

Empowering AI for English Materials Analysis in Malaysian Primary Special Education Schools

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Abstract: This study explores the potential of Artificial Intelligence (AI) to revolutionise the analysis of English teaching materials in Malaysian primary schools, particularly among special education teachers. AI-powered tools were evaluated for their effectiveness in improving the quality and accessibility of educational materials and their future potential to address systemic challenges. A quasi-experimental research design involving 54 special education teachers was employed, with 33 participants in the experimental group using AI tools and 21 in the control group employing traditional methods. Quantitative analysis using the Mann-Whitney U test revealed a statistically significant difference in perceived effectiveness between the groups ($Z = -6.839$, $p < 0.001$), with the experimental group achieving higher rankings. Spearman's correlation analysis demonstrated a strong, significant relationship ($r = -0.939$, $p < 0.001$) between hands-on AI experience and positive perceptions of its future potential. Qualitative insights from semi-structured interviews and journal writing supported these findings, highlighting AI's ability to reduce workload, automate routine tasks, and create inclusive, culturally relevant resources. Despite its promise, barriers such as limited training, inadequate infrastructure, and policy gaps were identified. The study underscores the need for comprehensive teacher training, infrastructure investment, and policy support to realize AI's full potential in fostering an inclusive and equitable education system in Malaysia.

Keywords: materials analysis, artificial intelligence, AI-powered tools, special education, learners with disabilities

INTRODUCTION

The rapid advancement of technology continues to reshape the global educational landscape, offering innovative tools and methodologies to enhance teaching and learning. Among these innovations, Artificial Intelligence (AI) has emerged as a transformative force with the potential to address some of the most persistent challenges in education (Okunlaya et al., 2022).

In the context of English language education, particularly in primary schools, AI-powered tools can be utilised to analyse, refine, and personalise teaching materials. However, the implementation of such tools in diverse and context-specific educational settings, such as Malaysian primary schools, requires careful exploration. This study explores into the potential of empowering AI to revolutionise the analysis of English teaching materials, focusing on its effectiveness, feasibility, and alignment with the unique characteristics of Malaysia's education system.

BACKGROUND OF THE STUDY

English proficiency is a cornerstone of educational and professional success in Malaysia. As one of the primary languages taught in schools, it plays a vital role in fostering communication skills and preparing students for a globalised workforce. Despite its significance, the teaching and learning of English in Malaysian primary schools face various challenges, including disparities in teaching quality, resource availability, and the cultural relevance of materials. Traditional approaches to creating and evaluating teaching materials often involve significant time and expertise, leaving teachers in resource-limited schools at a disadvantage (Fernald et al., 2009). In this context, AI presents a unique opportunity. AI-powered tools can assist in analysing existing materials, identifying gaps, and suggesting improvements, thereby reducing the workload of educators and ensuring a higher standard of quality across all schools.

Moreover, AI has the potential to personalise materials to suit diverse learner needs, from students in urban schools to those in rural or indigenous communities. For Malaysia, where the education system caters to a linguistically and culturally diverse population, such personalization can significantly enhance inclusivity and learning outcomes. By integrating AI into the analysis of English materials, this study explores how technology can align with Malaysia's educational goals, addressing both systemic inefficiencies and learner-specific challenges.

The Material Analysis Practice among Malaysian Special Education Teachers

In Malaysian classrooms, special education teachers play a critical role in addressing the diverse needs of students with learning disabilities, including dyslexia, ADHD, and autism spectrum disorder. These teachers face unique challenges in ensuring that educational materials are accessible, relevant, and effective for learners with varying abilities. Material analysis, the process of assessing the suitability, quality, and alignment of teaching resources with curriculum standards and learner needs, is an essential part of their responsibilities. However, in the context of special education in Malaysia, this practice is influenced by various factors, including limited resources, training gaps, and systemic constraints (Hussin et al., 2020).

For learners with disabilities, well-designed educational materials are essential for fostering engagement, understanding, and skill development. Material analysis in special education involves evaluating whether teaching resources meet the specific needs of learners, align with curriculum standards, and promote inclusivity. For example, materials must cater to individual learning styles and abilities while remaining accessible to learners with physical, cognitive, or sensory impairments. Special education teachers must often adapt standard teaching materials or develop customized resources to bridge the gap between mainstream curriculum requirements and the unique needs of their students (Nor et al., 2019). This requires a deeper understanding of pedagogical principles and specialized knowledge of disabilities, which many teachers report lacking due to insufficient training and resources.

Challenges Encountered for Materials Analysis

Despite their efforts, special education teachers in Malaysia face significant challenges in effectively analysing and adapting materials. One major issue is limited access to specialised resources, particularly in rural areas where schools often lack high-quality, disability-friendly teaching materials (Ariffin et al., 2021). Many teachers rely on generic resources that are not designed to address the specific needs of students with disabilities, which compromises learning outcomes. Additionally, insufficient training in material development and analysis tailored to special education further complicates the process. Teachers frequently report feeling inadequately prepared to evaluate or modify resources for learners with disabilities, a gap highlighted in studies by Abdullah et al. (2018).

Time constraints are another significant barrier for Malaysian special education teachers. Analysing and adapting materials is a time-intensive process, and teachers, often managing diverse classroom needs, struggle to allocate sufficient time for this task. Furthermore, while technology can assist in material analysis, many schools lack the necessary infrastructure or funding to adopt such innovations. Even where technological tools are available, teachers may lack the digital literacy required to effectively use them (Hussain et al., 2022). The diverse learner profiles in special education classrooms, where students require varying levels of support, add another layer of complexity. This diversity makes it challenging for teachers to design and evaluate materials that cater to all students' needs (Zainuddin & Mahmud, 2021).

Strategies Employed by Special Education Teachers for Materials Analysis

In practice, special education teachers in Malaysia employ various strategies to analyse and adapt materials despite these challenges. One common approach is the customisation of existing resources. Teachers often modify standard textbooks or worksheets to make them more accessible, using larger fonts, simplified language, or tactile elements for students with visual impairments. They also rely on collaboration and resource-sharing with peers or professional learning communities to exchange strategies and materials. Some teachers turn to materials developed by non-governmental organizations (NGOs) or institutions specialising in special education to supplement their resources (Rahman et al., 2020). Informal assessment techniques are another tool used by special education teachers to evaluate the effectiveness of teaching materials. For instance, teachers may observe student engagement during lessons or conduct feedback sessions to understand whether the materials are meeting their intended goals. Adjustments are then made iteratively based on these observations. Additionally, where possible, teachers incorporate assistive technologies, such as screen readers or communication devices, to enhance material accessibility. However, the integration of such technologies remains inconsistent due to resource constraints (Ahmad & Karim, 2021). Despite these efforts, teachers must ensure that adapted materials align with the objectives outlined in Malaysia's National Special Education Curriculum, which emphasizes functional skills and individual development.

