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INTERACTIVE TEACHING MATERIAL DEVELOPMENT MODEL TO IMPROVE PERSONALIZED LEARNING GENERATION

MODEL PENGEMBANGAN MATERI PENGAJARAN INTERAKTIF UNTUK MENINGKATKAN PEMBELAJARAN YANG DIPERSONALISASI

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Abstrak

Studi ini dimotivasi oleh meningkatnya kebutuhan akan materi pembelajaran yang relevan bagi Generasi Z, yang sangat melek teknologi dan membutuhkan materi interaktif dan fleksibel yang disesuaikan dengan kebutuhan belajar individu. Tujuan studi ini adalah untuk menganalisis model-model efektif dalam mengembangkan materi pengajaran interaktif yang mendukung pembelajaran personalisasi bagi Generasi Z dan untuk mengidentifikasi bagaimana materi-materi ini dapat meningkatkan aspek-aspek kunci dari proses pembelajaran mereka. Metodologi yang digunakan adalah Tinjauan Literatur Sistematis (SLR) berdasarkan pedoman PRISMA, dengan memilih artikel dari basis data ERIC, Mendeley, ScienceDirect, dan PubMed yang diterbitkan antara tahun 2020 dan 2025. Hasil menunjukkan bahwa materi pengajaran interaktif yang dikembangkan melalui model yang valid dan terstruktur seperti ADDIE telah terbukti meningkatkan keterlibatan belajar, pemahaman konseptual, kemandirian belajar, dan keterampilan berpikir kritis. Selain itu, pembelajaran personalisasi lebih efektif bila didukung oleh teknologi digital, kecerdasan buatan, dan analitik pembelajaran yang memungkinkan penyesuaian jalur pembelajaran sesuai dengan karakteristik individu. Temuan ini menegaskan bahwa materi pembelajaran interaktif memiliki potensi besar untuk menciptakan pembelajaran yang lebih efektif dan adaptif yang memenuhi kebutuhan Generasi Z.

Kata kunci: Pembelajaran Interaktif, Pembelajaran yang Dipersonalisasi, Generasi Z

Abstract

This study was motivated by the growing need for relevant learning materials for Generation Z, who are highly tech-savvy and require interactive, flexible materials tailored to individual learning needs. The purpose of this study was to analyze effective models for developing interactive teaching materials that support personalized learning for Generation Z and to identify how these materials can improve key aspects of their learning process. The methodology used was a Systematic Literature Review (SLR) based on PRISMA guidelines, selecting articles from the ERIC, Mendeley, ScienceDirect, and PubMed databases published between 2020 and 2025. The results show that interactive teaching materials developed through valid and structured models such as ADDIE have been proven to increase learning engagement, conceptual understanding, learning independence, and critical thinking skills. In addition, personalized learning is more effective when supported by digital technology, artificial intelligence, and learning analytics that enable the

adjustment of learning paths according to individual characteristics. These findings confirm that interactive teaching materials have great potential to create more effective, adaptive learning that meets the needs of Generation Z.

Keywords: Interactive Teaching, Personalized Learning, Generation Z

INTRODUCTION

Interactive teaching materials are increasingly considered necessary in modern learning because they can provide a more engaging learning experience by integrating text, images, audio, video, and digital navigation, encouraging more active student engagement. The development of interactive teaching materials based on digital applications has been proven to help overcome boredom, improve conceptual understanding, and adapt the learning process to the growing needs of distance learning. In addition, the design of interactive teaching materials that integrate environmental literacy values is highly feasible. It can improve critical thinking skills because it is systematically organized and has been validated by experts, teachers, and users. Similar findings were also seen in the development of interactive teaching materials based on a collaborative digital platform, which were declared valid, practical, and effective in improving critical thinking skills through interactive features and accessibility that support both independent and guided learning processes (Wahyuni et al., n.d.).

Personalized learning is increasingly seen as an essential approach in education because it tailors learning to each student's needs and characteristics, creating a more effective and meaningful learning process (H. H. Nguyen & Nguyen, 2023). This approach is inseparable from the role of digital technology, which supports increased student voice and choice, independent learning, and more adaptive learning strategy differentiation, as found in a study by Schmid, Pauli, and Petko that examined the implementation of technology in schools with a personalized approach in Switzerland (Alam et al., 2025). In addition, research over the past decade shows that personalization is increasingly reinforced by innovations such as artificial intelligence and learning analytics, which enable deeper analysis of student learning patterns (H. Nguyen & Nguyen, 2023). On the other hand, experts emphasize that personalized learning is a complex concept that requires a combination of structure, flexibility, and systemic adaptation to students' individual needs (Dewi et al., 2021).

