

Students' Engagement in AI-Supported English Language Learning: A Qualitative Case Study of Senior High School Students in Palopo City

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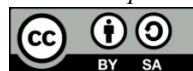
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ABSTRACT

Artificial intelligence (AI) is increasingly used in English as a foreign language (EFL) classrooms to provide immediate feedback, personalized assistance, and interactive learning. However, evidence of its impact on students' engagement, particularly in Indonesian senior high schools, remains limited. This qualitative case study explored students' behavioral, emotional, and cognitive engagement during AI-mediated English learning in Palopo City. The study provides practical insights into integrating AI into classroom instruction while maintaining the teacher's pedagogical role. Data were collected through four classroom observations involving 30 eleventh-grade students, semi-structured interviews with one English teacher and eight purposively selected students, and supporting documentation. The data were analyzed using thematic analysis. The findings indicate that AI supported engagement across three interrelated dimensions. Behavioral engagement was most evident, as students paid greater attention, responded more quickly, and participated more actively in classroom activities. Emotional engagement was reflected in students' enjoyment, confidence, excitement, and pride as they received feedback and recognized their learning progress. Cognitive engagement emerged when students compared responses, reflected on mistakes, reconsidered their understanding, and discussed alternative answers with peers. Nevertheless, AI implementation also presented challenges, including pressure from task pace, overreliance on AI-generated responses, unstable internet access, and unequal device availability. The study concludes that AI can strengthen behavioral, emotional, and cognitive engagement in EFL learning when used as a pedagogical tool supported by clear instructional objectives and active teacher guidance. Effective integration requires structured reflection, responsible AI use, and classroom practices that encourage students to think critically beyond AI-generated responses.

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1. Introduction

Artificial intelligence (AI) has become one of the most influential innovations in contemporary education, including English as a foreign language (EFL) learning. In language classrooms, AI-supported tools are commonly used to provide instant feedback, generate language examples, support translation and vocabulary learning, and create more flexible opportunities for practice. Recent reviews show that AI in language education has moved beyond isolated technological experimentation and has begun to shape broader teaching and learning practices, particularly in relation to writing support, feedback, learner perceptions, and classroom integration (Li et al., 2025; Peña-Acuña & Corga Fernandes Durão, 2024; Wiboolyasarini et al., 2025).

Within EFL contexts, AI has shown potential to support speaking, writing, reading, vocabulary learning, and learner autonomy. For example, AI-powered chatbots can provide interactive language practice and reduce the fear of making mistakes when students are given clear instructional guidance (Du & Daniel, 2024; Wiboolyasarini et al., 2025). Studies on AI-assisted English learning also report improvements in motivation, confidence, and willingness to participate, although these outcomes depend strongly on task design, teacher scaffolding, and classroom conditions (Liu et al., 2025; Zheng, 2024). These findings indicate that AI may influence not only language performance but also the quality of students' engagement in classroom activities.

Student engagement is generally understood as a multidimensional construct that includes behavioral, emotional, and cognitive dimensions (Fredricks et al., 2004). Behavioral engagement refers to students' visible participation, attention, effort, and involvement in learning tasks. Emotional engagement concerns students' feelings toward learning, such as enjoyment, interest, confidence, anxiety, or pride. Cognitive engagement involves deeper mental investment, including reflection, self-regulation, problem solving, and the willingness to revise one's understanding. This multidimensional view is important in AI-supported learning because students may look active while merely copying or relying on AI-generated answers. Therefore, engagement needs to be examined not only through participation but also through students' emotions and thinking processes.

Recent literature highlights both the promise and the risk of AI for engagement. A systematic review of ChatGPT and student engagement found that AI can support participation, satisfaction, and understanding, but it may also lead to disengagement, overreliance, and reduced critical thinking if students use it passively (Lo et al., 2024). Similarly, studies on AI and student engagement emphasize that the impact of AI depends on how learners perceive, control, and use the tool in relation to their learning goals (Abu Khurma et al., 2024; Fauziah et al., 2025). These findings suggest that engagement in AI-supported learning should be studied as a situated classroom process rather than as a direct effect of technology alone.