The Potentials of Artificial Intelligence as a Tool for Material Analysis

The introduction of AI-powered tools could significantly improve material analysis practices among special education teachers in Malaysia. AI has the potential to address many of the challenges outlined above. For instance, AI tools can enhance accessibility by identifying gaps in materials and suggesting modifications, such as converting text to speech or providing alternative formats. These tools can also save teachers valuable time by automating the analysis of large volumes of materials, enabling them to focus on instructional delivery and student

engagement. AI can further adapt materials based on individual learner profiles, considering factors such as reading level, preferred learning style, and specific disabilities (Chen et al., 2021).

AI has the potential to support teachers by serving as a professional development tool, providing real-time guidance on creating and evaluating materials that align with best practices (Ismail & Tan, 2022). This capability enables educators to refine their teaching resources more efficiently and effectively. Additionally, scaling AI tools across the education system can help Malaysia achieve consistent quality and accessibility of teaching materials in diverse school settings. However, for these benefits to materialize, challenges such as teacher training, technological infrastructure, and policy support must be addressed to ensure successful adoption.

AI tools have the capacity to automate repetitive and time-intensive tasks involved in material analysis, such as evaluating curriculum alignment, identifying accessibility issues, and suggesting modifications. For instance, AI can quickly assess whether materials adhere to standards outlined in the Malaysian National Special Education Curriculum. This automation allows teachers to focus more on pedagogical strategies and direct student interaction. According to Hussin et al. (2020), automation of routine tasks not only reduces teacher workload but also minimizes errors, ensuring a more consistent quality of materials.

Personalisation is a critical aspect of special education, where each student's needs, learning styles, and capabilities vary significantly. AI algorithms can analyse student data to adapt teaching materials accordingly. For instance, a tool could adjust the reading level of a text, simplify complex instructions, or incorporate culturally relevant examples to make the content more relatable. In the Malaysian context, where classrooms are often linguistically and culturally diverse, this level of personalization can significantly enhance student engagement and learning outcomes. Zainuddin and Mahmud (2021) note that personalised materials are particularly effective for students with learning disabilities, as they align better with individual cognitive and emotional needs.

AI has the potential to address some of the systemic challenges faced by special education in Malaysia. For instance, in resource-constrained environments, AI can democratize access to high-quality teaching materials by providing ready-made templates or recommendations tailored to specific learning objectives. Additionally, in schools with limited access to trained specialists, AI can bridge the gap by offering expert-level analysis of teaching materials. Leveraging AI tools in these contexts can help level the playing field, ensuring that students in underserved areas receive the same quality of education as those in more privileged settings (Ahmad & Karim, 2021). By empowering AI's capabilities, Malaysia can create a more inclusive and equitable education system, ensuring better learning outcomes for students with disabilities.

OALCF Checklist for Material Analysis as the Guide

In this study, the researcher will adopt the "Checklist for Evaluating Learning Materials" developed by the Ontario Adult Literacy Curriculum Framework (OALCF) to evaluate the quality and relevance of educational materials used by special education teachers. The OALCF checklist provides a systematic and comprehensive approach to assessing teaching resources across five key areas: content alignment, quality of content, effectiveness as a teaching-learning tool, ease of use, and accessibility. This framework is particularly suitable for special education as it emphasizes adaptability, learner-centric principles, and cultural relevance which are the factors critical in designing effective materials for students with diverse abilities and disabilities (OALCF, 2011).

The OALCF checklist involves evaluating materials for their curriculum alignment, clarity of objectives, inclusivity, and the ability to support task-based learning. It also considers the usability of materials for both teachers and learners, ensuring they are accessible and practical for real-world implementation. In the context of this study, the checklist will be integrated with AI-powered tools to enhance the efficiency and accuracy of the evaluation process. For example, AI can automate the identification of gaps in content, suggest modifications to improve accessibility, and provide recommendations tailored to specific learner profiles, thereby complementing the structured methodology of the OALCF checklist. Past research supports the role of such frameworks in enhancing material accessibility and usability. For instance, Ariffin et al. (2021) highlight how systematic material evaluation can address resource limitations in certain schools, while Hussain et al. (2022) emphasise the role of technology in streamlining these processes.

The adoption of the OALCF checklist aligns well with the Malaysian National Special Education Curriculum, which prioritises inclusivity, functional skills, and individual development. By combining this established framework with AI technologies, the researcher aims to generate actionable insights into the effectiveness of teaching materials and explore how AI can be integrated to enhance their quality. Additionally, the checklist's focus on cultural and contextual relevance ensures that the analysis remains sensitive to the unique needs of Malaysian learners, particularly those from diverse linguistic and cultural backgrounds. Previous studies, such as those by Chen et al. (2021), underscore the importance of culturally relevant frameworks in improving the engagement and learning outcomes of students from diverse backgrounds.

Through the use of the OALCF checklist, this study will provide a structured and replicable methodology for evaluating teaching materials in special education. It will also highlight the interactions between traditional evaluation frameworks and emerging technologies, offering a strong foundation for integrating AI into educational practices in Malaysia. The integration of Artificial Intelligence (AI) into education offers significant potential to improve teaching and learning, particularly for special education teachers in primary schools. In Malaysia, where special education teachers face challenges such as limited resources, diverse learner needs, and time constraints, AI-powered tools present an opportunity to enhance the analysis and adaptation of teaching materials. These tools can automate routine tasks, improve material accessibility, and personalise resources to meet the needs of learners with disabilities. However, the effectiveness and future potential of AI in this context remain underexplored. Given this context, the study aims to address the following research questions:

1. What is the effectiveness of AI-powered tools in improving the quality and accessibility of educational materials for special education students in Malaysian primary schools?
2. What is the future potential of AI as a tool for materials analysis among special education teachers in Malaysia, considering infrastructural, policy, and training factors?

METHODS

This section is expanded by four dimensions as participants, instrumentation, design and procedure.

Participants

To conduct this study, the researcher approached 54 special education teachers from various primary schools across Malaysia. These participants were selected from diverse regions, including urban, rural, and semi-urban areas, to ensure a broad representation of teaching contexts. This diverse sampling strategy was essential to capture the variability in resources, infrastructure, and teaching practices across the Malaysian education system (Hussain et al., 2022). The selection process ensured that the study reflects a nationwide perspective on the challenges and opportunities of integrating AI into material analysis.

