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Research Article

English Teacher's Perceptions on Interactive Multimedia and Differentiated Learning in Banda Aceh

[*1]Miftahul Jannah, [2]Zahratul Fitri, [1]Nour Ayouni, [1]Intan Surur Tinambunan

[1]Iskandar Muda University, Indonesia
[2]Malikussaleh University, Indonesia

*Corresponding author: miftahuljannah@unida-aceh.ac.id

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Abstract
This study aims to analyze the perceptions of high school English teachers in Banda Aceh regarding interactive multimedia learning and differentiated instruction, using a mixed-methods approach that combines quantitative data (questionnaires) and qualitative data (interviews) to explore teachers' perceptions, experiences, and challenges more comprehensively. The data were analyzed using descriptive statistical and thematic analysis. A total of 40 high school English teachers, members of the English Language Educators in Aceh (ELEA) community, were selected as respondents using purposive sampling. The results indicate that teachers hold highly positive perceptions of interactive multimedia learning, particularly in terms of student motivation, creativity, and learning engagement. For differentiated instruction, teachers found this method effective in improving learning outcomes and task flexibility. Recommendations from the study include enhancing technological infrastructure, providing regular training, and fostering collaboration among teachers to optimize the implementation of both methods. These findings underscore the importance of technical support and professional development for teachers to maximize the impact of technology-based and differentiated learning in the classroom.

Keywords
Perceptions; multimedia interactive learning; differentiated learning; English teachers

Introduction
The integration of technology in the learning process has become crucial to implement, especially in the era of the Industrial Revolution 4.0 (Zhao et al., 2022), which drives the utilization and development of technology across various fields, including education. The Industrial Revolution 4.0 demands an education system capable of producing graduates with technology-based competencies. This is critical because future graduates will face increasingly complex challenges, requiring technological mastery as a tool to solve diverse problems (Anisyah et al., 2024). This shift necessitates a move toward Education 4.0, where the curriculum focuses on digital literacy, human-machine collaboration, and cognitive flexibility (Oke & Fernandes, 2020; Yamamoto & Yamaguchi, 2019; Penprase, 2018)

One of the current national priority directives from the president is digitalization, where educators must be able to integrate digital-based learning to ensure graduates possess technological skills and remain competitive in the future (Moraes et al., 2023). In today's educational context, the use of interactive multimedia learning and differentiated instruction approaches has become increasingly important to enhance teaching and learning quality. The principles of interactive multimedia learning and differentiated instruction align with the current "Merdeka Curriculum," which emphasizes differentiated learning tailored to students' needs. Therefore, the development of interactive multimedia learning is necessary to facilitate the implementation of differentiated instruction.

Despite progress in classroom technology adoption, many teachers still face challenges in integrating interactive multimedia and differentiated instruction into their teaching methods. Previous research indicates that many educators have yet to fully utilize interactive learning (Bulan & Nur Imansyah, 2023; Sarah, 2024) and differentiated instruction due to a lack of training or understanding of how to implement them effectively (Smale-Jacobse et al., 2019; Digna & Widyasari, 2023).

Based on field observations and surveys, researchers found that most English teachers have not yet integrated interactive multimedia learning and differentiated instruction. Classroom practices reveal that English instruction remains teacher-centered, relying on lectures, Q&A discussions, and assignments. Additionally, many educators still assume students have uniform learning styles and needs, resulting in passive and unmotivated learners. Consequently, learning objectives are not optimally achieved. This aligns with data from the Aceh Education Office in 2023, which reported that 22 schools in Aceh have yet to implement digital-based interactive learning and differentiated instruction.

This situation highlights the urgent need for enhanced teacher training and competency development in educational technology and differentiated instruction. In this context, interactive multimedia can serve as a valuable tool to boost student engagement and learning effectiveness, which can be integrated into differentiated instruction. Research by several academics demonstrates that student learning outcomes can significantly improve through interactive media and differentiated instruction (He et al., 2024; Alyusfitri et al., 2024; Idogho & Olubodun, 2023; Mutmainah et al., 2023;Ahmadi, 2018). For example, a study evaluating Canva-based interactive media found that teachers responded very positively, with an 86% feasibility rate, deeming it highly suitable for learning (Gusrima, 2024). Similarly, digital assessment platforms like Kahoot and Quizizz create more interactive, engaging, and enjoyable learning environments, fostering active student participation (Karmila Sari & Siti Nurani, 2021)

However, despite evidence supporting the effectiveness of interactive multimedia, challenges persist. Many teachers lack confidence and understanding in adopting new technologies and differentiated instruction. Thus, an in-depth analysis of teachers' perceptions of interactive multimedia and differentiated instruction is essential to formulate targeted strategies for improving technology integration and addressing diverse learning needs, thereby supporting the achievement of SDG 4 (Quality Education).

