

Adaptive Learning Media within Universal Design for Learning: A Systematic Literature Review for Supporting Slow Learner Students

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Abstract

Inclusive education emphasizes equitable access through flexible, student-centered approaches, including for slow learners with diverse learning needs. This study aims to systematically review the use of adaptive learning media within the Universal Design for Learning (UDL) framework. The method employed is a systematic literature review using the PRISMA model, analyzing articles indexed in SINTA, Scopus, and conference proceedings from 2016 to 2026. The analysis of 30 studies indicates that adaptive media—particularly audio-visual, manipulative, and visual—are widely used, especially in mathematics and language learning. These media have been shown to enhance understanding, engagement, and individualized learning in line with UDL principles. However, implementation tends to emphasize representation and engagement more than action and expression. These findings highlight the important role of adaptive learning media in supporting slow learners within inclusive education contexts.

Keywords: *slow learner, adaptive learning media, UDL, inclusive education*

Abstrak

Pendidikan inklusif menekankan akses setara melalui pendekatan fleksibel dan berpusat pada siswa, termasuk bagi siswa slow learner yang memiliki kebutuhan belajar beragam. Penelitian ini bertujuan meninjau secara sistematis penggunaan media pembelajaran adaptif dalam kerangka Universal Design for Learning (UDL). Metode yang digunakan adalah systematic literature review dengan model PRISMA terhadap artikel terindeks SINTA, Scopus, dan prosiding periode 2016–2026. Hasil analisis terhadap 30 studi menunjukkan bahwa media adaptif berbasis audio-visual, manipulatif, dan visual dominan digunakan, terutama pada pembelajaran matematika dan bahasa. Media tersebut terbukti meningkatkan pemahaman, keterlibatan, serta mendukung pembelajaran individual sesuai prinsip UDL. Implementasi masih lebih menekankan aspek representasi dan keterlibatan dibandingkan aksi dan ekspresi. Temuan ini menunjukkan bahwa media pembelajaran adaptif berperan penting dalam mendukung kebutuhan belajar siswa slow learner dalam konteks pendidikan inklusif.

Kata kunci: *siswa lamban belajar, media pembelajaran adaptif, desain universal untuk pembelajaran, pendidikan inklusif*



INTRODUCTION

Inclusive education has become a global priority in ensuring equitable access to quality education for all learners, including those with diverse learning needs such as slow learner students. It emphasizes the importance of providing flexible learning environments, differentiated instruction, and accessible learning resources that accommodate individual differences in cognitive abilities, learning pace, and learning styles (UNESCO, 2020; Tomlinson, 2014). In this context, the implementation of Universal Design for Learning (UDL) offers a comprehensive framework that promotes inclusive practices by providing multiple means of representation, action and expression, and engagement to support diverse learners (CAST, 2018). However, despite its potential, many traditional instructional approaches still fail to fully address the specific needs of slow learner students, highlighting the need for adaptive learning media that are flexible, personalized, and responsive to learners' characteristics (Meyer et al., 2014; Hall et al., 2012). In line with the educational policy stipulated in Regulation of the Minister of National Education (Permendiknas) No. 70 of 2009 concerning the implementation of inclusive education in Indonesia, schools are required to provide inclusive education within regular or mainstream schools (Kasman, 2020). This regulation emphasizes providing equal opportunities for all learners, including those with disabilities as well as those with special intelligence and/or talents, to participate in education and learning activities together with other students in the same educational environment. This policy is consistent with Law No. 20 of 2003, which states that all citizens have the right to education, including both typically developing children and children with special needs (Fauzan et al., 2021).

Therefore, inclusive education necessitates learning systems that are capable of accommodating the diversity of learners' characteristics and needs. One group that requires special attention is slow learner students, who experience delays in understanding and processing learning information compared to their peers. Slow learner students often show delays in cognitive processing, response to stimuli, and adaptation to social environments. Their characteristics include difficulty in grasping learning materials, slow response rates, limited vocabulary mastery, and generally lower abstract thinking abilities compared to typically developing students. These characteristics contribute to low academic achievement, which is influenced by weaknesses in reading skills, language abilities, memory, social skills, and behavioral aspects (Zachrotul Chumairo et al., 2021). As a result, slow learner students require more time to process learning content than their peers. Consequently, they often encounter obstacles and difficulties when participating in learning activities delivered through conventional, uniform instructional approaches commonly used by teachers. Such approaches tend to limit students' participation, engagement, interest, and learning motivation, ultimately leading to lower learning outcomes for slow learner students in inclusive classrooms.