Out of the 54 participants, 33 teachers were assigned to the experimental group, while the remaining 21 formed the control group. The experimental group was provided with AI-powered tools to assist in the analysis and adaptation of teaching materials, while the control group continued using traditional methods. This division was designed to compare the effectiveness of AI tools against standard practices in material analysis. According to Rahman et al. (2020), experimental designs are effective for evaluating the impact of new technologies in educational settings, as they allow for a clear assessment of their benefits and challenges.

The geographic and contextual diversity within both groups ensured that the findings reflect the broader realities of Malaysian special education, accounting for variations in technological readiness, teacher training, and resource availability. By comparing these groups, the study aims to provide evidence-based insights into the potential of AI as a tool for improving material analysis among special education teachers.

Instruments

In this study, the researcher utilized three instruments to gather data: a questionnaire, semi-structured interviews, and journal writing. These instruments were designed to provide a comprehensive understanding of the respondents' experiences and perceptions of using AI for material analysis in special education.

The questionnaire, which consisted of 15 items, was developed to address the study's two primary research questions. Items 1 to 10 were designed to answer the first research question, focusing on the effectiveness of AI in improving the quality and accessibility of teaching materials. These questions explored aspects such as the alignment of AI-suggested materials with curriculum standards, their accessibility for students with disabilities, and their impact on teachers' workload. Meanwhile, items 11 to 15 targeted the second research question, examining the future potential of AI tools. These questions sought feedback on challenges such as infrastructure readiness, teacher training needs, and policy support for scaling AI adoption in Malaysian schools.

Semi-structured interviews were conducted to gain deeper insights into the teachers' experiences, allowing respondents to elaborate on their questionnaire responses. Additionally, journal writing provided a reflective dimension, capturing the teachers' day-to-day experiences and challenges while using AI tools. Together, these instruments ensured a robust and nuanced understanding of AI's role in material analysis.

Research Design

This study employs a quasi-experimental research design to investigate the role of AI in material analysis among special education teachers in Malaysia. Quasi-experimental designs are commonly used in educational research when randomization is not feasible, allowing for the comparison of experimental and control groups to evaluate intervention effectiveness (Creswell, 2014). In this study, the 54 special education teachers were divided into two groups:

33 in the experimental group, who utilized AI tools, and 21 in the control group, who continued with traditional methods. This approach enables the researcher to assess the impact of AI on teaching materials through a combination of quantitative and qualitative data analysis.

To address the first research question, descriptive analysis was conducted using SPSS 2.0, focusing on questionnaire items 1 to 10. This analysis provided statistical insights into the effectiveness of AI tools in improving material quality and accessibility. The Mann-Whitney U test was applied to compare responses between the experimental and control groups, as it is effective for analysing non-parametric data in educational settings (Pallant, 2020). These findings were further supported by emerging themes from semi-structured interviews and journal entries, which offered qualitative insights into teachers' experiences with AI.

For the second research question, the researcher applied Spearman rank correlation to explore the relationships between key variables identified in questionnaire items 11 to 15. This correlational analysis was complemented by qualitative data from interviews and journals, which highlighted future potential, including infrastructural and training needs. This mixed-methods approach ensures a comprehensive understanding of AI's effectiveness and potential in Malaysian special education.

Research procedure

The research procedure for this study involved a systematic and structured approach to ensure the validity, reliability, and comprehensiveness of the findings. The process began with adapting the OALCF Checklist for Material Analysis (Appendix A) to cater to the Malaysian context. The original checklist, known for its solid framework in evaluating educational materials, was modified to address the unique needs of Malaysian special education, such as cultural relevance, linguistic diversity, and alignment with the Malaysian National Special Education Curriculum. This adaptation ensured that the checklist was suitable for analysing materials designed for students with various disabilities in Malaysia.

To validate the adapted checklist, the researcher appointed experts in special education as validators. These experts, with substantial experience in curriculum development, material design, and special education pedagogy, reviewed the checklist to ensure its relevance and applicability. Their feedback was incorporated to refine the tool, enhancing its credibility and reliability. This step ensured that the checklist was not only aligned with international best practices but also responsive to the specific needs of Malaysian educators and learners.

Following validation, the researcher adapted the checklist to serve as a prompt for the AI platform (Appendix B). By embedding the checklist criteria into the AI's functionality, the researcher enabled the tool to evaluate teaching materials effectively, ensuring consistency with the principles outlined in the validated framework. This step was crucial for operationalizing the checklist within the AI tool, allowing the experimental group to engage with a standardized and evidence-based approach to material analysis.

The next phase of the study involved training the 33 teachers in the experimental group on how to use the AI tool with the adapted checklist prompt. The training sessions aimed to familiarize participants with the tool's functionality, focusing on how the checklist criteria could guide their analysis process effectively. The experimental group gained hands-on experience with the AI tool, while the 21 teachers in the control group did not receive any treatment and continued using traditional methods for material analysis. This distinction ensured a clear comparison between the two approaches. To standardize the materials used for assessment and ensure the reliability of the data collected, both groups were provided with a set of worksheets (Appendix C). These worksheets were sourced from materials prepared by BPSH (Bahagian Pengurusan Sekolah Harian), a division under the Malaysian Ministry of Education (KPM). Originally designed as remedial materials for mainstream students who did

not achieve the minimum performance level in their PBD (classroom assessment), these resources were particularly relevant for this study. During preliminary observations, the researcher discovered that many special education teachers commonly adapt and use these worksheets in their teaching. This choice of material ensured that the study reflected real-world practices, making the results more applicable to typical classroom scenarios.

The teacher would copy and paste the prompt given by the researcher in the AI-powered tool, specifically ChatGPT to be used in this research. The teacher then would read the comments given in order to identify the quality of the additional materials they will use with the learners. After completing the material analysis, participants in both groups answered a questionnaire to capture their experiences and perspectives. This step allowed the researcher to evaluate the effectiveness of the AI tool in comparison to conventional methods, offering valuable insights into the practical implications for teaching in special education contexts. To further enrich the findings, a subset of respondents was approached for semi-structured interview sessions. These interviews were designed to explore participants' experiences in greater depth, capturing insights into their challenges, perceptions, and overall reflections on the use of AI for material analysis. The qualitative data collected from these interviews complemented the quantitative findings from the questionnaire, providing a holistic view of the study's outcomes.

Finally, the researcher compiled and analysed the data using appropriate statistical and thematic analysis techniques. The results were synthesized to address the research questions, highlighting the effectiveness of AI as a tool for material analysis and its future potential in Malaysian special education. The findings were then reported, contributing to the growing body of knowledge on the integration of AI in education and offering valuable insights for policymakers, educators, and researchers.