Although studies on AI in education are expanding rapidly, empirical evidence from senior high school EFL classrooms remains limited, especially in Indonesian local contexts. Much of the existing research still focuses on higher education, writing support, or general perceptions of AI use (Li et al., 2025; Nelson et al., 2025). School-level research has begun to emerge in different contexts, including studies of AI-supported reading and speaking, but there is still a need for context-sensitive inquiry into how students actually participate, feel, and think when AI is integrated into English learning (Al-Nawaiseh, 2026; Dai et al., 2026). This gap is particularly relevant in Palopo City, where the use of digital tools in English

classrooms is developing alongside practical challenges such as internet access, device availability, and varied student readiness.

The novelty of this study lies in its simultaneous examination of behavioral, emotional, and cognitive engagement in an authentic senior high school EFL classroom where AI was integrated into actual learning activities. Unlike previous studies that have mainly focused on students' perceptions, general acceptance of AI, or language performance outcomes, this study explores how students visibly participate, emotionally respond, and cognitively process learning tasks during AI-mediated English instruction. By examining these three dimensions together, the study offers a more holistic understanding of student engagement and provides classroom-based evidence of how AI functions not only as a digital tool but also as part of the pedagogical interaction among teachers, students, tasks, and learning conditions.

Based on this background, the present study investigates students' engagement in AI-supported English language learning among senior high school students in Palopo City. The study is guided by two research questions: (1) How do students demonstrate behavioral, emotional, and cognitive engagement during AI-supported English learning? and (2) What challenges emerge during the implementation of AI-supported English learning in the classroom? By addressing these questions, the study contributes to the literature on AI integration in Indonesian EFL education by providing empirical evidence from an authentic school-level classroom context. It also offers practical implications for English teachers who seek to use AI responsibly to enhance student engagement while maintaining teacher guidance, structured reflection, and critical learning practices.

2. Method

Type of Research/Design

This study employed a qualitative case study design to explore students' engagement in English language learning using AI in a natural classroom context. A case study was considered appropriate because the research focused on a bounded learning situation involving a particular group of senior high school students and their experiences during AI-supported English learning (Creswell & Poth, 2018; Yin, 2018). The qualitative approach enabled the researcher to examine not only observable classroom behavior but also students' feelings, perceptions, and reflections during the learning process. Therefore, this design was suitable for understanding how behavioral, emotional, and cognitive engagement appeared in an authentic classroom setting where AI was integrated into English learning activities.

Subject/Population and Sample

The study was conducted in an eleventh-grade English as a foreign language (EFL) classroom at a senior high school in Palopo City, Indonesia. The observed class consisted of 30 students who participated in AI-supported English learning activities. The students were senior high school learners aged approximately 16 to 17 years. From this class, eight students were selected for semi-structured interviews using purposive sampling. The selection considered variation in classroom participation, willingness to share learning experiences, and involvement in AI-supported activities. One English teacher was also selected because of direct involvement in planning and facilitating the AI-supported learning sessions. To protect confidentiality, the teacher and students are referred to using codes in the presentation of findings.

Instrument

Data were collected through classroom observations, semi-structured interviews, and supporting documentation. Each instrument was selected to obtain different but

complementary evidence of student engagement. Classroom observation was used to capture students' visible participation and classroom behavior during AI-supported English learning. This instrument was particularly useful for identifying behavioral engagement, such as attention, participation, willingness to answer, peer interaction, and responses to classroom tasks. It also helped record observable emotional and cognitive responses, including students' reactions to feedback, discussion with peers, and attempts to revise their answers.

Semi-structured interviews were conducted with one English teacher and eight students to obtain deeper information that could not be fully captured through observation. The interviews were used to explore participants' experiences, perceived benefits, difficulties, feelings, and reflections during AI-supported English learning. Student interviews provided insight into how learners interpreted and responded to AI use, while the teacher interview provided information about lesson planning, classroom facilitation, and challenges in integrating AI into English learning.

Supporting documentation was used to contextualize and strengthen the observation and interview data. The documents included learning tasks, teacher materials, lesson plans, and students' classroom outputs related to AI-supported English learning. These documents helped the researcher understand how AI was integrated into classroom activities and provided additional evidence for interpreting students' engagement patterns.

Procedure/Data Collection

The data collection procedure was conducted in four main stages: preparation, classroom observation, interviews, and documentation review. In the preparation stage, the researcher coordinated with the English teacher to determine the learning schedule, classroom context, and AI-supported activities to be observed. The researcher also prepared observation notes, interview guidelines, and a documentation checklist based on the indicators of behavioral, emotional, and cognitive engagement used in this study.

