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Enhancing Student Engagement and Reading Comprehension of Twice-Exceptional Students with ADHD through Picture Books and Differentiated Instruction: A Classroom Action Research

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ABSTRACT

This study investigated the use of digital picture books supported by differentiated instruction to enhance student engagement and vocabulary-based reading comprehension in a Grade 1–2 inclusive English classroom. The study focused on twice-exceptional (2e) students with Attention Deficit Hyperactivity Disorder (ADHD) characteristics who experienced difficulties maintaining attention and understanding vocabulary during reading activities. This study employed Classroom Action Research (CAR). The participants were five students in a mixed Grade 1–2 inclusive classroom at SD Sinar Kasih Tomohon. Data were collected through a student engagement observation sheet and a vocabulary-based reading comprehension test. The findings showed improvements in both student engagement and vocabulary-based reading comprehension. The mean student engagement score increased from 2.04 in Cycle 1 to 2.84 in Cycle 2, indicating a higher level of participation, attention, and involvement in classroom activities. Students' vocabulary-based reading comprehension also improved from 55% in Cycle 1 to 84% in Cycle 2. These improvements suggest that digital picture books provided meaningful visual support for vocabulary learning, while differentiated instruction helped address students' diverse learning needs and encouraged active participation. The study concludes that the use of digital picture books supported by differentiated instruction can enhance student engagement and vocabulary-based reading comprehension among twice-exceptional (2e) students with ADHD characteristics in an inclusive English classroom. The study suggests that inclusive classrooms effectively support twice-exceptional (2e) students through

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differentiated instruction, visual materials, and individualized scaffolding, emphasizing responsive teaching rather than curriculum modification alone.

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1. Introduction

Inclusive education aims to provide equitable learning opportunities for all students, including those with diverse learning needs. In inclusive classrooms, teachers are expected to provide appropriate support that enables every student to participate and learn successfully. This perspective aligns with Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD), which emphasizes the importance of scaffolding in helping learners accomplish tasks beyond their independent abilities. In English language learning, successful learning outcomes are influenced by instructional support and learning opportunities that accommodate students' individual needs (Liando, 2009).

One group that often requires additional support is twice-exceptional (2e) students with Attention Deficit Hyperactivity Disorder (ADHD). Although these students may demonstrate academic strengths, they frequently experience difficulties with attention, self-regulation, and sustained engagement during classroom activities (Barkley, 2015; Kałdonek-crnjaković, 2020; Navarro-Arana et al., 2025). Such challenges may affect their participation and academic performance, particularly in reading activities that require concentration and vocabulary understanding.

Classroom observations conducted by the researcher in a mixed Grade 1–2 inclusive English classroom revealed that several twice-exceptional ADHD students struggled to maintain attention during reading lessons (see Kałdonek-Crnjaković, 2024; Marashi & Dolatdoost, 2016; Suhani et al., 2023). They were easily distracted, required frequent reminders, and experienced difficulties understanding new vocabulary and simple reading texts. Vocabulary knowledge plays a crucial role in reading comprehension because students need to understand word meanings to construct meaning from texts (Nation, 2001). According to Sianturi et al. (2025), a positive relationship between vocabulary mastery and reading comprehension among English language learners. Consequently, difficulties in vocabulary learning appeared to influence both students' engagement and their ability to comprehend texts (see also Daiu & Mihali, 2025; Kurniasari et al., 2020; Leona et al., 2021; Rebuschat et al., 2021; Zwier & Boers, 2022).

To address these challenges, teachers need instructional approaches that are engaging and responsive to diverse learning needs. Picture books may support vocabulary learning and reading comprehension by combining visual and verbal information, consistent with Paivio's (1986) Dual Coding Theory. In addition, differentiated instruction enables teachers to adapt learning experiences according to students' readiness, interests, and learning profiles (Tomlinson, 2017). These approaches may also support student engagement, which Fredricks et al. (2004) define as students' behavioral, emotional, and cognitive involvement in learning activities.

