IFP itself can no longer be regarded as the primary novelty of a study.

A more specific research gap therefore lies in the learner context and instructional design. Previous research has investigated interactive games (Chamsuparoke & Charubusp, 2021), technology-mediated vocabulary games (Sukenasa et al., 2020), interactive digital platforms such as Wordwall (Rahayu & Utami, 2023), multimodal learning materials (Dewi et al., 2026), and IFP-based vocabulary learning among early-childhood and secondary-school learners (Arif & Hikmah, 2026; Putra et al., 2026). However, evidence concerning the systematic integration of IFP into English vocabulary instruction for Grade 2 elementary learners through reflective Classroom Action Research cycles remains comparatively limited. In particular, further classroom-based evidence is needed to demonstrate how multimodal input, interactive tasks, collaborative participation, repeated vocabulary practice, observation, and reflection can be combined and progressively adapted to respond to the learning needs of young elementary students.

The present study addresses this gap in the context of Grade 2 students at SD Tahfidz Griya Qurany, Bekasi. Based on the identified classroom difficulties, IFP was selected not simply because it represents a contemporary digital technology, but because its multimodal and touch-based features correspond to the pedagogical needs of young vocabulary learners. The instructional activities integrate visual presentation, audio-supported pronunciation, word-picture matching, spelling activities, interactive quizzes, and classroom interaction. This design provides students with repeated opportunities to encounter vocabulary through different forms while actively participating in learning. More importantly, these activities are implemented within Classroom Action Research cycles of planning, action, observation, and reflection, allowing weaknesses identified during one cycle to inform instructional adaptations in the subsequent cycle. Thus, technology functions as part of a reflective instructional process rather than as an isolated classroom device.

Accordingly, the novelty of this study lies not in introducing IFP as a new learning technology, but in proposing and empirically implementing an instructional model that integrates Interactive Flat Panel within a reflective Classroom Action Research framework by combining multimodal input, interactive tasks, collaborative activities, repeated practice, and instructional adaptation to improve young learners' vocabulary mastery. This positioning extends existing IFP research by focusing on Grade 2 elementary learners and by examining vocabulary improvement as part of an iterative process of classroom intervention and pedagogical reflection. Based on the identified classroom problem, pedagogical rationale, and research gap, this study aims to improve Grade 2 students' English vocabulary mastery through the integration of Interactive Flat Panel (IFP) within a reflective Classroom Action Research framework at SD Tahfidz Griya Qurany, Bekasi.

METHOD

Research Design

This study employed Classroom Action Research (CAR) to improve the English vocabulary mastery of second-grade students through the use of an Interactive Flat Panel (IFP). The research adopted the cyclical model proposed by Kemmis and McTaggart, which consists of four interconnected stages: planning, action, observation, and reflection. This model was selected because it allows the researcher to identify classroom problems, implement an instructional intervention, observe its implementation and outcomes, and subsequently use the reflection findings to improve the next cycle. Thus, the CAR design was appropriate for examining not only whether students' vocabulary mastery improved but also how the instructional process could be continuously adapted to respond to students' learning difficulties.

The research was conducted in two cycles, with each cycle consisting of two meetings. The first cycle was implemented to establish the initial effectiveness of IFP-supported

vocabulary instruction and to identify students' difficulties during the implementation. The second cycle was conducted after reflecting on the findings from Cycle I, particularly difficulties related to vocabulary recognition, pronunciation, spelling, and students' interaction with the IFP. The instructional activities in Cycle II were therefore adjusted based on the results of Cycle I. The research was considered successful when at least 70% of the students achieved the school's Minimum Mastery Criterion (KKM) of 70 and demonstrated active participation in the learning process.

Participants and Research Setting

The participants were 18 second-grade students at SD Tahfidz Griya Qurany, Bekasi. The research focused on English vocabulary learning, particularly vocabulary related to the topic "Animals." The study involved the English teacher as a collaborator during the implementation and observation of the classroom action research. The students constituted the main participants because the intervention was specifically designed to address their vocabulary learning difficulties, while the collaborating English teacher supported classroom observation and provided additional information regarding students' participation and learning behavior. Data sources consisted of the students, the collaborating English teacher, and research documents such as lesson plans, observation sheets, field notes, photographs, students' worksheets, and vocabulary test results.