During the classroom observation stage, the researcher conducted four observations while the teacher implemented AI-supported English learning activities. The observations were carried out in the natural classroom setting without interrupting the teaching and learning process. During each observation, the researcher recorded students' attention, participation, peer interaction, emotional reactions, responses to teacher questions, and ways of responding to AI-generated feedback. Observation notes were written during and immediately after the class to ensure that important classroom events were captured accurately.

After the observations, semi-structured interviews were conducted with one English teacher and eight purposively selected students. The interviews were used to obtain deeper information about participants' experiences, perceived benefits, difficulties, feelings, and reflections during AI-supported English learning. The student interviews helped clarify how students understood and responded to the use of AI, while the teacher interview provided information about lesson planning, classroom facilitation, and challenges in integrating AI into English learning activities.

Supporting documentation was then collected to strengthen and contextualize the observation and interview data. The documentation included lesson plans, learning tasks, teacher materials, and students' classroom outputs related to AI-supported English learning. These documents were reviewed to understand how AI was integrated into the lesson and to provide additional evidence for the engagement patterns identified in the classroom.

To maintain research ethics, the identities of the school, teacher, and students were kept confidential. Participants were represented using codes in the presentation of findings. The collected data were then organized according to their sources before being analyzed thematically.

Data Analysis

The collected data were analyzed using thematic analysis. The analysis followed several stages: familiarizing with the data, identifying initial codes, grouping similar codes, developing themes, reviewing the themes, and interpreting the findings in relation to the research questions (Braun & Clarke, 2006). The coding process was guided by three dimensions of student engagement: behavioral engagement, emotional engagement, and cognitive engagement. Codes that did not fit these three categories but appeared repeatedly were grouped as implementation challenges. The frequencies of coded excerpts were used as descriptive indicators to show the relative salience of each theme, not as statistical generalizations.

To ensure the credibility and trustworthiness of the qualitative findings, data triangulation was applied by comparing information obtained from classroom observations, semi-structured interviews, and supporting documentation. Themes were developed based on patterns that appeared consistently across different data sources. For example, classroom behaviors observed during AI-supported activities were checked against students' interview responses and relevant classroom documents. This triangulation process helped reduce reliance on a single source of data and strengthened the credibility of the interpretation.

3. Research Findings

The findings indicate that AI-supported English language learning was associated with student engagement across behavioral, emotional, and cognitive dimensions. Behavioral engagement appeared as the most dominant dimension, followed by emotional and cognitive engagement. In addition, the data revealed several implementation challenges, particularly related to task pressure, overdependence on AI, and technical constraints. The findings are presented thematically below.

In this section, documentary data were used to support and contextualize the findings obtained from classroom observations and interviews. The documentation, including learning tasks, teacher materials, and students' classroom outputs, helped confirm how AI was integrated into the learning activities and how students responded to AI-generated feedback through task completion, answer revision, and classroom products. Thus, the documentary evidence served as supporting data to strengthen the interpretation of students' behavioral, emotional, and cognitive engagement.

Behavioral Engagement

Behavioral engagement emerged as the most visible form of engagement during AI-supported English learning. Classroom observations showed that 24 of the 30 students demonstrated active participation during the observed sessions. Students paid closer attention to learning tasks, responded more quickly to teacher questions, and showed greater willingness to participate compared with their usual classroom behavior. The analysis identified 30 coded excerpts related to behavioral engagement, including active participation, focused attention, quick responses, and peer involvement.

The teacher explained that AI-supported activities helped draw the attention of students who were usually quiet in regular lessons: "Some students who rarely speak during regular lessons become very active when we use AI in class." This statement was supported by a student who said, "I usually feel shy to answer questions in front of the class, but when we use AI, I can respond more confidently." These excerpts suggest that AI created a learning condition in which students felt more prepared to participate because they could check, compare, or refine their answers before sharing them.

Behavioral engagement was also evident in students' physical and verbal participation. During the observed sessions, students looked at the AI-supported tasks attentively, asked

questions about word meanings, responded to feedback, and discussed possible answers with peers. Rather than remaining passive, many students attempted to complete the tasks and showed interest in the immediate response provided by the AI tool. The documentary data supported this finding by showing that students completed AI-mediated classroom tasks and produced learning outputs related to the activities observed in class. These documents confirmed that students' participation was not limited to verbal responses but also appeared in their written task completion and classroom products. This indicates that AI-supported learning encouraged visible classroom involvement, especially when the teacher connected the tool to clear learning tasks.