Previous studies have reported positive effects of picture books (Day, 2024) and differentiated instruction (Langelaan et al., 2024; Qorib, 2024; Riyanita et al., 2024;

Yunaini et al., 2024)on young learners. However, Classroom Action Research (CAR) as a systematic approach to improving teaching practices in inclusive classrooms, particularly for students with ADHD and multiple abilities, remains limited. The cyclical process of planning, implementation, observation, and reflection allows for the continuous refinement of teaching strategies based on student learning responses. This demonstrates that action research can serve not only as a research methodology but also as an effective model for teacher professional development and evidence-based classroom improvement. Therefore, this Classroom Action Research investigates how digital picture books supported by differentiated instruction can enhance student engagement and vocabulary-based reading comprehension in a Grade 1–2 inclusive English classroom.

2. Research Method

2.1 Research Design

This research employed Classroom Action Research (CAR), following the framework established by Kemmis et al. (2014), which includes stages of planning, action, observation, and reflection. The research was carried out in two cycles to enhance student participation and vocabulary-focused reading comprehension by utilizing digital picture books and tailored instruction within an inclusive English classroom.

2.2 Research Setting and Participants

The study was conducted at SD Sinar Kasih Tomohon, an inclusive Grade 1–2 English classroom implementing the Merdeka Curriculum. The participants were five twice-exceptional (2e) students with ADHD characteristics. These students showed good academic potential but experienced difficulties in maintaining attention and understanding vocabulary during reading activities. The classroom teacher acted as the researcher and implemented the intervention throughout the study.

2.3 Research Procedure

The study was carried out in two action research cycles. In Cycle 1, digital picture books and differentiated instruction were introduced to support vocabulary learning. Students participated in guided reading activities, vocabulary practice, and picture-based tasks. Observations and test results were used to identify areas for improvement.

Based on the reflection from Cycle 1, several adjustments were made in Cycle 2. Instructions were simplified, activities were organized into smaller steps, and additional support was provided through modeling, guided practice, and reinforcement. The revised strategies were then implemented and evaluated.

2.4 Instructional Intervention

Teacher-developed digital picture books created using Canva and PowerPoint were used as the main learning media. The materials contained simple vocabulary, short sentences, and visual illustrations related to pet animals. Differentiated instruction was applied by providing different levels of support according to students' learning needs.

Students participated in guided reading, picture–word matching activities, picture-selection tasks, and oral responses.

2.5 Research Instruments

Two instruments were used to collect quantitative data: a student engagement observation sheet and a vocabulary-based reading comprehension test.

1) Student engagement observation sheet

Student engagement was observed using five indicators adapted from Fredricks et al. (2004): attention, participation, responsiveness, task completion, and persistence. Each indicator was rated on a four-point Likert scale ranging from 1 (very low) to 4 (very high). Details of each indicator are presented in Table 1.

Table 1. Details of Students' Engagement Observation Indicators

Aspect	Indicators
Attention	Maintains focus for 5–10 minutes; not easily distracted by stimuli; maintains eye contact with teacher/materials; regains focus after redirection
Participation	Shows willingness to participate in activities; responds to teacher questions; joins group/pair activities; actively engages in tasks
Responsiveness	Follows teacher instructions appropriately; completes tasks with guidance; seeks clarification when needed; responds to feedback
Task Completion	Completes tasks on time; finishes worksheets properly; shows effort in completing tasks; submits work as instructed
Persistence	Continues working despite difficulty; maintains effort until tasks are completed; does not give up easily; remains engaged over time

2) Vocabulary-based reading comprehension test

The Vocabulary-Based Reading Comprehension Test measured students' understanding of basic English vocabulary. The test focused on pet animal vocabulary taught during the intervention, such as hamster, guinea pig, canary bird, and otter. The test consisted of two sections: picture–word matching and picture selection. Each section contained 10 items, resulting in a total of 20 items. The same test format, vocabulary focus, and scoring procedures were used in both cycles. Each correct answer received one point, while incorrect answers received zero points. Scores were converted into percentages using the following formula:

$$(Total\ Correct\ Answers \div 20) \times 100$$

The scoring guide for the vocabulary-based reading comprehension test is presented in Table 2.