RESULT AND DISCUSSION

The Mann-Whitney U test was conducted to compare the effectiveness of AI prompts in material analysis between the experimental group (33 participants using AI) and the control group (21 participants using traditional methods). This test was chosen due to the non-normal distribution of the data, as indicated by the normality test results run with p-value of <0.001 . The descriptive statistic revealed significant data as shown in Table 1.

Table 1: Descriptive Statistic on the Effectiveness of AI prompt in Material Analysis

	Group	N	Mean Rank	Sum of Ranks
Effectiveness of AI prompt in materials analysis	Experimental Group	33	38.00	1254.00
	Control Group	21	11.00	231.50
	Total	54		

The mean rank for the experimental group was 38.00, while the mean rank for the control group was 11.00. The sum of ranks was 1254.50 for the experimental group and 231.00 for the control group. These descriptive statistics suggest a noticeable difference in perceived effectiveness between the two groups. The experimental group, which used AI prompts, had significantly higher rankings, implying that participants found the AI prompts more effective for material analysis compared to traditional methods. However, statistical significance would need to be confirmed with inferential testing, the Mann-Whitney U test. Table 2 illustrates the The Mann-Whitney U statistic result on the effectiveness of AI prompts in the material analysis.

Table 2: The Mann-Whitney U statistic

Effectiveness of AI prompt in materials analysis	
Mann-Whitney U	.000
Wilcoxon W	231.000
Z	-6.839
Asymp. Sig. (2-tailed)	<.001
a. Grouping Variable: GROUP	

The Mann-Whitney U test was conducted to evaluate the difference in the perceived effectiveness of AI prompts in material analysis between the experimental group, the teachers who use AI and the control group, the teachers who use traditional methods. This non-parametric test was chosen due to the non-normal distribution of the data, as confirmed by the earlier normality tests. The descriptive statistics revealed substantial differences in mean ranks between the experimental group (38.00) and the control group (11.00), prompting the need for statistical testing to determine the significance of these differences.

The test yielded a Mann-Whitney U value of. The Z-score was -6.839, which is highly negative, indicating a significant separation between the distributions of the two groups. The associated Asymptotic Significance (2-tailed) value was $p = <0.001$, which is well below the conventional value of 0.05. This p-value suggests that the difference between the experimental and control groups is statistically significant, rejecting the null hypothesis that there is no difference in effectiveness between the two methods.

These results indicate that the experimental group, which utilised AI prompts for material analysis, perceived the method as significantly more effective than traditional approaches. This aligns with the descriptive statistics, where the experimental group had substantially higher mean ranks and sum of ranks compared to the control group. The findings underscore the potential of AI tools to enhance the process of material analysis, making them a valuable resource for special education teachers.

This significant result also emphasizes the importance of integrating AI into educational practices to improve efficiency and outcomes. However, while the results are promising, further research is necessary to explore the long-term impact of AI tools, as well as their applicability across diverse educational contexts in Malaysia.

Table 2: Spearman Correlations

			Future Potential of AI for Material Analysis	
Spearman's rho	GROUP	Correlation Coefficient	1.000	-.939**
		Sig. (2-tailed)	.	<.001
		N	54	54
	Future Potential of AI for Material Analysis	Correlation Coefficient	-.939**	1.000
		Sig. (2-tailed)	<.001	.
		N	54	54

** . Correlation is significant at the 0.01 level (2-tailed).

The Spearman correlation test was conducted to explore the relationship between group assignment and the perceived future potential of AI as a tool for material analysis. This analysis was aimed at addressing the second research question: *What is the future potential of AI as a tool for material analysis among special education teachers in Malaysia?*

The Spearman's rho correlation coefficient was -0.939, indicating a very strong negative correlation between the group and their perceptions of AI's future potential. The p-value (Sig. 2-tailed) was <0.001 , which is statistically significant at the 0.01 level. This result implies that

the experimental group (teachers who used AI prompts) had significantly higher perceptions of the future potential of AI for material analysis compared to the control group (teachers using traditional methods). The negative sign reflects the inverse coding of the groups in the analysis, where the experimental group was coded lower than the control group.

The findings suggest that teachers who experienced AI tools in action were more optimistic about their future potential. This optimism may stem from their direct interaction with the AI platform, which likely demonstrated its ability to streamline material analysis, improve accessibility, and save time. The control group, in contrast, lacked exposure to AI tools and thus may not have fully recognized or appreciated their potential benefits, contributing to lower ratings on this measure. The significant and strong correlation highlights the importance of hands-on experience with AI for fostering positive perceptions about its future role in education. Teachers who interact directly with AI tools are more likely to envision their scalability, effectiveness, and broader applications in addressing challenges such as material customization, accessibility, and curriculum alignment.

This finding underscores the need for comprehensive teacher training programs that provide practical exposure to AI technologies. Moreover, it points to the importance of policy and infrastructural support to facilitate AI adoption in educational settings. Without such measures, the control group's skepticism may persist among broader teaching communities, limiting the widespread adoption and integration of AI into material analysis. In conclusion, the Spearman correlation results strongly support the notion that direct experience with AI tools positively influences teachers' perceptions of their future potential. These findings reinforce the importance of implementation strategies that emphasize teacher involvement and hands-on training to realize AI's full impact in Malaysian special education.

In this study also, qualitative data collection through semi-structured interviews and journal writing complemented the quantitative findings obtained from the Mann-Whitney U test and Spearman correlation analysis. These qualitative methods provided an in-depth understanding of the participants' perceptions and experiences, allowing the researcher to explore the effectiveness of AI prompts for material analysis (research question 1) and the future potential of AI tools in Malaysian special education (research question 2). The integration of these methods ensured a holistic examination of the research objectives, bridging numerical data with personal experiences and reflections.

Interviews: Capturing Teacher Perspectives

The semi-structured interviews were designed to explore the practical implications of using AI tools for material analysis in special education. Participants from both the experimental and control groups were interviewed to gather insights into their experiences, challenges, and perceptions. For the experimental group, teachers using AI prompts, the interviews explored into how the AI enhanced their ability to analyse materials, including its role in improving alignment with curriculum standards, addressing accessibility issues, and streamlining their workflow. Participants consistently emphasised that the AI tools simplified the process by automating repetitive tasks, allowing them to focus more on creative aspects of teaching material design. Many noted that the prompts provided actionable suggestions to improve the accessibility of materials for diverse learners, particularly those with learning disabilities.