Generation Z, as a generation that has been familiar with the digital world since birth, has unique characteristics in the learning process, such as a need for social interaction through digital media, a desire to learn collaboratively, and a tendency to use technology as part of their daily lives. A study shows that Gen Z not only relies on technology but also needs learning strategies that utilize social media to enhance the learning experience and connect theory with real-world practice. Furthermore, research (Muhtadi et al., 2022) found that Gen Z's level of learning independence in online learning is influenced by several factors, including gender differences, particularly in terms of self-confidence, discipline, initiative, and self-control, while digital literacy skills are emphasized as an urgent need for Gen Z to understand complex learning materials such

as chemistry concepts and to maximize the use of technology as a learning tool in the era of digital disruption; therefore, it is important to explore how an interactive teaching material development model can be designed to meet the personalized learning needs of Generation Z (R1) and how interactive teaching materials can improve key personalized learning aspects among Generation Zlearners(R2).

LITERATURE REVIEW

Interactive Teaching

Interactive teaching materials are learning materials designed using multimedia such as text, images, videos, animations, audio, and automatic evaluation to create a more engaging learning experience. (Pursitasari et al., 2022) explain that interactive teaching materials can reduce learning fatigue by presenting content that is more engaging and communicative, thereby supporting student learning retention more effectively than traditional printed materials. In addition, multimedia makes it easier for students to understand abstract concepts through visual representations. During development, interactive teaching materials require validation of content, media, and visual appearance. The study by Pursitasari et al. (2022) shows that teaching materials developed using the ADDIE model and validated by subject-matter experts, media experts, and teachers achieve high validity in content, language, and usability. This validity includes the suitability of the material to the competencies, ease of navigation, readability, and visual appeal that can enhance learning effectiveness. These findings indicate that the quality of design and structure greatly determines the success of interactive teaching materials. The use of interactive teaching materials has also been proven to improve students' cognitive skills, especially critical thinking. This is because interactive designs allow students to engage in analysis, reflection, and problem-solving activities through simulations and automatic evaluations. Proved that students who used eco-literacy-based interactive teaching materials showed significant improvements in their interpretation, inference, and evaluation skills. Thus, interactive teaching materials are not only a medium for conveying information, but also a means of improving students' higher-order thinking skills (HOTS).

Personalized learning is an educational approach that allows students to learn according to their needs, interests, abilities, and learning styles. In the context of Generation Z, who are accustomed to technology, personalized learning is increasingly relevant because it enables learning to be flexible, quick, and independent. The findings of (H. H. Nguyen & Nguyen, 2023) show that online learning requires self-management skills, such as discipline, initiative, and responsibility, which can be supported through interactive teaching materials designed to be personally adaptive. Interactive teaching materials enable personalized learning through various features such as independent navigation, adaptive learning paths, and automatic feedback. These features allow students to set their own learning pace without pressure. Show that interactive teaching materials that provide flexible access, attractive visualizations, and tiered activities can

facilitate students' individual needs and foster stronger self-control in the learning process. Thus, personalization is not only about content but also about the learning experience.

In addition to supporting independent learning, personalized learning enables students to develop critical thinking skills more optimally. When students are given the freedom to choose their learning path, evaluate their progress, and receive immediate feedback, they are better able to understand concepts in depth and develop analytical skills. This aligns with findings that interactive teaching materials enhance critical thinking through interpretation, analysis, and problem-solving activities grounded in environmental and social contexts. Thus, personalized learning combined with interactive teaching materials contributes significantly to 21st-century digital learning.

Personalized Learning

Personalized learning is an educational approach that allows students to learn according to their needs, interests, abilities, and learning styles. In the context of Generation Z, who are accustomed to technology, personalized learning is increasingly relevant because it enables learning to be flexible, quick, and independent. The findings show that online learning requires self-management skills, such as discipline, initiative, and responsibility, which can be supported through interactive teaching materials designed to be personally adaptive. Interactive teaching materials enable personalized learning through various features such as independent navigation, adaptive learning paths, and automatic feedback. These features allow students to set their own learning pace without pressure. (Cilliers, 2021) show that interactive teaching materials that provide flexible access, attractive visualizations, and tiered activities can facilitate students' individual needs and foster stronger self-control in the learning process. Thus, personalization is not only about content but also about the learning experience.