Based on this background, the research questions are:

1. What are the perceptions of high school English teachers in Banda Aceh regarding the use of interactive multimedia learning and differentiated instruction?
2. What factors influence the implementation of interactive multimedia and differentiated instruction?

This study focuses on exploring English teachers' perceptions of interactive multimedia learning and differentiated instruction, as well as the factors affecting their implementation. By understanding these perceptions and factors, the research aims to provide recommendations for designing more effective training programs and teaching models. This is vital to ensure teachers acquire the necessary skills and knowledge in interactive multimedia and differentiated instruction, ultimately enhancing student motivation and learning outcomes (Sari, 2020). Furthermore, the findings are expected to contribute to curriculum development, the achievement of quality education (SDG 4), and the implementation of the Merdeka Curriculum, which emphasizes adaptive and student-responsive learning approaches.

Method

This study employs a mixed-method design, which combines both quantitative and qualitative data collection approaches. The advantage of this mixed design lies in its ability to produce more comprehensive findings compared to using a single method (John W, 2012). More specifically, this study adopts a sequential explanatory model, in which the quantitative approach is conducted first, followed by the qualitative approach to collect and analyze data.

This study offers an advantage in problem-solving through a more comprehensive and innovative approach compared to the researcher's previous studies (Jannah, 2021;Jannah et al., 2023), which focused more narrowly on the effectiveness of interactive learning media within specific contexts. This research integrates interactive multimedia with a differentiated learning approach, enabling the optimization of teaching methods based on students' individual needs and learning styles, as adapted from the Merdeka Curriculum.

From a methodological perspective, this study different with Bulan and Nur Imansyah (Bulan & Nur Imansyah, 2023), which employed only a qualitative method. In contrast, the present study combines both qualitative and quantitative methods. Through questionnaires and interviews, this research not only gathers teachers' perceptions but also explores the factors that influence the implementation of interactive multimedia and differentiated instruction in the classroom.

The respondents in this study are high school English teachers. The selection of this subject area is based on the importance of English as one of the core competencies in 21st-century skills, which holds priority and significance in the era of the Industrial Revolution 4.0 (Dhivya et al., 2023;Masita et al., 2024). The researcher selected 40 high school English teachers who are members of the *English Language Educators in Aceh* (ELEA) community as the study sample. A purposive sampling technique was used to select the sample, with the criteria that participants must be active members of the teacher community in Aceh, have a minimum of 5 years of teaching experience, and hold permanent status either as civil servants or foundation-employed teachers.

Two types of instruments will be used to collect the data: a questionnaire and an interview guide. The questionnaire is used to collect data related to high school English teachers' perceptions of interactive multimedia learning and differentiated instruction, as well as the factors influencing their implementation. Meanwhile, the interview guide is used to obtain more comprehensive and in-depth information on teachers' perceptions, experiences, and challenges in using interactive multimedia and differentiated instruction.

The researcher will use a closed-ended questionnaire consisting of 20 items about teachers' perceptions of interactive multimedia and differentiated instruction. These items are adapted from the revised 2024 edition of the Merdeka Curriculum Guidelines (Ginanto et al., 2024). In this study, validity is tested using the Pearson Product Moment correlation, by comparing the calculated r-value with the r-table value. The r-table for n = 40 is 0.32. All questionnaire items have a calculated r-value greater than 0.32, indicating that all items are valid.

Meanwhile, reliability is tested using Cronbach's Alpha, which yields a result of $\alpha = 0.89 > 0.60$, indicating that the instrument is highly reliable. The data obtained will then be analyzed using a quantitative design with a five-point Likert scale; 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA). The responses will be entered into data analysis software, and each answer will be scored according to the likert scale (1–5). The data will then be calculated using statistical formulas for each item and categorized based on score intervals (Sugiyono, 2019).