Research Procedure

The intervention followed the four stages of the Kemmis and McTaggart CAR model in each cycle: planning, action, observation, and reflection. In the planning stage, the researcher prepared lesson plans, animal vocabulary materials, IFP-based learning activities, observation sheets, field notes, documentation procedures, and vocabulary tests. The learning materials included animal names such as *elephant, lion, monkey, turtle, bird, ant, rabbit, camel, fish,* and *cat*. The researcher also established the criteria of success before the intervention was implemented, namely the achievement of a minimum score of 70 by at least 70% of the students and active participation during the learning process.

In the action stage, the IFP was used as the main instructional medium to provide students with interactive and multimodal vocabulary learning experiences. Students were first introduced to animal vocabulary through pictures displayed on the IFP and were provided with audio-supported pronunciation. They then repeated the vocabulary individually and collectively. The learning activities subsequently involved touchscreen-based tasks, including matching English words with animal pictures, drag-and-drop activities, completing missing letters, and writing vocabulary directly on the screen using a stylus. Interactive quizzes were also incorporated to provide students with opportunities to recall and apply the vocabulary. These activities were designed to provide repeated exposure to vocabulary through visual, auditory, and interactive modes while encouraging students to participate directly in the learning process.

The observation stage was conducted simultaneously with the action stage. Students' participation, interaction, attention, enthusiasm, pronunciation, vocabulary recognition, spelling, cooperation, confidence, and use of the IFP were observed using a structured observation checklist. The observation instrument contained 15 indicators, each scored on a four-point scale from 1 to 4. The indicators covered students' interaction with the IFP, use of the audio feature, participation in drag-and-drop activities, vocabulary recognition and understanding of meaning, pronunciation, spelling, matching activities, participation, confidence, enthusiasm, and cooperation. Each indicator was scored according to the level of observable student behavior during the learning activity. A score of 1 indicated the lowest level of observed participation or performance, whereas a score of 4 represented the highest level. The maximum observation score was therefore 60 (15 indicators × 4 points).

To strengthen observer consistency, the classroom observation was conducted collaboratively with the English teacher. Before observation, the researcher and the collaborating teacher discussed the observation indicators, scoring criteria, and observable behaviors so that both observers had a common understanding of the instrument. The same observation indicators and scoring scale were applied across Cycle I and Cycle II. The observation results were then compared and discussed after each meeting to identify differences in interpretation and reach agreement on the recorded classroom behaviors. This

procedure was used to reduce subjectivity in classroom observation and to strengthen the consistency of the observational data.

In the reflection stage, the researcher and the collaborating teacher analyzed the results obtained from the vocabulary tests and classroom observations to identify the strengths and weaknesses of the intervention. The reflection focused on students' vocabulary achievement, participation, pronunciation, spelling, recognition of vocabulary meanings, and interaction with the IFP. The results of the reflection were then used to revise the lesson plans and learning activities for the subsequent cycle. In particular, difficulties identified during Cycle I became the basis for improving the instructional activities in Cycle II. Thus, the second cycle was not a repetition of the first cycle but an instructional improvement based on evidence obtained from the preceding cycle.

Research Instrument

Two main instruments were used to measure the outcomes and implementation of the intervention: a vocabulary achievement test and a classroom observation checklist. The vocabulary test was designed to measure students' mastery of the target animal vocabulary introduced during the intervention. The test was developed based on five vocabulary indicators: (1) identifying the meaning of English vocabulary, (2) matching English words with appropriate pictures, (3) recognizing animal vocabulary, (4) spelling English vocabulary correctly, and (5) using vocabulary appropriately in simple language contexts. These indicators were selected to reflect both receptive and productive aspects of elementary vocabulary learning.