In contrast, the control group, teachers using traditional methods, shared their reliance on conventional practices, which often involved manual adjustments to ensure alignment with curriculum goals and learner needs. These participants highlighted the challenges of traditional methods, such as the time-consuming nature of the process and difficulties in adapting materials for students with specific disabilities. Some expressed curiosity about the potential

benefits of AI but remained sceptical due to their lack of hands-on experience with the technology.

Emerging themes from the interviews revealed distinct contrasts between the two groups. The experimental group reported increased confidence and efficiency in analysing materials, citing the AI's ability to identify gaps and suggest improvements in accessibility and relevance. However, some participants in this group mentioned initial challenges in understanding how to effectively integrate AI into their workflows, emphasising the need for comprehensive training and ongoing support. Conversely, the control group expressed frustration with the limitations of traditional methods and acknowledged the potential value of AI in addressing these challenges, though their lack of exposure to AI tools made them cautious about their adoption.

Journal Writing: Documenting Experiences Over Time

Journal writing added a longitudinal dimension to the qualitative data collection, capturing the participants' day-to-day experiences and reflections throughout the study. Teachers in the experimental group were asked to maintain journals documenting their use of AI prompts for material analysis. These journals provided detailed accounts of how the AI tools influenced their workflows, highlighting both benefits and challenges. Participants frequently described how AI reduced redundancy in the analysis process, improved the clarity and accessibility of materials, and enhanced their confidence in producing high-quality teaching resources. Many journal entries emphasised the AI's adaptability, noting that it could offer culturally relevant suggestions for material design, an essential feature in Malaysia's diverse educational context.

Recurring themes in the journals also underscored the efficiency gains brought by AI tools. Teachers reported that tasks that previously required significant time and effort, such as evaluating the suitability of materials for students with learning disabilities, were completed more quickly and accurately with AI assistance. Moreover, the journals revealed how the AI tools encouraged a more reflective approach to material design, prompting teachers to consider accessibility and inclusivity more systematically.

For the control group, journal writing focused on their perceptions of traditional methods and the challenges they encountered in adapting materials for special education students. These participants often described the process as labor-intensive and highlighted the difficulty of ensuring that materials met the diverse needs of their students. Despite these challenges, many control group participants expressed pride in their ability to produce effective materials through manual efforts. However, their entries also reflected a sense of curiosity about the potential benefits of AI tools, particularly in reducing workload and improving accessibility.

Effectiveness of AI Prompts in Enhancing Material Analysis

The findings from the study clearly demonstrated that AI tools significantly improved the effectiveness of material analysis when compared to traditional methods. The Mann-Whitney U test revealed that the experimental group, which utilized AI prompts, had a much higher mean rank (38.00) compared to the control group (11.00). This significant difference ($p < 0.001$) highlights the impact of AI tools in streamlining the material analysis process. Teachers in the experimental group reported feeling more confident and efficient in their workflows, as AI automated routine tasks such as identifying accessibility gaps and providing actionable suggestions. Qualitative data further reinforced these findings. Teachers in the experimental group shared during interviews that AI tools not only saved time but also improved the accuracy of their analyses. Journal entries revealed that AI tools encouraged a more structured and systematic approach to evaluating materials. For instance, many participants noted that the

AI helped them align their materials more effectively with curriculum standards, reducing the cognitive load associated with manual adjustments.

However, despite these advantages, some challenges emerged. A common theme was the adaptation period required to learn and integrate AI tools into existing workflows. Several participants mentioned that initial training sessions were insufficient, leaving them unsure of how to maximize the capabilities of the AI tools. This challenge underscores the need for comprehensive and ongoing professional development programs to help teachers build confidence in using AI. In conclusion, while the quantitative and qualitative findings highlight the transformative potential of AI in enhancing material analysis, they also reveal the importance of addressing the initial learning curve through robust training and support systems.

The Role of AI in Fostering Inclusive Education

One of the most significant findings of the study was AI's ability to foster inclusivity in the design and analysis of teaching materials. Both the experimental group's feedback and journal entries highlighted the ways in which AI tools helped identify gaps in material accessibility. Teachers frequently mentioned that AI provided recommendations for improving resources to accommodate diverse learners, including those with visual, auditory, or cognitive impairments. This aligns with global research emphasizing AI's role in promoting inclusive education. Chen et al. (2021) demonstrated how AI tools can improve the accessibility of learning materials by automating the adaptation process, such as simplifying text for students with reading disabilities or generating alternative formats like audio or tactile graphics. In the Malaysian context, where classrooms often include students from diverse linguistic and cultural backgrounds, this feature of AI is particularly valuable. Teachers shared that the AI tools they used provided culturally relevant suggestions, making the materials more relatable and effective for students.

The findings suggest that integrating AI into material analysis practices can significantly contribute to a more equitable education system. By addressing barriers to accessibility, AI tools enable teachers to design resources that cater to the needs of all learners, particularly those in special education. However, the potential of AI in fostering inclusivity is contingent upon teachers' ability to effectively use these tools, highlighting the need for both technical training and ongoing support.

Future Potential of AI for Material Analysis

The study also explored the future potential of AI tools in material analysis. The Spearman correlation analysis revealed a strong, statistically significant relationship between group assignment and perceptions of AI's future potential ($r = -0.939$, $p < 0.001$). Teachers in the experimental group, who had hands-on experience with AI tools, expressed high levels of optimism about their future scalability, adaptability, and applicability in education. In contrast, the control group, lacking direct exposure to AI, was more sceptical. During interviews, teachers in the experimental group described AI as a valuable resource for addressing systemic challenges such as material customization and curriculum alignment. Many envisioned AI tools becoming integral to professional development, providing real-time feedback and fostering reflective teaching practices. Journal entries also highlighted the scalability of AI tools, with participants noting that they could be applied across various subjects and adapted to different educational contexts. The findings underscore the importance of providing teachers with practical exposure to AI tools. Without direct experience, educators may remain uncertain about AI's benefits, limiting its adoption and integration. This aligns with global research, which shows that hands-on experience is crucial for fostering positive perceptions of emerging

technologies (Hussain et al., 2022). For AI to achieve its full potential, implementation strategies must prioritize teacher involvement and practical training.

Barriers to AI Adoption in Special Education

While the findings highlight the effectiveness and potential of AI tools, several barriers to their adoption were identified. Participants noted challenges such as insufficient training, limited infrastructure, and a lack of policy support. These barriers are consistent with previous research highlighting the difficulties of integrating technology into educational systems, particularly in resource-constrained environments (Rahman et al., 2020). A major concern raised during interviews was the inadequacy of training programs. Many teachers in the experimental group felt that the initial training sessions did not fully prepare them to use AI tools effectively. They emphasized the need for ongoing professional development that addresses both technical skills and pedagogical strategies for integrating AI into their workflows.