Table 1. Score Range and Category

Score Range	Perception Category
1.00 – 1.79	Very Poor
1.80 – 2.59	Poor
2.60 – 3.39	Fair
3.40 – 4.19	Good
4.20 – 5.00	Very Good

Subsequently, interviews were conducted to obtain in-depth qualitative data regarding teachers' perceptions and the factors influencing the implementation of interactive and differentiated multimedia learning. The researcher randomly selected 4 high school English teachers from the 40 respondents for face-to-face interviews. Each interview was recorded and lasted between 20 to 25 minutes. The interviews were conducted in a semi-structured format with open-ended questions, allowing the teachers to explain their views in detail as well as the influencing factors in the implementation process.

The recorded interviews were then transcribed into text to facilitate data analysis by identifying key themes that emerged from the participants' responses. Afterward, the researcher carried out data triangulation by combining the results of the questionnaire and the interviews to enhance the validity of the research findings (Miles, 2018).

Results

English Teachers' Perceptions on Interactive Multimedia Learning

The following table presents teachers' perceptions regarding the implementation of interactive multimedia in education, measured on a 1-5 Likert scale (where 1 = strongly disagree and 5 = strongly agree). The data highlights both the positive impacts of digital tools on student engagement and creativity, as well as the persistent challenges related to technical infrastructure and teacher training. These results are derived from a questionnaire conducted among educators, with average scores reflecting their collective experiences and observations.

Table 2. Average Perceptions Score (Scale 1-5)

No	Statements	Average Score
1	Learning platforms like Kahoot/Quizizz make students more motivated to learn.	4.5
2	Google Classroom makes it easier to manage assignments and materials.	4.4
3	Interactive multimedia enhances student creativity	4.6
4	Technical obstacles (network, devices) when using multimedia.	3.6
5	Need for training on using interactive multimedia	4.6
6	Training on using interactive multimedia is still inadequate	4.1

No	Statements	Average Score
7	Lack of confidence in using new teaching technologies due to insufficient training.	3.9
8	Limited internet access at school hinders the use of digital platforms.	4.1
9	Insufficient availability of devices is a major obstacle in interactive multimedia learning	3.8
10	Interactive multimedia makes learning more engaging.	4.6
11	Students show positive responses to multimedia-based learning	4.6
12	Interested in continuing to develop interactive multimedia learning	4.6

The figure below illustrates teachers' perceptions of interactive multimedia tools in education, based on survey responses scored on a 1-5 Likert scale (where 1 = strongly disagree, 5 = strongly agree).