The vocabulary test consisted of [insert the actual number of test items] items. The test included vocabulary tasks that corresponded to the learning materials taught through the IFP. Examples of the assessment tasks included: "Look at the picture and choose the correct word," "Match the animal picture with the correct English word," "Complete the missing letters in the word *elephant*," and "Write the correct English word for the animal shown in the picture." These item formats were designed to assess students' ability to recognize, understand, recall, and produce the target vocabulary rather than merely reproduce words through rote memorization.

Each correctly answered vocabulary item received a score of 1, while an incorrect answer received a score of 0. The students' total scores were then converted into a score on a 0–100 scale using the following formula: Student Score = (Number of Correct Answers / Total Number of Items) × 100

The resulting scores were compared with the school's Minimum Mastery Criterion (KKM) of 70. Students obtaining a score of 70 or above were classified as having achieved the minimum mastery criterion, whereas students obtaining a score below 70 were classified as not yet achieving the criterion. At the class level, the intervention was considered successful when at least 70% of the students achieved a score of 70 or above.

Before implementation, the vocabulary test and observation checklist were reviewed through expert judgment to establish content validity. The validation process focused on the relevance of the test items and observation indicators to the learning objectives, the appropriateness of the vocabulary for Grade 2 students, the clarity of item instructions, the correspondence between the items and the target vocabulary, and the suitability of the observation indicators for capturing students' classroom participation.

Data Collection and Data Analysis

Data were collected through vocabulary tests, classroom observations, interviews, field notes, and documentation. The vocabulary tests consisted of a pre-test administered before the intervention and post-tests administered at the end of Cycle I and Cycle II. The tests measured students' ability to identify vocabulary meanings, match English words with appropriate pictures, recognize animal vocabulary, spell English words correctly, and use vocabulary appropriately in simple language contexts. The same assessment framework was maintained across the measurement points to enable comparison of students' vocabulary mastery before and after the implementation of the intervention.

The quantitative data from the vocabulary tests were analyzed descriptively by comparing students' mean scores and the percentage of students who achieved the KKM of 70 across the pre-test, Cycle I, and Cycle II. The percentage of students achieving mastery

was calculated using the following formula: Percentage of Mastery = (Number of Students Achieving KKM / Total Number of Students) × 100%

Students' classroom participation was analyzed using the observation scores and converted into percentages. The observation percentage was calculated by comparing the total score obtained by students with the maximum possible observation score using the following formula: Observation Percentage = (Obtained Observation Score / Maximum Observation Score) × 100%

In Cycle I, the observation score was 46 out of a maximum of 60, corresponding to 76.67%. The same scoring and conversion procedure was applied to the observation data obtained in Cycle II. The results from both cycles were compared to determine changes in students' participation and classroom engagement following the instructional improvements.

The qualitative information obtained from interviews, field notes, and classroom observations was analyzed descriptively to complement the quantitative findings. The qualitative data were used to identify students' difficulties, classroom responses to the IFP-based activities, and changes in students' participation and learning behavior across the two cycles. The qualitative findings were then compared with the vocabulary test results to provide a more comprehensive interpretation of the effectiveness of the intervention.

To strengthen the credibility of the findings, the study employed method triangulation, source triangulation, expert judgment, and collaborative observation. Method triangulation involved comparing information obtained from vocabulary tests, classroom observations, interviews, field notes, and documentation. Source triangulation compared information obtained from Grade II students, the English teacher as collaborator, and research documents. Expert judgment was used to review the content relevance and clarity of the research instruments before implementation. Collaborative observation involved the participation of the English teacher during the CAR process. These procedures were intended to strengthen the credibility of the findings by comparing evidence obtained through different methods and sources and by reducing potential subjectivity in classroom observation.