Emotional Engagement

Emotional engagement was reflected in students' enjoyment, excitement, confidence, and sense of achievement during AI-supported learning. Approximately 23 students showed positive emotional responses, such as smiling, laughing, reacting spontaneously to feedback, and expressing satisfaction when their answers improved. The analysis generated 25 coded excerpts related to emotional engagement, including enjoyment, motivation, confidence, and pride.

One student stated, "I feel more excited when using AI because it makes learning more interesting." Another student added, "When I see my progress improving, I feel proud." These responses indicate that AI-supported learning was not only perceived as a technical activity but also as an experience that affected students' feelings toward English learning. The immediate feedback and interactive nature of AI appeared to reduce hesitation and helped some students view English tasks as more manageable.

Documentation also helped contextualize students' emotional engagement. Some students' classroom outputs showed attempts to improve their answers after receiving feedback, which reflected their satisfaction and confidence in completing the tasks. The teacher materials and learning tasks further indicated that AI was used in activities that allowed students to receive immediate responses and revise their work. This supported the interview findings that students felt more confident and motivated when they could see their learning progress.

However, emotional engagement was not entirely positive for all students. Some students experienced pressure when they had to respond quickly or compare their answers with AI-generated alternatives. A few students also felt disappointed when their answers were repeatedly corrected. This suggests that AI can increase enthusiasm, but it can also create emotional pressure when students interpret feedback as a sign of failure rather than as part of the learning process.

Cognitive Engagement

Cognitive engagement appeared when students used AI feedback to reflect on their answers, compare alternatives, and reconsider their understanding of English language tasks. Nineteen students demonstrated learning behaviors such as rereading questions, discussing possible answers with peers, checking vocabulary, and paying attention to feedback before making final decisions. The analysis identified 24 coded excerpts related to cognitive engagement, including reflection, comparison, interpretation, and conceptual understanding.

A student explained, "When I answer a question, I can compare my answer with other possible responses before making a decision." This statement shows that AI helped students see language learning as a process of evaluating choices rather than simply giving one answer. The teacher also reported that AI-supported activities helped identify students' misunderstandings and areas that required further explanation. In this sense, AI functioned as a support tool that helped both students and the teacher notice learning gaps more quickly.

Students' classroom outputs provided additional evidence of cognitive engagement. Several documented tasks showed that students attempted to revise, reorganize, or improve their responses after receiving AI-generated feedback and teacher guidance. These documents indicated that some students did not simply accept AI responses, but used them as input for comparing answers and refining their understanding. Therefore, the documentary evidence strengthened the observation and interview data by showing concrete traces of students' thinking processes in their written work.

Even so, cognitive engagement was less dominant than behavioral and emotional engagement. Some students focused on obtaining quick answers instead of analyzing why an answer was correct or incorrect. This pattern indicates that AI does not automatically promote deep thinking. Students need structured follow-up activities, teacher questioning, and opportunities to explain their reasoning so that AI-generated responses become a starting point for reflection rather than a shortcut to task completion.

Challenges in AI-Supported English Learning

The implementation of AI-supported English learning also involved several challenges. First, some students experienced pressure because AI-supported activities required them to respond to tasks more quickly. Although this pace made the classroom more dynamic, it also created anxiety for students who needed more time to process vocabulary, grammar, or instructions. Second, a tendency toward overdependence was observed among some students. Instead of using AI feedback to revise their thinking, they copied or accepted AI-generated responses without sufficient evaluation.

Third, technical constraints affected the learning process. Unstable internet connection and limited access to devices sometimes interrupted classroom activities and reduced students' opportunity to engage equally. These constraints show that successful AI integration depends not only on students' interest but also on the availability of infrastructure and the teacher's ability to manage classroom conditions. The documentation helped clarify these challenges by showing the types of classroom tasks assigned, the expected learning outputs, and the points at which students needed access to AI tools or digital devices. This supporting evidence helped explain why task pace, device availability, and internet access became important issues during implementation. Therefore, AI-supported learning requires pedagogical planning, digital access, and explicit guidance on responsible use.