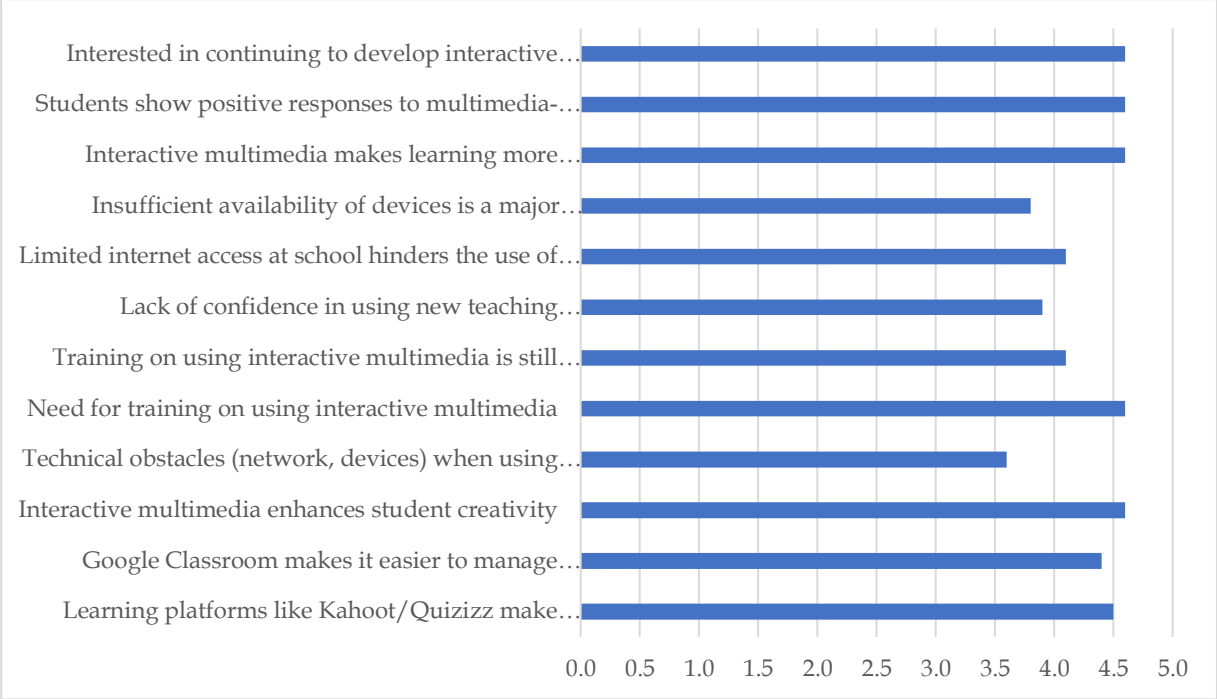

Figure 1. English Teachers' Perceptions on Interactive Multimedia Learning

The analysis of the questionnaire data shows that multimedia-based learning generally received positive responses from teachers. Most statements related to student motivation, creativity, and interest in multimedia learning received high average scores (4.5-4.6), indicating that teachers observed significant improvements in student engagement. However, several challenges were noted, such as infrastructure limitations (internet access and devices) with scores of 3.8-4.1, as well as insufficient teacher training in

using new technologies (scores of 3.9-4.1). This suggests that while interactive multimedia is effective in teaching and learning, its implementation is still hindered by technical factors and teacher readiness.

Interviews with four English teachers (coded as R1-R4) reinforced the questionnaire findings. These qualitative perspectives confirm that enthusiasm for multimedia must be balanced with infrastructure support and systematic training programs to achieve optimal results, as follows:

> "Students immediately get excited when they see the colorful visuals in Quizizz, but I often struggle when the internet suddenly cuts out mid-class."
>
> (R1; 08.30)

> "I want to try new tools like Canva for presentations, but I've never received formal training."
>
> (R2; 09.45)

> "The school's devices are outdated and sometimes lag when playing instructional videos."
>
> (R3; 10.26)

> "If there were regular workshops on educational technology, more teachers would be willing to experiment."
>
> (R4; 11.45)

These insights highlight the urgent need for institutional investment in both technological resources and teacher professional development to fully harness the potential of digital learning tools.

English Teachers' Perceptions on Differentiated Learning

The following table presents key findings from a questionnaire on teachers' perceptions and practices regarding differentiated learning strategies. The statements reflect various aspects of differentiated instruction, including student grouping, assessment methods, material design, and collaboration among educators. Responses were collected using a Likert scale (1-5), where higher scores indicate stronger agreement or perceived effectiveness. This data highlights both the strengths and challenges of implementing differentiated learning in classroom settings, as well as areas requiring further support, such as teacher training and resource development.

Table 3. Average Perceptions Score (Scale 1-5)

No	Statements	Average Score
1	Providing learning options according to student interests	4.2
2	Grouping students based on ability levels	4.0
3	Flexibility in assignment deadlines	4.1
4	Using varied assessment methods	4.2
5	Difficulty in designing materials with varying difficulty levels.	3.9
6	Differentiated learning improves learning outcomes	4.4

No	Statements	Average Score
7	Collaboration with other teachers supports differentiated learning implementation.	4.3
8	Need for training to design differentiated learning	4.4

The chart below visually represents teachers' perceptions of differentiated learning strategies, based on questionnaire responses measured on a 1-5 Likert scale (where 1 = Strongly Disagree, 5 = Strongly Agree).