Another significant barrier was the lack of technological infrastructure in some schools, particularly in rural areas. Teachers reported that limited access to devices and internet connectivity hindered their ability to fully utilize AI tools. This finding highlights the need for investments in infrastructure to ensure equitable access to technology across all regions. Policy support was also identified as a critical factor. Teachers emphasized the importance of clear guidelines and funding mechanisms to facilitate the adoption of AI tools in special education. Without such support, the scalability and sustainability of AI integration remain uncertain.

By triangulating data from quantitative and qualitative sources, the study provides comprehensive answers to the research questions. The findings demonstrate that AI tools significantly enhance the effectiveness of material analysis, reducing workload and improving the quality of teaching resources. Additionally, AI has the potential to foster inclusivity in education by addressing accessibility gaps and promoting culturally relevant material design. However, the study also highlights several barriers to AI adoption, including insufficient training, limited infrastructure, and a lack of policy support. Addressing these challenges is essential for realizing the full potential of AI in Malaysian special education. Implementation strategies should prioritize teacher training, investments in infrastructure, and the development of supportive policies. Ultimately, the integration of AI into educational practices holds great promise for improving outcomes in special education. By leveraging the capabilities of AI tools and addressing systemic barriers, Malaysia can create a more inclusive, efficient, and effective education system for learners with diverse needs. These findings provide a roadmap for policymakers, educators, and researchers seeking to harness the power of AI in education.

Recommendation for Future Research

This study provides valuable insights into the integration of Artificial Intelligence (AI) in material analysis for Malaysian special education but also highlights areas for future research. Longitudinal studies are needed to assess the long-term impact of AI on teaching practices, material quality, and student outcomes. Expanding the research to diverse educational settings, including rural, indigenous, and secondary schools, could reveal how AI tools adapt to different contexts. Additionally, exploring AI's role in teacher professional development could uncover its potential to foster reflective practices and enhance pedagogical skills. Future studies could also investigate the integration of AI with assistive technologies, such as screen readers and communication devices, to further support students with disabilities. Addressing infrastructure and policy challenges remains critical, with research needed on cost-effective models for technology implementation and policy frameworks that incentivize AI adoption. Personalized learning through AI, including algorithms tailored to individual learning needs, offers another

avenue for exploration, alongside the ethical considerations of data privacy and algorithmic bias. Comparative studies on various AI tools and their effectiveness could guide educators in selecting the most suitable platforms. Finally, collaborative, cross-disciplinary research involving educators, AI developers, and policymakers could ensure the ethical and inclusive implementation of AI, paving the way for an equitable, innovative education system.

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Appendix A Adapted Checklist from OALCF Checklist for Material Analysis

CONTENT			
Criteria	Meets Expectations	Needs Improvement	Comments
Supports learner's goal path			
Reflects learner's cultural context			
Supports relevant competencies			
QUALITY OF CONTENT			
Criteria	Meets Expectations	Needs Improvement	Comments
Objectives are clear			
Content is current and relevant			
Supports principles of adult learning			
POTENTIAL EFFECTIVENESS AS A TEACHING-LEARNING TOOL			
Criteria	Meets Expectations	Needs Improvement	Comments
Material is adaptable			
Supports diverse learning styles			
Methods are sound and appropriate			
Facilitates task-based learning			
EASE OF USE			
Criteria	Meets Expectations	Needs Improvement	Comments
Easy to use for educators			
Accessible for learners			
Instructions are clear			
GENERAL COMMENT			
Comments on Strengths and Weaknesses			

Appendix B The Prompt for AI

Prompt for Material Analysis (*Generated from the Adapted Checklist for Materials Analysis*): The user will copy and paste this prompt in their AI-Powered Tools to analyse the intended additional materials.

"I am evaluating a set of educational materials intended for use in special education classrooms. Please analyse the materials based on the following criteria from the Ontario Adult Literacy Curriculum Framework (OALCF) Checklist for Evaluating Learning Materials. Provide a detailed assessment for each criterion, indicating whether the material meets expectations or needs improvement. Include specific recommendations for improvement wherever applicable. Additionally, summarize the strengths and weaknesses of the materials."

CONTENT

1. Does the material support the learner's goal path (e.g., employment, independence, further education)? Provide examples and suggestions if improvements are needed.
2. Does the material reflect the learner's cultural context and avoid biases or stereotypes? Highlight any areas of concern.
3. Does the material support relevant competencies required for the target learners? If gaps exist, propose actionable solutions.

QUALITY OF CONTENT

1. Are the objectives of the material clearly stated and aligned with learning outcomes? Identify ambiguities or areas requiring clarification.
2. Is the content current and relevant to the learners' needs? Suggest updates for outdated or irrelevant content.
3. Does the material align with adult learning principles, such as practical application and learner-centered design? Recommend enhancements for better alignment.

POTENTIAL EFFECTIVENESS AS A TEACHING-LEARNING TOOL

1. Is the material adaptable for learners with varying needs or skill levels? Suggest ways to improve flexibility.
2. Does the material support diverse learning styles (e.g., visual, auditory, kinesthetic)? Provide examples of inclusivity or areas where diversity could be improved.
3. Are the methods used in the material sound and appropriate for achieving the intended outcomes? Highlight any methodological gaps.
4. Does the material facilitate task-based learning relevant to real-world applications? Recommend ways to enhance task-based integration.