Table 2. Vocabulary-Based Reading Comprehension Test Scoring Guide

Component	Items	Description	Scoring
Word Recognition	10	Identify correct vocabulary	1 point per correct answer
Picture-Word Matching	10	Match words with pictures	1 point per correct answer

Total	20	Combined score	Max = 20
Percentage	-	Score conversion	(Score ÷ 20) × 100

2.6 Data Collection and Analysis

Data were collected through classroom observations and vocabulary tests in each cycle. Student engagement was observed during learning activities, while the Vocabulary-Based Reading Comprehension Test was administered at the end of each cycle.

The data were analyzed using descriptive quantitative analysis. Student engagement scores were calculated using mean scores and interpreted using the categories shown in Table 3. The use of mean scores and categorical interpretation is commonly applied in educational research to describe students' levels of engagement and learning performance (Creswell & Poth, 2018).

Vocabulary test scores were converted into percentages and interpreted based on the Phase A English Learning Outcomes of the Merdeka Curriculum and the school's assessment criteria. The results from Cycle 1 and Cycle 2 were compared to identify changes in student engagement and vocabulary-based reading comprehension. To support the credibility of the findings, data were collected from two sources: student engagement observations and vocabulary test results across two research cycles.

Table 3. Student's Engagement Level Interpretation

Mean Score	**Level**	**Interpretation**
3.26 – 4.00	High	Very strong engagement in learning activities
2.51 – 3.25	Moderate–High	Good engagement with minor inconsistencies
1.76 – 2.50	Moderate–Low	Limited engagement requiring support
1.00 – 1.75	Low	Very low engagement and passive behavior

This classification framework was used to interpret students' engagement level in both Cycle 1 and Cycle 2. This allowed students' engagement level to be analyzed and compared consistently across the two cycles (Brookhart, 2013; Arikunto, 2018). Vocabulary test scores were converted into percentages and interpreted based on the Phase A English Learning Outcomes of the Merdeka Curriculum and the school's assessment criteria. The achievement level classification is presented in Table 4.

Table 4. School-Based Achievement Level

Percentage Score	**Level**	**Interpretation**
91–100%	Strong Achievement	Excellent performance demonstrating high attainment of learning outcomes
76–90%	Good Achievement	Good performance with minor errors and inconsistencies
60–75%	Moderate Achievement	Basic performance with partial attainment of learning outcomes
<60%	Low Achievement	Poor performance indicating insufficient attainment of learning outcomes

The results from Cycle 1 and Cycle 2 were compared to identify changes in student engagement and vocabulary-based reading comprehension. Because the study involved a small number of participants, the findings were interpreted descriptively based on individual and overall student progress.

3. Results

This Classroom Action Research involved five twice-exceptional (2e) Grade 1-2 students with ADHD characteristics in an inclusive school. The study conducted teacher-developed digital picture books and differentiated instruction across two Kemmis et al. (2014) action research cycles to enhance student engagement and vocabulary-based reading comprehension. Data were collected based on observations and vocabulary tests.

1. Cycle 1 Results

In Cycle 1, the researcher used digital picture books and differentiated instruction in the form of guided reading activities to help students learn vocabulary in an inclusive English classroom. Visual aids, guided questions, repetition and teacher support were provided to meet the various needs of students' learning needs, especially twice-exceptional (2e) students with ADHD characteristics.

Student engagement was evaluated based on five indicators, namely attention, participation, responsiveness, task completion, and persistence. The overall mean engagement score was 2.04, indicating a moderate-to-low level of engagement (see Table 5) Students showed better performance in attention and task completion, while participation, responsiveness, and persistence were still limited. Persistence received the lowest score, indicating that many students struggled to stay focused and continue working throughout the lesson.