RESULTS AND DISCUSSION

Result

Initial Condition of Students' Vocabulary Mastery

The initial condition of students' English vocabulary mastery was identified through a pre-test administered to 18 second-grade students at SD Tahfidz Griya Qurany. The pre-test was conducted before the implementation of Interactive Flat Panel (IFP)-supported instruction and was intended to determine the students' initial ability to recognize and understand English vocabulary related to animals. The results showed that the students' vocabulary mastery was still relatively low. The mean score obtained by the students was 55.4, and none of the 18 students achieved the Minimum Mastery Criterion (KKM) of 70. Thus, the percentage of students achieving the predetermined mastery criterion was only 0%.

This initial condition provided an important basis for implementing classroom action research. The students experienced difficulties in several aspects of vocabulary learning, including recognizing English words, understanding their meanings, pronouncing words, and spelling vocabulary correctly. These difficulties indicated that vocabulary instruction needed to provide students with repeated exposure and opportunities to interact directly with learning materials. In this context, the IFP was introduced as an instructional medium that combined visual, auditory, and interactive elements. The intervention was therefore designed not merely to display vocabulary but also to enable students to hear pronunciation, observe pictures, manipulate words, and participate in interactive tasks. The vocabulary assessment itself focused on identifying meanings, matching words with pictures, recognizing animal vocabulary, spelling words, and using vocabulary appropriately.

Results of Cycle I

Cycle I consisted of two meetings and was implemented through the four stages of classroom action research: planning, action, observation, and reflection. During the planning stage, the researcher prepared the lesson plans, animal vocabulary materials, IFP activities, observation instruments, and evaluation instruments. The learning activities focused on

introducing animal vocabulary and helping students recognize and pronounce the target words through the IFP.

During the implementation of Cycle I, students were introduced to animal vocabulary through pictures and English words displayed on the IFP. They listened to pronunciation through the audio function and repeated the words after the teacher and the digital medium. Students were then involved in interactive touchscreen activities, including listening to pronunciation, matching vocabulary with pictures, performing drag-and-drop activities, and completing missing letters. For example, students were asked to complete a partially displayed word such as "C _ M _ L" into "CAMEL." These activities allowed students to interact directly with the vocabulary materials rather than relying exclusively on teacher explanation.

The observation results indicated that students were already actively involved in the learning process, although several aspects still required improvement. The observation instrument consisted of 15 indicators, with each indicator scored from 1 to 4. The total observation score obtained in Cycle I was 46 out of a maximum score of 60, corresponding to 76.67%. Students demonstrated relatively positive participation in listening to pronunciation, paying attention to pictures, performing drag-and-drop activities, matching words with pictures, and participating in activities using the IFP. However, lower scores were observed in vocabulary recognition, pronunciation, and the use of the stylus. Some students also remained confused about the meanings of several vocabulary items.

The vocabulary post-test at the end of Cycle I showed a substantial improvement compared with the pre-test. The students' mean score increased from 55.4 to 70.4, representing an increase of 15.0 points. Furthermore, 11 of the 18 students (61.1%) achieved the KKM of 70, while seven students had not yet reached the criterion. Although the result demonstrated clear improvement, the success criterion had not yet been achieved because the research required at least 70% of students to reach the KKM. Therefore, the researcher continued the intervention into Cycle II.

Results of Cycle II

Cycle II was designed based on the reflection results from Cycle I. The main problems identified in the first cycle were students' difficulties with spelling, vocabulary recognition, and unequal participation. Consequently, the activities in Cycle II were modified to provide more opportunities for students to practice spelling, classify vocabulary, cooperate with peers, and interact directly with the IFP. The researcher introduced more collaborative activities, including a Team Games Tournament, together with multi-touch activities using the IFP.

One of the main activities in Cycle II was the Spelling Race. In this activity, scrambled letters were displayed on the IFP, and group representatives were asked to arrange the letters into correct animal vocabulary. For example, students arranged "B–E–E" into "BEE" and "F–I–S–H" into "FISH." The group score was displayed directly on the IFP. This activity provided students with repeated opportunities to recall vocabulary and pay attention to the sequence of letters while simultaneously encouraging cooperation and positive competition.