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Generation Z

Generation Z is a group of learners born in an era when the internet has become part of everyday life. (Suyatno et al., 2025) states that Gen Z not only prioritizes communication but also needs interaction, a learning process that allows for active engagement, dynamic visuals, and digital experiences integrated into their lives. They are accustomed to learning through various digital platforms such as videos, social media, and internet-based learning applications. This makes

them more responsive to fast, flexible, technology-oriented learning. However, despite their high level of technological proficiency, Generation Z does not consistently demonstrate optimal levels of learning independence. Muhtadi et al. (2022) found that in online learning, Gen Z still tends to need guidance in aspects such as confidence, initiative, discipline, and self-control. These factors cause a gap between technological abilities and independent learning management abilities, so learning materials need to be designed to support the process of gradually strengthening student independence.

In addition, Gen Z's characteristics of multitasking, boredom easily, and a preference for visual learning experiences suggest that traditional learning is less effective for them. Cilliers (2021) emphasizes the need for an interactive, relevant, and collaborative learning environment to remain engaged and motivated. Therefore, understanding the learning characteristics of Gen Z is an essential basis for designing interactive teaching materials that align with their preferences while also enhancing their independence and mastery of 21st-century skills.

METHODS

The method used in this study was a Systematic Literature Review (SLR) to identify, evaluate, and synthesize studies discussing the use of Powtoon in listening comprehension learning. The review process was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Veeraiyan et al., 2022). SLR was chosen because it provides a systematic, transparent, and replicable review process, thereby strengthening the results and making them scientifically accountable. According to Kitchenham (2004), SLR is an approach designed to identify, assess, and interpret research findings relevant to research questions through structured and controlled procedures.

The author identified a set of keywords aligned with the research focus, namely: interactive teaching, personalized learning, Generation Z, teaching materials, and learning activities. The search was conducted in several academic journal databases, including Mendeley, ERIC, Science Direct, and PubMed. This study covers articles published in the last five years, namely 2020–2025. The instruments used in this study were published scientific articles, so no data were collected directly from participants. Through a rigorous selection process, this study applied inclusion and exclusion criteria to ensure that only relevant, high-quality articles were analyzed.

Procedure

This research procedure was conducted in several stages, following the PRISMA model. In the initial stage, the author searched for articles using a pre-formulated list of keywords. All articles that appeared were then collected in the identification stage, which resulted in 1.597 articles related to Interactive Teaching Materials Development for Generation Z. Next, in the screening stage, articles were selected by removing duplicates and excluding articles that did not clearly discuss the development of interactive teaching materials; this screening process was carried out using Rayyan software to ensure accuracy and consistency of selection. After that, the

process continued to the eligibility stage, which involved reading and reviewing the content of the articles in more depth to ensure that the substance was in line with the focus of the research, namely Interactive Teaching Material Development Model to Improve Personalized Learning for Generation Z. The final stage was inclusion, which involved selecting articles that were truly relevant and met the eligibility criteria to be used as final data in the analysis, so that only research directly related to the development of interactive teaching materials was used in this study.

Study selection criteria

The research selection criteria in this SLR include inclusion and exclusion parameters designed to ensure that only relevant, high-quality, and empirically based articles are included in the analysis. Inclusion parameters include: studies discussing Interactive Teaching Materials or the development of teaching materials in the context of education; research focusing on the development of teaching materials for Generation Z or learning approaches appropriate to the characteristics of Gen Z; research using empirical approaches such as experiments, quasi-experiments, qualitative, or mixed methods; scientific publications published between 2020 and 2025; and articles available in full text. Meanwhile, exclusion parameters include conceptual studies without empirical data, opinion articles, non-systematic literature reviews, and educational technology research unrelated to the development of interactive teaching materials for Generation Z. The application of these selection criteria follows a systematic approach commonly used in instructional material development research, where the selection of studies is considered based on methodological relevance, completeness of empirical data, and suitability to the learning context being studied.