Table 5. Student's Engagement Scores (Cycle 1)

Indicator	**S1**	**S2**	**S3**	**S4**	**S5**	**Average**
Attention	3	3	2	2	1	2.2
Participation	3	3	2	1	1	2.0
Responsiveness	3	3	2	1	1	2.0
Task Completion	3	3	2	2	1	2.2
Persistence	3	2	2	1	1	1.8
Mean Score	3.0	2.8	2.0	1.4	1.0	2.04

Vocabulary-based reading comprehension was measured through word recognition and picture–word matching activities. The average score was 55%, which fell into the low achievement category (Table 6). Students achieved slightly better results in picture–word matching than in word recognition, suggesting that they could understand vocabulary more easily when visual support was available but still had difficulty recognizing words independently.

Table 6. Vocabulary Based Reading Comprehension Test Result (Cycle 1)

Student	Matching	Recognition	Total	Percentage	Interpretation
S1	8	7	15	75%	Moderate
S2	7	6	13	65%	Moderate
S3	6	5	11	55%	Low
S4	6	4	10	50%	Low
S5	3	3	6	30%	Low
Average	6	5	11	55%	Low

Overall, the results of Cycle 1 show that digital picture books and guided reading helped students begin to learn new vocabulary and participate in classroom activities. However, additional support and more effective differentiated instruction were still needed to strengthen student engagement and improve vocabulary comprehension.

2. Cycle 2 Results

Cycle 2 was carried out after reflecting on the results of Cycle 1. Several changes were made to improve the learning process, especially in the use of digital picture books and differentiated instruction. The aim was to help students stay engaged during lessons and improve their understanding.

The lessons continued to focus on animal vocabulary, including small pets such as hamsters, guinea pigs, otters, and hedgehogs. To make learning easier, instructions were given more clearly, and activities were broken down into smaller steps. Students also received more guidance, practice opportunities, and encouragement throughout the lessons.

During the activities, students read the digital picture book together with the teacher, discussed new words, and completed picture-selection and word–picture matching tasks. Different levels of support were provided based on students' needs. Some students worked more independently, while others received additional prompts and guidance from the teacher.

The results showed that students were more engaged in Cycle 2. The overall engagement score increased from 2.04 in Cycle 1 to 2.84. (Table 7). Students participated more actively during discussions and were more willing to answer questions. They also showed better focus during learning activities and were able to complete tasks with less support than before.

Table 7. Student Engagement Scores (Cycle 2)

Indicator	S1	S2	S3	S4	S5	Average
Attention	3	3	3	2	2	2.6
Participation	4	3	4	3	2	3.2
Responsiveness	3	3	3	3	2	2.8
Task Completion	4	3	4	2	2	3.0
Persistence	3	3	2	3	2	2.6
Mean Score	3.4	3.0	3.2	2.6	2.6	2.84

Students' vocabulary comprehension also improved. The average test score increased from 55% in Cycle 1 to 84% in Cycle 2 (Table 8). Most students performed well in both matching and recognition tasks. They were able to connect words with pictures more accurately and showed a better understanding of the target vocabulary.

Table 8. Vocabulary Based Reading Comprehension Test Result (Cycle 2)

Student	Matching	Recognition	Total	Percentage	Interpretation
S1	9	9	18	90%	Strong Achievement
S2	10	9	19	95%	Strong Achievement
S3	9	8	18	85%	Good Achievement
S4	8	8	16	80%	Good Achievement
S5	7	7	14	70%	Moderate Achievement
Average	**8.6**	**8.2**	**16.8**	**84%**	Good Achievement

Classroom observations supported these results. Students appeared more confident and needed fewer reminders to stay on task. They followed instructions more easily and completed activities with greater independence. Compared with Cycle 1, fewer distractions were observed during lessons, and students remained involved in the activities for longer periods.

Overall, Cycle 2 showed clear progress in both student engagement and vocabulary comprehension. The combination of digital picture books, clearer learning procedures, and differentiated support helped create a more effective learning experience for students in the inclusive classroom (Cf. Qorib, 2024).