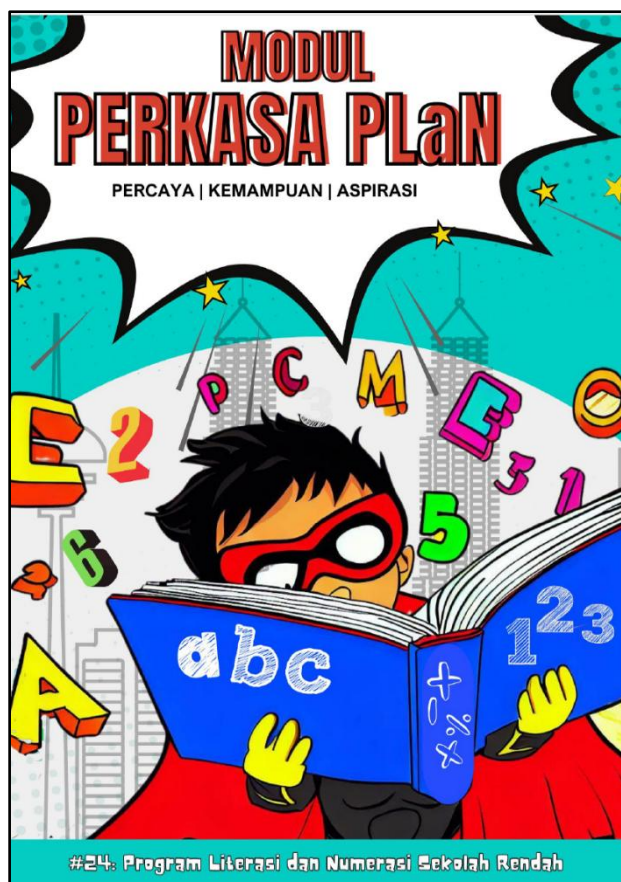
EASE OF USE

1. Is the material easy to use for educators? Identify any usability challenges and propose solutions.
2. Is the material accessible for learners, including those with disabilities (e.g., screen-reader compatibility, clear formatting)? Suggest ways to improve accessibility.
3. Are the instructions for using the material clear and straightforward? Highlight any confusing or unclear guidance.

GENERAL COMMENTS

- Summarize the strengths and weaknesses of the material.
- Provide actionable recommendations for improving the overall quality, relevance, and usability of the material.

Appendix C The Standardised Worksheet Used for Materials Analysis Practice

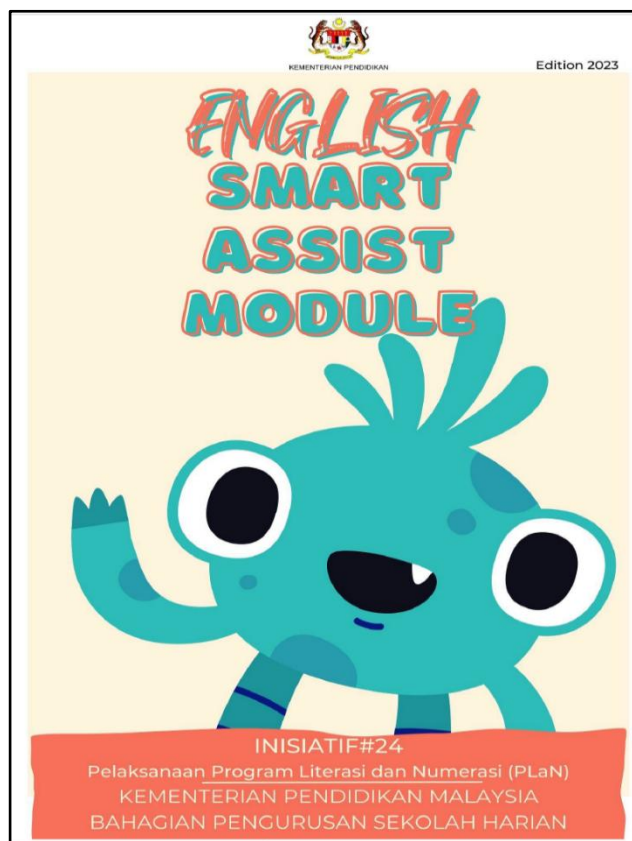


Terbitan 2023

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Hak Cipta Terpelihara. Tidak dibenarkan mengeluarkan ulang mana-mana bahagian artikel, ilustrasi dan isi kandungan buku ini dalam apa-apa juga bentuk dan dengan cara apa-apa jua sama ada secara elektronik, fotokopi, mekanik, rakaman atau cara lain sebelum mendapat kebenaran bertulis daripada Pengarah, Bahagian Pengurusan Sekolah Harian, Kementerian Pendidikan Malaysia, Aras 3 & 4, Blok E2, Parcel E, Pusat Pentadbiran Kerajaan Persekutuan, 62604 Putrajaya, Malaysia.

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SET 1

LISTENING/SPEAKING

Activity A: Ice Breaking Session

Pupils work in pairs and take turns to ask and answer basic information about others. Practise this with other friends.

 Hello! What's your name?	Hello! My name is ____
 What's your hobby?	I like ____
 What's your father's name?	His name is ____
 What's your mother's name?	Her name is ____

SMART ASSIST MODULE 8

ChatGPT 4o

SET 2

WRITING

Write a birthday wish to Johan. Rewrite the text below. Add capital letters, full stops, and a question mark.

dear johan

happy birthday to you i bought you a new ball to play
do you like it we can play together later

Additional activity: Create a birthday card for a friend.
You may refer to the previous text.

SMART ASSIST MODULE 63



SET 3

READING

Read about the text

8 March 2023

Dear diary, today is my birthday. Ms. Paulo and my friends celebrated my birthday in class. She bought us a big chocolate cake. Everyone loves chocolate cake. My chocolate cake looked amazing. Today is a happy day.

Thumbs up Thumbs down activity

True statement False statement

1. Ms. Paulo bought a carrot cake.
2. There's a small car on the cake.
3. It was a happy day.

Create an image

modify this worksheet according the checklist given

The checklists are as follows:

A) DESIGN

1. External design

- 1.1 Material is durable with a strong cover
- 1.2 Cover page is age appropriate

2. Internal design

- 2.1 Material is printed on good quality of paper
- 2.2 Printing is of high quality
- 2.3 Well-edited
- 2.4 Guidance is given to learners on correct use of the book
- 2.5 Table of contents states what students are expected to do
- 2.6 Units include references to the curriculum
- 2.7 Pages which are crowded
- 2.8 Layout of pages is suitable
- 2.9 Typeface of pages is suitable
- 2.10 Symbols are used to indicate different social interaction forms
- 2.11 Symbols are used to indicate media usage
- 2.12 Symbols are used to indicate difficulty level of the tasks

3. Course components

- 3.1 Interactive games
- 3.2 Familiar games
- 3.3 Cut-outs



Appendix D Example Material Analysis Process and the Response Given by AI-powered Tool Using the Prompt Reflecting the Adapted Checklist for Material Analysis

Step 1: The teacher selected the material to be analysed

LISTENING/SPEAKING

Activity 8: Work in pairs. Pupil A will say a sentence using the words given below. For example, "Show me a big cup". Pupil B will show and say the sentence. For example, "This is a big cup".

Pupil A note (Choose and say)

Show me a ...	
 → big cup	 → small cup
 → red cap	 → red cap
 → long pencil	 → short pencil
 → clean shirt	 → dirty shirt

Step 2: The teacher uploaded the material in AI-powered tool and paste the prompt given.

ChatGPT 4o

GENERAL COMMENTS

- Summarize the strengths and weaknesses of the material.
- Provide actionable recommendations for improving the overall quality, relevance, and usability of the material.