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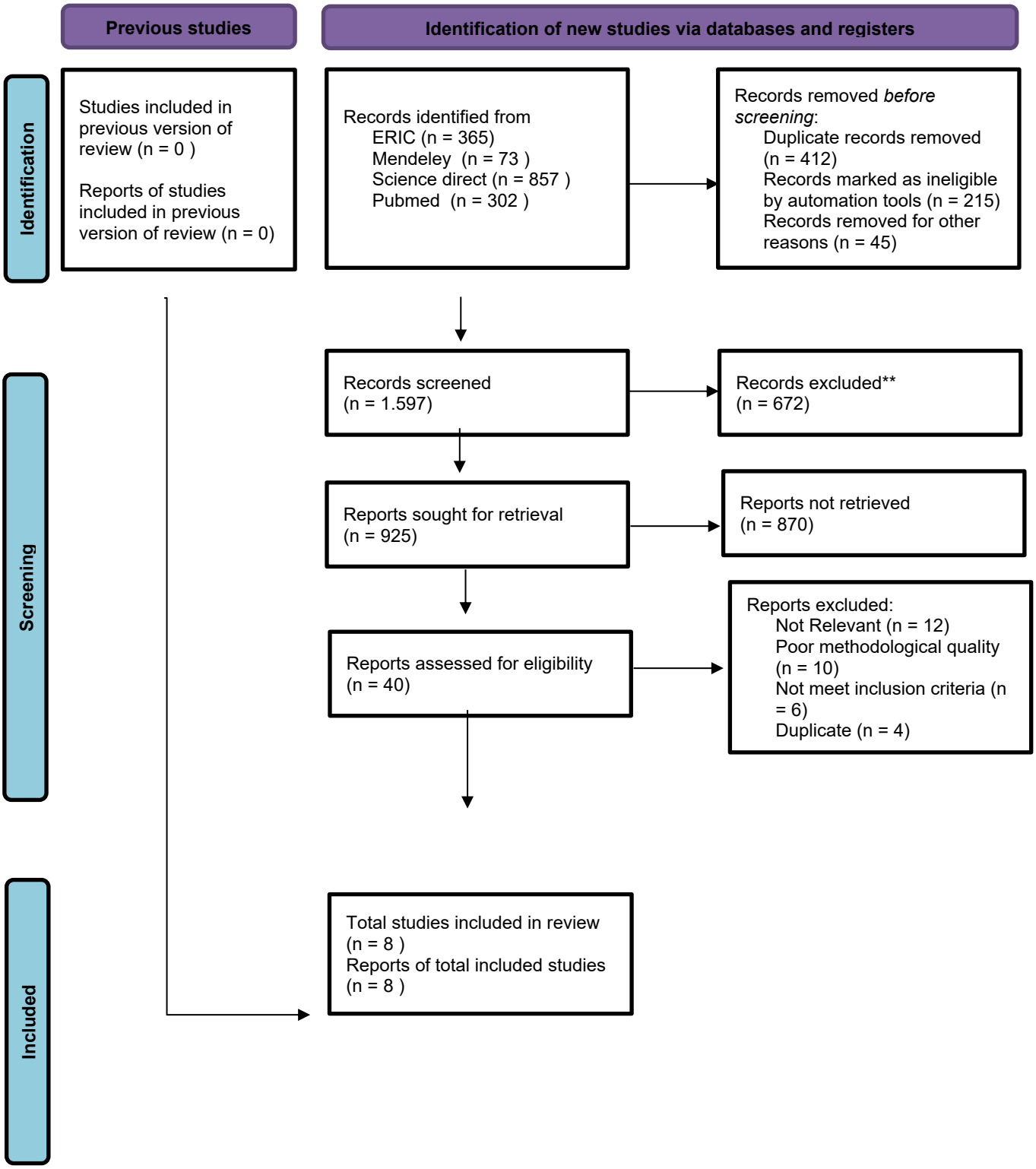

RESULT AND DISCUSSION

No	Authors/Country/Year	Main Characteristic	Study Design/Measuring	Findings
1	Pursitasari et al. (Indonesia, 2022)	Interactive teaching materials that integrate environmental literacy.	Development using the ADDIE model, validated by subject matter experts, media experts, and teachers. Measured for validity, practicality, and effectiveness in improving critical thinking skills.	The teaching materials developed were found to be highly valid in terms of content, language, and usefulness. Their use was proven to be significant in improving students' critical thinking skills (interpretation, inference, evaluation). The interactive design reduced learning fatigue and supported retention.
2	Ferdiyansyah, dkk. (2022)	Development of interactive teaching materials based on digital applications for distance learning.	Development studies and experiments to measure the impact on students' conceptual understanding and engagement.	Digital-based interactive teaching materials have been proven to help overcome boredom, improve conceptual understanding, and adapt to distance learning needs. Multimedia integration 3encourages m4ore active student engagement.
3	Wahyuni, dkk. (t.t.)	Interactive teaching materials based on a collaborative digital platform.	Development research by testing validity, practicality, and effectiveness.	The teaching materials are valid, practical, and effective in improving