The results of Cycle 2 showed clear improvement compared to Cycle 1. Student engagement increased from 2.04 to 2.84, with students participating more actively, responding more confidently, and completing tasks more independently. Vocabulary-based reading comprehension also improved, with the average score rising from 55% to 84%. These findings suggest that the use of digital picture books, supported by differentiated instruction and appropriate scaffolding, helped improve both student engagement and vocabulary learning in the inclusive English classroom.

4. Discussion

The findings showed improvements in both student engagement and vocabulary-based reading comprehension from Cycle 1 to Cycle 2. As students became more actively involved in learning activities, their vocabulary achievement also increased. This result supports Fredricks et al. (2004), who emphasized the role of engagement in promoting academic achievement.

The use of digital picture books appeared to support vocabulary learning by providing visual representations of target words. This finding is consistent with Paivio's (1986), which suggests that learning is enhanced when verbal and visual information are presented together. The improvement in students' vocabulary achievement is also consistent with the findings of Mogea (2022), who reported that the use of instructional strategies can enhance students' vocabulary learning (see also Rahmanu & Molnár, 2024;

Sinaga & Tarigan, 2024). Furthermore, vocabulary mastery plays an important role in English language learning and serves as a foundation for language development (Sahmawati et al., 2024). Therefore, the visual support provided through digital picture books may have helped students recognize, understand, and retain target vocabulary more effectively. In addition, differentiated instruction helped address diverse learning needs by providing appropriate support and learning opportunities for students (see Qorib, 2024; Riyanita et al., 2024; Yunaini et al., 2024). This supports Tomlinson's (2017) view that differentiated instruction promotes participation and learning success in diverse classrooms.

Overall, the improved implementation of digital picture books and differentiated instruction contributed to higher engagement and better vocabulary-based reading comprehension among students in the inclusive Grade 1–2 English classroom. The study demonstrates that inclusive classrooms can successfully support twice-exceptional (2e) students when appropriate instructional strategies are implemented. Rather than relying solely on curriculum modification, teachers can improve learning outcomes through carefully designed instructional adaptations, including visual learning materials, differentiated tasks, and individualized scaffolding. This suggests that effective inclusion depends not only on student placement but also on responsive teaching practices that recognize diverse learning characteristics.

5. Conclusion

This Classroom Action Research demonstrated that the integration of teacher-developed digital picture books with differentiated instruction effectively improved both student engagement and vocabulary-based reading comprehension among twice-exceptional (2e) Grade 1–2 students with ADHD characteristics in an inclusive English classroom. Across the two action research cycles, student engagement increased substantially, as reflected in improvements in attention, participation, responsiveness, task completion, and persistence.

The findings suggest that the instructional refinements introduced in Cycle 2, including clearer learning procedures, differentiated scaffolding, structured learning activities, and increased opportunities for guided practice, enabled students to participate more actively, maintain attention for longer periods, and complete learning tasks with greater independence. The visual and contextual features of digital picture books also supported vocabulary acquisition by strengthening the connection between words and their meanings, while differentiated instruction accommodated the diverse learning needs of students in the inclusive classroom.

Overall, the study indicates that combining digital picture books with differentiated instruction provides an effective pedagogical approach for improving engagement and vocabulary learning among young learners with diverse educational needs. The findings further demonstrate the value of iterative classroom action research in refining instructional practices to create more inclusive, engaging, and effective English language learning environments.

As for limitations and future research, this study involved only five students from one inclusive classroom, which limits the generalizability of the findings. In addition, the study focused on vocabulary-based reading comprehension and did not examine other aspects of English language learning. Future research may involve larger samples and different educational contexts to further examine the effectiveness of digital picture books and differentiated instruction. Further studies may also investigate their impact on other language skills, such as speaking, reading comprehension, and writing.

Conflict of Interest

None

Authors' contribution

The authors make substantial contributions to the conception and design of the study. The authors take responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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