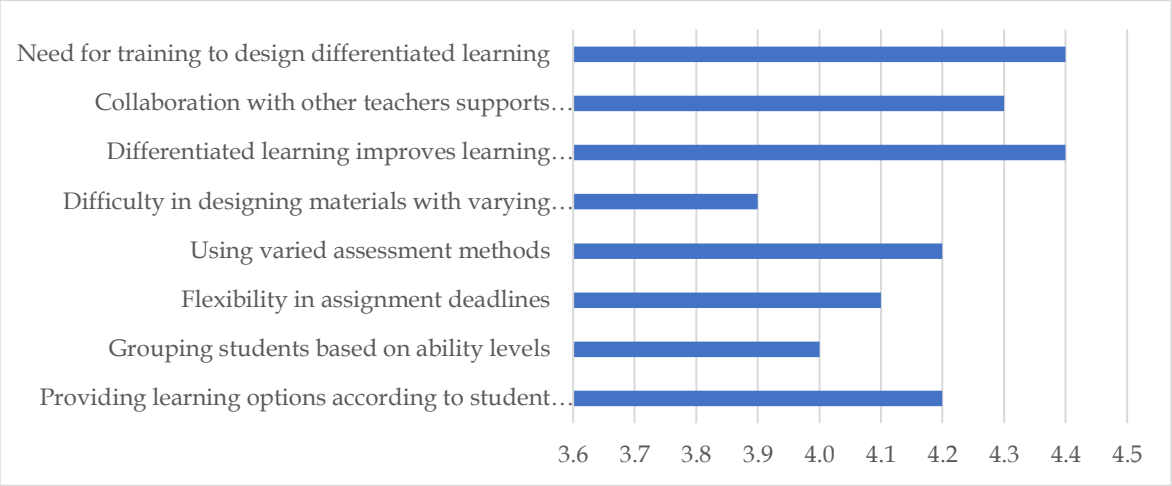

Figure 2. English teachers' perceptions of differentiated learning

The survey results from 40 English teachers reveal significant insights into the implementation of differentiated learning strategies in classroom settings. Teachers demonstrated strong agreement (average scores of 4.3-4.4) that differentiated learning effectively improves student outcomes and that collaboration among colleagues successfully supports its implementation. However, the data also highlights a clear need for targeted professional development, as evidenced by the equally high score (4.4) regarding training requirements. While teachers report successfully implementing various strategies, including providing interest-based learning options (4.2), using varied assessment methods (4.2), and allowing flexible deadlines (4.1), they face particular challenges in designing materials with varying difficulty levels (3.9). This pattern suggests that while the conceptual framework of differentiated instruction is well-understood and valued, practical application presents specific difficulties, particularly in resource development. The consistency of responses across all 40 participants strengthens the validity of these findings and underscores the importance of addressing these challenges through comprehensive support systems, including professional development programs focused on material adaptation and the creation of shared resource repositories to alleviate preparation burdens while maintaining instructional quality.

The survey results from 40 English teachers, supported by in-depth interviews with four English teachers (coded as R1-R4), reveal significant insights into the implementation of differentiated learning strategies. Teachers demonstrated strong agreement (average scores of 4.3-4.4) that differentiated learning improves student outcomes, as follows:

> "When I group students by ability and tailor tasks, even my weakest students show remarkable progress, they engage because the work matches their level"

(R1;08.36)

"Our grade-level team meets weekly to share differentiated materials. Without this collaboration, I'd struggle to manage the workload."

(R2; 09.50)

"Creating tiered worksheets for one lesson takes hours. I often reuse old materials because developing new ones is time-consuming."

(R3; 10.35)

"I'd attend any workshop on quick differentiation strategies. Right now, I'm just guessing what might work."

(R4;11.56)

This aligns with the survey's high score (4.4) on effectiveness. Collaboration emerged as a critical support system, scoring 4.3 in the survey. However, challenges in material design were apparent, with the survey scoring this lowest (3.9). This directly reflects the survey's identified need for training (4.4).

Discussion

The findings of this study reveal that English teachers in Banda Aceh hold highly positive perceptions of interactive multimedia learning and differentiated instruction, aligning with previous research on the effectiveness of these approaches. Teachers reported that interactive multimedia tools such as Kahoot, Quizizz, and Google Classroom significantly enhance student motivation, creativity, and engagement, with average scores ranging from 4.4 to 4.6 (Table 2). This corroborates the findings of He et al. (2024), who conducted a meta-analysis demonstrating that interactive technologies positively impact language education by fostering active participation and improving learning outcomes. Similarly, Alyusfitri et al. (2024) highlighted the effectiveness of interactive multimedia-based e-modules in elementary schools, further supporting the teachers' observations in this study.