				critical thinking skills. Their interactive features and accessibility support both independent and guided learning processes.
4	Schmid, dkk. (Swiss, 2023)	Implementation of technology for personalized learning in schools.	Empirical studies analyzing the application of technology in supporting learning strategy differentiation.	The role of digital technology supports the enhancement of student "voice" and choice, independent learning, and more adaptive differentiation of learning strategies in a personalized approach.
5	Nguyen & Nguyen (2023)	Innovation in personalized learning (AI & Learning Analytics).	Literature review of research developments over the past decade.	Personalization is enhanced by innovations such as artificial intelligence (AI) and learning analytics, 6which enable deeper analysis of student learning patterns. This approach requires a combination of structure, flexibility, and systemic adaptation.
6	Muhtadi, dkk. (Indonesia, 2022)	Generation Z's independence in online learning.	A quantitative study to analyze factors that influence independent learning, including gender differences.	Gen Z's level of independent learning is influenced by factors such as gender differences,

				especially in terms of confidence, discipline, initiative, and self-control. They still tend to need guidance in managing independent learning.
7	Cilliers (2021)	Generation Z's learning characteristics and technological needs.	Qualitative/analytical study of Gen Z characteristics in the context of education.	Gen Z requires learning strategies that utilize social media and collaborative learning environments to connect theory with practice. They are more responsive to learning that is visual, interactive, relevant, and integrated with their everyday digital experiences.
8	Dewi, dkk. (Indonesia, 2021)	Gen Z's digital literacy skills to understand complex material.	Studies emphasizing the urgency of digital literacy competencies.	Digital literacy skills are an urgent necessity for Gen Z to understand complex material and maximize technology as a learning tool in the era of digital disruption.

A systematic review of 10 studies shows that the development of interactive teaching materials significantly improves learning quality, particularly through the application of personalized learning for Generation Z students. Overall, studies confirm that multimedia, including text, audio, video, animation, and automated evaluation features, can create a more engaging learning experience and help students understand the material more deeply. The study

by Pursitasari et al. (2022) found that eco-literacy-based interactive teaching materials developed through the ADDIE model have high validity and are effective in improving students' critical thinking skills, particularly in interpretation, inference, and evaluation. These findings align with the study by Wahyuni et al., which shows that interactive media on collaborative platforms are considered valid, practical, and effective in supporting both independent and structured learning. The use of digital platforms and applications in the development of interactive teaching materials has also been proven to reduce learning fatigue and strengthen retention of understanding. In a study, multimedia integration was found to enliven the learning atmosphere and increase student engagement through independent navigation, step-by-step activities, and instant feedback. These features strongly support the concept of personalized learning, which gives students the freedom to adjust their own learning pace, especially for Generation Z, who are familiar with technology, enjoy dynamic visual content, and are accustomed to multitasking. This is reinforced by Cilliers (2021), who emphasizes that Gen Z needs interactive, relevant, and technology-based learning processes to maintain their motivation and participation.

From a broader perspective, several studies, such as Schmid et al. (2023) and Nguyen & Nguyen (2023), show that technologies such as artificial intelligence and learning analytics play a significant role in supporting personalized learning. These technologies enable teachers to understand students' learning patterns more deeply, allowing them to adapt learning strategies accordingly. However, research by Muhtadi et al. (2022) highlights that even though Gen Z is tech-savvy, they still need reinforcement in aspects of learning independence, such as discipline, initiative, and self-control. Meanwhile, Dewi et al. (2021) emphasize that digital literacy is an essential component in helping students optimize the use of learning technology.

Overall, the results of this SLR show that interactive teaching materials are not only a means of delivering material but also an essential instrument in supporting personalized learning through flexible access, adaptive learning paths, and increased student engagement. Interactive media is able to respond to the needs of Generation Z, who are fast-paced, visual, and technology-based, and contributes to the development of 21st-century skills such as critical thinking, independent learning, and digital literacy. These findings also underscore the need for interactive teaching material development models that not only integrate various media but also incorporate personalization features aligned with Gen Z's learning profile.

CONCLUSION

The results of various studies show that the development of interactive teaching materials plays a vital role in increasing the effectiveness of personalized learning for Generation Z, especially since this generation has unique characteristics as digital natives who need fast, flexible, visual, and interactive learning. Interactive teaching materials that integrate multimedia such as text, images, audio, video, animation, and automatic evaluation have been proven to increase motivation, reduce boredom, and help students understand abstract concepts more concretely. In addition, design quality, such as content validity, ease of navigation, an attractive visual display,

and tiered activities, is a key factor in determining its effectiveness in supporting critical thinking skills and deep understanding. Personalized learning is also optimized when supported by technologies such as artificial intelligence and learning analytics, which can tailor the learning process to individual needs. By combining the learning characteristics of Gen Z, the need for digital literacy, and the ability of interactive teaching materials to provide adaptive and independent learning paths, the interactive teaching materials development model can make a significant contribution to creating learning that is more effective, personalized, relevant, and in line with the demands of 21st-century education.

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