The second major activity was the Quiz Bowl, which utilized the multi-touch or split-screen function of the IFP. Two students from different groups competed to identify an animal based on the sound played by the teacher. Students had to listen carefully and quickly tap the appropriate animal picture on the screen. The activity therefore integrated listening, vocabulary recognition, rapid response, and direct interaction with the digital medium.

The observation results demonstrated further improvement in students' participation. The total observation score increased from 46 in Cycle I to 55 in Cycle II, while the percentage increased from 76.67% to 91.67%, representing an increase of 15 percentage points. Improvements were particularly visible in students' participation, cooperation, confidence, listening, and enthusiasm. The team-based activities also provided students with more opportunities to interact with classmates while using the IFP.

The vocabulary post-test administered after Cycle II showed another improvement. The students' mean score increased from 70.4 in Cycle I to 80.7 in Cycle II, representing an additional increase of 10.3 points. More importantly, all 18 students (100%) achieved the KKM of 70. Therefore, the success criterion of the classroom action research was achieved in Cycle II.

Overall Improvement in Vocabulary Mastery

The overall development of students' vocabulary mastery can be observed by comparing the pre-test, Cycle I, and Cycle II results. The mean score increased progressively from 55.4 in the pre-test to 70.4 in Cycle I and 80.7 in Cycle II. Thus, the total improvement from the initial condition to the end of Cycle II was 25.3 points. The proportion of students achieving the KKM also increased substantially, from 0% in the pre-test to 61.1% in Cycle I and 100% in Cycle II.

Table 1. Overall Improvement in Vocabulary Mastery

Stage	Mean Score	Students Achieving KKM	Percentage
Pre-test	55.4	0 of 18	0%
Cycle I	70.4	11 of 18	61.1%
Cycle II	80.7	18 of 18	100%

The improvement in learning outcomes occurred alongside an improvement in students' classroom activity. Students' activity increased from 76.67% in Cycle I to 91.67% in Cycle II. These findings indicate that the improvement was not limited to test performance but was accompanied by increased involvement in the learning process.

Discussion

The findings of this study indicate that the implementation of Interactive Flat Panel (IFP)-supported instruction was associated with a progressive improvement in the English vocabulary mastery of second-grade students. The mean score increased from 55.4 in the pre-test to 70.4 in Cycle I and 80.7 in Cycle II. In terms of mastery achievement, the proportion of students reaching the Minimum Mastery Criterion (KKM) of 70 increased from 0% before the intervention to 61.1% in Cycle I and 100% in Cycle II. This improvement suggests that vocabulary instruction became more accessible when students were provided with opportunities to learn through visual, auditory, and interactive experiences. This finding is consistent with the meta-analysis conducted by Hao et al. (2021), which examined 45 studies involving 2,374 EFL learners and found a large overall effect of technology-assisted vocabulary learning compared with non-technology-assisted instruction (g = .845). The authors also reported that technology-assisted instruction could contribute to vocabulary retention, although its effectiveness depended on factors such as device type, learning context, game conditions, and assessment format. Thus, the present findings provide classroom-based evidence that appropriately designed technology-supported activities can facilitate vocabulary learning among young EFL learners.

One important explanation for the improvement is the multimodal nature of the IFP activities implemented in this study. During Cycle I, students were not only shown written vocabulary but were also exposed to animal pictures, audio pronunciation, touchscreen activities, word-picture matching, drag-and-drop tasks, and missing-letter exercises. Such activities provided repeated opportunities for students to connect the visual representation of an animal with its English lexical form and pronunciation. This finding is in line with Dewi et al. (2026), who investigated multimodal video integration in Indonesian primary English classrooms and reported that structured multimodal vocabulary instruction could support vocabulary mastery among first-grade students. Their study emphasized the importance of rich multimodal input in stimulating vocabulary growth among young learners. The similarity between the two studies lies in the use of multiple modes of representation rather than relying exclusively on verbal explanation. However, the present study extends this approach by incorporating direct touchscreen interaction, allowing students to manipulate learning materials rather than simply watching or listening to them.