This prompt is designed to leverage AI's analytical capabilities to generate a comprehensive and actionable evaluation of educational materials, ensuring alignment with the adapted OALCF checklist. Let me know if further refinements are needed!

OALCF Checklist Evaluation

Message ChatGPT

Oalcf Checklist Evaluation

"I am evaluating a set of educational materials intended for use in special education classrooms. Please analyze the materials based on the following criteria from the Ontario Adult Literacy Curriculum Framework (OALCF) Checklist for Evaluating Learning Materials. Provide a detailed assessment for each criterion, indicating whether the material meets expectations or needs improvement. Include specific recommendations for improvement wherever applicable. Additionally, summarize the strengths and weaknesses of the materials."

CONTENT Does the material support the learner's goal path (e.g., employment, independence, further education)? Provide examples and suggestions if improvements are needed. Does the material reflect the learner's cultural context and avoid biases or stereotypes? Highlight any areas of concern. Does the material support relevant competencies required for the target learners? If gaps exist, propose actionable solutions.

QUALITY OF CONTENT Are the objectives of the material clearly stated and aligned with learning outcomes? Identify ambiguities or areas requiring clarification. Is the content current and relevant to the learners' needs? Suggest updates for outdated or irrelevant content. Does the material align with adult learning principles, such as practical application and learner-centered design? Recommend enhancements for better alignment.

POTENTIAL EFFECTIVENESS AS A TEACHING-LEARNING TOOL Is the material adaptable for learners with varying needs or skill levels? Suggest ways to improve flexibility. Does the material support diverse learning styles (e.g., visual, auditory, kinesthetic)? Provide examples of inclusivity or areas where diversity could be improved. Are the methods used in the material sound and appropriate for achieving the intended outcomes? Highlight any methodological gaps. Does the material facilitate task-based learning relevant to real-world applications? Recommend ways to enhance task-based integration.

EASE OF USE Is the material easy to use for educators? Identify any usability challenges and propose solutions. Is the material accessible for learners, including those with disabilities (e.g., screen-reader compatibility, clear formatting)? Suggest ways to improve accessibility. Are the instructions for using the material clear and straightforward? Highlight any confusing or unclear guidance.

GENERAL COMMENTS Summarize the strengths and weaknesses of the material. Provide actionable recommendations for improving the overall quality, relevance, and usability of the material.

Step 3: The teacher took note the feedback given and plans for adaptation.



Using the worksheet you provided, here is an evaluation of the material based on the OALCF checklist:

AI-Generated Evaluation of Listening and Speaking Worksheet

CONTENT

1. Supports Learner's Goal Path:

- **Assessment:** The worksheet aligns with goals related to improving listening and speaking skills, particularly useful for communication in daily life or employment.
- **Recommendations:** Add context or scenarios where learners can relate these phrases to real-life situations, such as in a workplace or classroom setting, to strengthen the connection to goal paths.

2. Reflects Learner's Cultural Context and Avoids Bias:

- **Assessment:** The material uses neutral and universal items such as "cup" and "pencil," which avoids cultural bias.
- **Recommendations:** Incorporate culturally relevant objects or settings (e.g., items commonly found in Malaysia) to make it more relatable for learners.

3. Supports Relevant Competencies:

- **Assessment:** The worksheet develops fundamental competencies in listening, responding, and pronunciation.
- **Recommendations:** Include instructions or examples to extend this activity for higher-order competencies like forming questions or engaging in short dialogues.



QUALITY OF CONTENT

1. Objectives Are Clearly Stated:

- **Assessment:** The objectives for improving listening and speaking skills are implied but not explicitly stated.
- **Recommendations:** Add a brief learning objective at the beginning, such as: "Students will improve their ability to listen, interpret, and respond to spoken prompts accurately."

2. Content is Current and Relevant:

- **Assessment:** The content is basic but universally relevant for beginner learners.
- **Recommendations:** Update the examples to include modern or culturally specific items (e.g., smartphones, traditional items like batik) for greater relevance.

3. Aligns with Adult Learning Principles:

- **Assessment:** The activity encourages practical speaking and listening tasks, suitable for engaging adult learners.
- **Recommendations:** Ensure that the instructions emphasize learner-centered engagement by allowing learners to create their own examples after practicing the given sentences.

POTENTIAL EFFECTIVENESS AS A TEACHING-LEARNING TOOL

1. Adaptability for Learners with Varying Needs:

- **Assessment:** The material is adaptable to different levels of learners by modifying the complexity of sentences.
- **Recommendations:** Provide differentiated instructions or additional prompts for advanced learners (e.g., "Describe the object and its use").

2. Supports Diverse Learning Styles:

- **Assessment:** The activity supports auditory (listening to sentences) and kinesthetic (showing objects) learners effectively.
- **Recommendations:** Add visual aids, such as pictures of objects, for visual learners to enhance inclusivity.

3. Methods are Sound and Appropriate:

- **Assessment:** The method of pairing students for practice is effective for interaction.
- **Recommendations:** Include a reflective component where students can discuss challenges faced during the activity and how they resolved them.

4. Facilitates Task-Based Learning:

- **Assessment:** The activity is task-based, focusing on listening and responding skills.
- **Recommendations:** Create a task at the end where learners use multiple sentences in a short dialogue or role-play scenario.



EASE OF USE

1. Easy to Use for Educators:

- **Assessment:** The instructions are simple and easy for educators to implement.
- **Recommendations:** Include a teacher's guide with suggested prompts or answers to streamline preparation.

2. Accessible for Learners:

- **Assessment:** The format is clear and well-organized, but accessibility features like large fonts or alternative formats for visually impaired learners are missing.
- **Recommendations:** Increase font size and spacing, and ensure compatibility with assistive technologies like screen readers.

3. Instructions Are Clear:

- **Assessment:** Instructions are straightforward but lack detail for first-time users.
- **Recommendations:** Elaborate instructions with an example: "Pupil A says, 'Show me a big cup,' and Pupil B responds with the object and sentence."

GENERAL COMMENTS

- **Strengths:** The material is straightforward, practical, and encourages interaction. It is adaptable for different levels and supports listening and speaking skills effectively.
- **Weaknesses:** The material could benefit from clearer objectives, cultural relevance, visual aids, and enhanced accessibility.
- **Actionable Recommendations:** Add objectives, integrate culturally relevant examples, include visual aids, and enhance accessibility to broaden its effectiveness.



Step 4: (Optional) The teacher could make use of the AI-Powered tool to redesign the material based on the feedbacks given in the analysis made and this could be a reference for the teacher to adopt or adapt for the amended material.