However, the study also identified challenges, particularly in terms of technical infrastructure and teacher training. Issues such as limited internet access, outdated devices, and insufficient training received moderate scores (3.6–4.1), indicating significant barriers to implementation. These findings resonate with the work of Bulan & Nur Imansyah (2023), who found that many English teachers struggle with technological integration due to a lack of resources and professional development. Sarah (2024) also emphasized that post-pandemic, EFL teachers continue to face difficulties in adopting ICT tools without adequate support.

Regarding differentiated instruction, teachers acknowledged its effectiveness in improving learning outcomes (average score of 4.4) and valued collaboration among colleagues (average score of 4.3). Yet, they faced challenges in designing tiered materials (average score of 3.9), echoing the concerns raised by Digna and Widyasari (2023), who noted that teachers often lack the time and skills to create differentiated resources. Smale-Jacobse et al. (2019) similarly found that while differentiated instruction is beneficial, its implementation requires systematic training and institutional support.

The study's mixed-methods approach, combining quantitative and qualitative data, provided a comprehensive understanding of these issues. This methodological strength aligns with the recommendations of John W (2012), who advocated for mixed-methods designs to capture nuanced perspectives in educational research. The integration of survey and interview data also addressed limitations observed in prior studies, such as Bulan and Nur Imansyah (2023), which relied solely on qualitative methods.

Interactive multimedia and differentiated instruction are perceived as effective by English teachers in Banda Aceh, with studies indicating strong belief in their potential to increase student engagement and cater to diverse learning styles (Mutmainah et al., 2023; Ahmadi, 2018). However, their successful implementation hinges on addressing significant infrastructural limitations, such as unreliable internet

and hardware shortages a common challenge in peripheral Indonesian regions (Lestari et al., 2024; Gemiharto & Priyadarshani, 2022). These findings contribute to the broader discourse on educational technology and differentiated learning, underscoring the need for policy interventions and collaborative efforts to achieve SDG 4 (Quality Education).

Conclusion

This study explored the perceptions of English teachers in Banda Aceh regarding the implementation of interactive multimedia learning and differentiated instruction. The findings revealed overwhelmingly positive attitudes toward these innovative pedagogical approaches, with teachers acknowledging their significant benefits for student engagement, motivation, and learning outcomes. Interactive multimedia tools such as Kahoot, Quizizz, and Google Classroom were particularly praised for enhancing creativity and making lessons more dynamic. Similarly, differentiated instruction was viewed as highly effective in addressing diverse learning needs through flexible grouping, varied assessments, and tailored materials. These results align with existing research (He et al., 2024; Smale-Jacobse et al. 2019), reinforcing the transformative potential of these methods in modern education.

However, the study also identified critical barriers that impede successful implementation. Teachers reported challenges related to inadequate technological infrastructure, including unreliable internet connectivity and outdated devices, which disrupt the seamless use of digital tools. Additionally, many educators expressed a lack of confidence in adopting new technologies and designing differentiated materials, citing insufficient training and time constraints.

To address these challenges, several actionable recommendations are proposed. First, schools and policymakers must prioritize investments in technological infrastructure, ensuring stable internet access and up-to-date devices to support interactive learning environments. Second, comprehensive and ongoing professional development programs should be implemented to equip teachers with the necessary skills to leverage digital tools and differentiate instruction effectively. Workshops could focus on practical strategies for creating tiered materials, utilizing multimedia platforms, and integrating these methods into the Merdeka Curriculum. Third, fostering collaboration among teachers through professional learning communities or online platforms would facilitate resource-sharing and reduce individual workloads. For instance, a centralized repository of pre-designed differentiated materials could save time and encourage wider adoption of these practices.

Furthermore, institutional support is crucial to sustain these initiatives. Educational authorities should develop clear policies and allocate dedicated funding to promote technology-enhanced, student-centered learning. Finally, future research could explore the long-term impacts of these strategies on both student achievement and teacher adaptability, particularly in diverse socio-economic contexts. By addressing these areas, stakeholders can bridge the gap between teachers' positive perceptions and classroom realities, ultimately advancing the goals of SDG 4 (Quality Education) in Banda Aceh and beyond. The study underscores that while interactive multimedia and differentiated instruction hold great promise, their success hinges on systemic support, collaboration, and targeted professional empowerment.

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