The results further demonstrate that the effectiveness of the IFP was closely related to the nature of the instructional activities rather than to the technology itself. In Cycle I, students' vocabulary scores improved, but the learning process still revealed difficulties in vocabulary recognition, pronunciation, spelling, and the use of the stylus. The observation score reached 76.67%, indicating relatively active participation, but several aspects still required improvement. This finding is important because digital technology does not automatically guarantee effective learning. Chamsuparoke and Charubusp (2021), in their study of Grade 2 young EFL learners, found that interactive games were more supportive of participation and

vocabulary learning when they used concrete vocabulary, colorful images, sound and music, an appropriate level of difficulty, and scaffolding. They also emphasized that games still require teacher guidance and appropriate instructional planning. The present study supports this argument because the improvement became more pronounced after the teacher modified the activities based on the problems identified in Cycle I.

The development from Cycle I to Cycle II demonstrates the importance of reflection in classroom action research. Based on the difficulties identified in Cycle I, the researcher redesigned the activities to provide greater emphasis on spelling, vocabulary recognition, collaboration, and active participation. The Spelling Race required students to arrange scrambled letters into correct animal words, while the Quiz Bowl required students to identify animal pictures based on sounds and respond by touching the appropriate picture on the IFP. These modifications were followed by an increase in the mean score from 70.4 to 80.7 and an increase in mastery from 61.1% to 100%. The finding is comparable with Sukenasa et al. (2020), who found that a technology-mediated board game improved English vocabulary achievement among 67 primary school students and also encouraged students' learning motivation. Their findings suggest that technology becomes more pedagogically meaningful when it is embedded in interactive and game-based learning experiences. In the present study, therefore, the improvement in Cycle II can reasonably be interpreted as the combined result of digital interaction, repeated vocabulary exposure, teacher scaffolding, collaborative learning, and instructional revision.

Another significant finding concerns students' learning participation. The observation score increased from 46 out of 60 (76.67%) in Cycle I to 55 out of 60 (91.67%) in Cycle II, representing an increase of 15 percentage points. The improvement was particularly visible in students' cooperation, confidence, listening, enthusiasm, and willingness to participate in IFP-based activities. In Cycle II, the team-based Spelling Race and Quiz Bowl required students to take turns, cooperate with group members, respond to questions, manipulate the touchscreen, and compete to obtain points. This result corresponds with Chamsuparoke and Charubusp (2021), who found that carefully selected interactive games could increase participation among low-participating Grade 2 EFL learners. It is also consistent with Sukenasa et al. (2020), whose technology-mediated board game encouraged young learners' motivation alongside vocabulary achievement. Therefore, the present findings suggest that interactive digital media may contribute not only to the cognitive dimension of vocabulary learning but also to students' behavioral engagement in the classroom.

The improvement in vocabulary mastery can also be understood from the way the IFP enabled students to practice different components of word knowledge. The vocabulary assessment in this study covered identifying word meanings, matching English words with pictures, recognizing animal vocabulary, spelling words correctly, and using vocabulary appropriately. The learning activities similarly provided students with opportunities to recognize, listen to, pronounce, spell, and manipulate vocabulary. This is relevant because vocabulary learning among young learners should not be reduced to memorizing isolated word translations. The results of Rahayu and Utami (2023) concerning Wordwall-based digital media likewise demonstrate the relevance of interactive digital activities in English vocabulary instruction at the elementary school level. Their study developed Wordwall-based vocabulary learning media for fifth-grade students and highlighted the potential of interactive digital activities to stimulate students' interest and motivation in vocabulary learning. Although the digital platforms and student grade levels differ, both studies indicate that interactive digital environments can provide additional opportunities for learners to engage with vocabulary beyond conventional presentation and repetition.