Summary of Findings

Table 1. Summary of Student Engagement Themes

Theme	Main Indicators	Frequency of Emergence
Behavioral engagement	Active participation, focused attention, quick responses, peer involvement	30 coded excerpts
Emotional engagement	Excitement, enjoyment, confidence, motivation, pride	25 coded excerpts
Cognitive engagement	Reflection, answer comparison, feedback interpretation, conceptual understanding	24 coded excerpts
Implementation challenges	Task pressure, overdependence on AI, unstable internet, limited device access	Recurring across observations and interviews

4. Discussion

The findings show that AI-supported English learning can strengthen student engagement, particularly in the behavioral dimension. Students became more attentive, more willing to respond, and more active in classroom tasks when AI was integrated into the lesson. The coded frequencies presented in Table 1 should be understood as descriptive indicators in the thematic analysis. They represent the number of data excerpts coded under each theme and indicate the relative prominence of each engagement dimension in the qualitative data. Therefore, these frequencies are not intended as statistical measurements or generalizable quantitative results, but as supporting evidence showing which themes appeared most frequently across observations, interviews, and documentation.

The dominance of behavioral engagement suggests that AI initially functioned as an entry point for classroom participation. This finding is consistent with studies reporting that AI-powered tools can make EFL activities more interactive and accessible when they are connected to meaningful instructional goals (Du & Daniel, 2024; Wiboolyasarini et al., 2025). It also supports the view that AI can increase participation by giving students additional support before they speak or submit an answer (Fauziah et al., 2025). In this study, students' increased participation was not only reflected in verbal responses but also in their attention to tasks, peer discussion, and willingness to interact with AI-generated feedback.

Emotional engagement was also evident through students' excitement, enjoyment, confidence, and pride. These findings suggest that AI can help create a more encouraging learning atmosphere by providing immediate feedback and visible signs of progress. This aligns with research showing that AI-assisted EFL learning can influence learner emotions, motivation, and anxiety (Liu et al., 2025; Zhang & Liu, 2025; Zheng, 2024). In the present study, emotional engagement appeared to act as a bridge between classroom participation and deeper learning involvement. Students who felt more confident were more willing to participate, revisit their answers, and engage with feedback.

Cognitive engagement, however, appeared less dominant than behavioral and emotional engagement. Although students compared answers, reflected on feedback, and discussed alternatives, some of them still tended to depend on AI-generated responses. This finding supports previous reviews warning that AI may promote both engagement and disengagement depending on how students use it (Lo et al., 2024). It also resonates with research on AI-generated feedback showing that AI can support revision and reflection, but deeper learning still requires teacher verification, structured questioning, and follow-up tasks (Nelson et al., 2025; Tran, 2025). Therefore, the presence of AI does not automatically lead to critical thinking; pedagogical design determines whether students merely consume answers or engage with them critically.

The novelty of this study lies in its simultaneous examination of behavioral, emotional, and cognitive engagement in an authentic Indonesian senior high school EFL classroom. Unlike previous studies that mainly focus on students' perceptions, acceptance of AI, motivation, or language performance, this study shows how the three dimensions of engagement emerge together but not equally. Behavioral engagement was the most visible, emotional engagement supported students' willingness to participate, while cognitive engagement depended more strongly on teacher scaffolding, reflective questioning, and task design. This provides a more nuanced understanding of AI-supported EFL learning because it shows that active participation and positive emotions do not automatically indicate deep cognitive engagement.

The challenges identified in this study also confirm that AI integration is not only a technological issue but also a pedagogical and contextual issue. Students' pressure, overdependence, unstable internet connection, and limited device access may reduce the benefits of AI-supported learning. A large-scale survey on students' AI use similarly indicates

that student adoption can develop faster than institutional and pedagogical readiness (Granström & Oppi, 2025). Research on AI-supported assessment also emphasizes that learner outcomes are shaped by motivation and engagement pathways rather than by exposure to AI alone (Dai et al., 2026). These insights are relevant for Indonesian school contexts where access, guidance, and readiness may vary across classrooms.

The findings of this study can also be interpreted in relation to the broader development of AI-supported English language learning in Indonesian and international EFL contexts. The dominance of behavioral engagement indicates that AI initially functions as an entry point for participation, especially for students who may be hesitant to respond in conventional classroom interaction. In Indonesian ELT research, Kusuma et al. (2024) found that ChatGPT was used by EFL preservice teachers to support teaching content creation, instructional strategies, assessment development, and language proficiency improvement, although concerns about information quality and accuracy remained. Similarly, Taylor (2024) showed that AI-integrated ESP learning still requires teacher support, especially because learners may experience different emotional, motivational, and participation-related challenges. These studies strengthen the present finding that AI-supported engagement should be understood not merely as increased activity, but as participation shaped by classroom design, teacher mediation, and students' readiness to use AI responsibly.