The findings are particularly relevant when compared with recent research specifically examining Interactive Flat Panel technology. Arif and Hikmah (2026), for example, investigated the use of IFP for English vocabulary learning among 33 kindergarten children and found that the mean vocabulary score increased from 10.36 to 13.57 after IFP-based learning. Their study provides recent evidence that IFP can support vocabulary development among young learners, although it used a one-group pre-test–post-test design rather than classroom action research. Similarly, Riyadi and Ningsih (2024) examined the use of Interactive Flat Panel Display media in Social Studies learning for madrasah students and demonstrated the relevance of IFP as an educational medium in Indonesian school contexts.

The present study therefore contributes to this emerging body of research by focusing specifically on English vocabulary learning among second-grade elementary school students and by implementing IFP through a two-cycle Classroom Action Research design. Its contribution is not the claim that IFP alone produces vocabulary gains, but that IFP can be effectively integrated into an iterative pedagogical process in which instructional activities are continuously adapted to students' learning difficulties.

Overall, the findings indicate that the improvement in students' vocabulary mastery was closely connected to the integration of interactive technology with purposeful pedagogical activities. The mean vocabulary score increased by 25.3 points, from 55.4 in the pre-test to 80.7 in Cycle II, while the percentage of students achieving the KKM increased from 0% to 100%. At the same time, classroom participation increased from 76.67% to 91.67%. These results strengthen previous findings that technology-assisted and game-based learning can support vocabulary development among young EFL learners (Hao et al., 2021; Sukenasa et al., 2020; Chamsuparoke & Charubusp, 2021). Nevertheless, the findings should be interpreted within the methodological boundaries of classroom action research. Because the study did not employ a control group or inferential statistical testing, the results demonstrate improvement within the research context rather than establishing that IFP independently caused the observed gains. The main contribution of this study is therefore the demonstration that an IFP can function as an interactive instructional medium when combined with multimodal input, game-based activities, teacher scaffolding, collaborative learning, and reflective modification across classroom action research cycles. This provides a practical model for elementary English teachers who seek to integrate digital technology into vocabulary instruction while maintaining active student participation.

CONCLUSION

This study demonstrates that Interactive Flat Panel (IFP)-supported instruction was associated with improved English vocabulary mastery and classroom participation among second-grade students at SD Tahfidz Griya Qurany. Vocabulary achievement increased progressively across the research cycles, while classroom participation also improved. The findings suggest that the contribution of IFP was not derived from the technology itself, but from the purposeful integration of its visual, auditory, and touchscreen affordances with repeated vocabulary practice, interactive tasks, collaborative activities, teacher scaffolding, and reflective instructional adaptation. Thus, the study contributes to elementary English pedagogy by illustrating how IFP can function as part of a multimodal and interactive learning environment that is responsive to young learners' vocabulary-learning needs.

Practically, the findings suggest that elementary English teachers can use IFP to support vocabulary presentation, pronunciation practice, word-picture association, spelling, quizzes, and collaborative activities, provided that these technological features are aligned with clear learning objectives and appropriate pedagogical strategies. Teachers should therefore view IFP as an instructional medium rather than as a substitute for effective teaching and interaction. Future research should involve larger and more diverse samples, different school contexts, longer-term vocabulary retention, and comparative or quasi-experimental designs to examine the specific contribution of IFP more rigorously. Because this study employed Classroom Action Research without a control group or inferential statistical testing, the findings should be interpreted as context-specific evidence of instructional improvement rather than definitive causal evidence that IFP alone produced the observed gains.

RECOMMENDATION

Based on the findings of this study, teachers are recommended to utilize Interactive Flat Panel (IFP) as an interactive instructional medium in English vocabulary learning by combining visual, auditory, touchscreen, game-based, and collaborative activities that encourage active student participation. Teachers should also provide appropriate guidance and scaffolding, particularly for students who experience difficulties in recognizing, pronouncing, or spelling vocabulary. For future researchers, it is recommended to conduct studies with larger samples, different grade levels, longer intervention periods, and more rigorous research designs, such as quasi-experimental studies with control groups and inferential statistical analysis, to further examine the effectiveness of IFP in English vocabulary learning.

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