Another important point is that AI-supported learning needs to be directed toward deeper forms of engagement. Although students in this study showed enthusiasm and active participation, cognitive engagement appeared less dominant than behavioral and emotional engagement. This suggests that students may become active and motivated when using AI, but they still need structured tasks that require reflection, comparison, justification, and independent decision-making. Granström and Oppi (2025), through a large-scale school-level survey, found that students often adopt AI tools faster than formal pedagogical frameworks can respond, creating a gap between tool use and critical learning. This supports the present study's argument that teacher-designed scaffolding remains essential to transform AI use from simple answer-seeking into meaningful cognitive engagement.

The findings also highlight the importance of AI literacy among both teachers and students. In this study, students' positive responses to AI were accompanied by potential risks, particularly overdependence on AI-generated answers and limited critical evaluation of AI output. Drajati et al. (2025) emphasized that Indonesian EFL teachers need stronger AI literacy, particularly in awareness, usage, evaluation, and ethics, to ensure effective classroom implementation. In a related language-learning context, Ebrahimi and Chowdhury (2025) showed that machine translation can support learner autonomy and metacognitive awareness when learners use it selectively and critically. Therefore, AI should not be positioned as a replacement for teacher explanation or student thinking. Rather, it should be integrated as a learning partner that supports feedback, exploration, and reflection while still requiring students to verify, revise, and justify their responses.

Overall, this study contributes to the literature by providing school-level qualitative evidence from an Indonesian EFL context. Its original contribution is not only in confirming that AI can support student engagement, but also in showing how behavioral, emotional, and cognitive engagement interact in classroom practice. The findings indicate that AI can make students more active and emotionally involved, but deeper cognitive engagement requires intentional pedagogical mediation. Teachers should not position AI as a replacement for instruction. Instead, AI should be used to support feedback, stimulate discussion, encourage reflection, and help students develop confidence in English learning. To strengthen cognitive engagement, teachers need to ask students to justify their answers, compare AI suggestions with their own reasoning, identify errors, and revise their responses based on clear criteria.

5. Conclusion

This study explored students' engagement in AI-supported English language learning among senior high school students in Palopo City. The main contribution of this study lies in showing that AI-supported learning influenced the three dimensions of student engagement differently. Behavioral engagement emerged as the strongest and most visible dimension, as students became more attentive, responsive, and active during classroom tasks. Emotional engagement supported this participation through enjoyment, excitement, confidence, and pride. However, cognitive engagement was less automatic and continued to depend on teacher scaffolding, structured reflection, and guided classroom tasks that encouraged students to compare answers, interpret feedback, and revise their understanding.

These findings suggest that AI can make English learning more interactive and motivating, but it does not automatically lead to deeper thinking. The use of AI may increase students' participation and confidence, yet meaningful cognitive engagement requires teachers to guide students beyond simply accepting AI-generated responses. Therefore, AI should be integrated as a pedagogical aid rather than as a substitute for teacher instruction. English teachers are encouraged to use AI not only to increase classroom participation but also to promote reasoning, reflection, independent thinking, and responsible evaluation of AI output.

The study also identified several implementation challenges, including pressure related to task pace, overdependence on AI responses, unstable internet access, and limited device availability. These challenges indicate that effective AI integration requires clear learning objectives, teacher guidance, digital access, and responsible classroom use. In this sense, the originality of the study is not merely in confirming that AI can support engagement, but in demonstrating that behavioral, emotional, and cognitive engagement develop unevenly in AI-supported EFL learning and require different forms of pedagogical support.

This study is limited to one classroom context and a small number of interview participants; therefore, the findings should not be generalized to all senior high school students. Future studies may involve more schools, compare different AI tools, or use mixed-methods designs to examine the relationship between AI-supported learning, engagement, teacher scaffolding, and English learning outcomes more comprehensively.

6. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

7. Author Contributions

A.M.S., S.R., and H conceptualized the research idea presented, collected the data, development of the theory, methodology, data organization and analysis, discussion of the results, and approval of the final version of the work. All authors confirm that they have read and approved the final version of this manuscript. The percentage contributions for the conceptualization, drafting, and revision of this paper are as follows: A.M.S.: 40%, S.R.: 30%, and H.: 30%.

8. Data Availability Statement

The authors declare that data sharing is not applicable, as no new data were created or analyzed in this study.

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