One learning approach for the implementation of inclusive education is the Universal Design for Learning (UDL) approach, which was developed to accommodate flexibility and variability in the use and provision of instructional materials and learning resources for students with special needs through multiple forms of content presentation, student engagement, and learners' action and expression. The implementation of Universal Design for Learning (UDL) in early childhood education contributes significantly to the creation of learning environments that are more inclusive, flexible, and responsive to the needs of all learners (Haris et al., 2025). It stated that UDL is implemented through flexible instructional design, the recognition of diverse learning styles among children, and the strengthening of teachers' capacity to design and apply differentiated instructional approaches. Universal Design for Learning is a pedagogical framework developed by CAST (2018) in (Mais et al., 2025), with the primary principle of providing equitable access to learning through three pillars which are multiple means

of engagement, multiple means of representation, and multiple means of action and expression. As supported by (Lohmann et al., 2018) stated that UDL is a framework designed to anticipate and accommodate the needs of diverse and exceptional learners by ensuring that all students can access the curriculum. The concept rests on three main principles: flexible presentation of information, increased student engagement, and multiple ways to express understanding. In the context of digital learning media, UDL provides significant opportunities to support more adaptive learning through technology that is accessible to all learners (Rao, 2021). The UDL approach emphasizes flexibility in instructional design so that every learner, including slow learner students, can access and understand learning materials according to their individual abilities and needs. The application of UDL principles is believed to create a learning environment that is more equitable and responsive to differences in learning abilities.

Along with the advancement of educational technology, adaptive learning media have emerged as a potential solution to support the implementation of UDL in instructional practice. Adaptive learning media are designed to adjust content, learning pace, and modes of content delivery based on learners' characteristics and needs. The integration of adaptive learning media with UDL principles enables the creation of more personalized, flexible, and dynamic learning experiences, thereby enhancing the engagement and conceptual understanding of slow learner students. (Zakariyah et al., 2024) stated that UDL-based digital learning media can meet diverse learner needs by offering flexible ways of presenting content, promoting active engagement, and enabling personalized learning pathways. The key factors influencing UDL adoption, including the flexibility of digital media forms, especially for slow learner students (text, audio, video, interactive graphics, and AR), educator training in inclusive digital pedagogy, and technological accessibility to ensure equitable learning opportunities.

This UDL approach not only enables learning to be adapted to individual needs, but also ensures that the instructional design implemented is inclusive and equitable for all learners. UDL is a teaching strategy that aims to meet all students' specific needs and competencies by eliminating unnecessary learning barriers. Through the implementation of UDL, teachers can ensure that the learning environment is adapted to serve every student, especially those with special needs (Praveen et al., 2024). The use of interactive game-based learning media grounded in Universal Design for Learning (UDL) can help facilitate slow learner students in understanding school material more easily (Zachrotul Chumairo et al., 2021a). Therefore, this study is essential to classify forms of adaptive learning media for slow learner students based on UDL, including how content is presented, how students act and express themselves, and how motivation and interest can be enhanced through varied approaches. However, several problems still arise from learning media that are not UDL-based, which make it difficult for slow learner students to process information and materials, and may lead to decreased learning interest and motivation. Thus, this study aims to provide insights into effective forms of learning media presentation, as well as the characteristics and types of adaptive media that can meet the needs and competencies of slow learner students.

Despite the growing implementation of inclusive education, studies on adaptive learning media and Universal Design for Learning (UDL) are often conducted separately, with limited focus on slow learner students as a distinct group. Existing research tends to emphasize general special education contexts without providing a systematic classification of adaptive media aligned with UDL principles, particularly in terms of representation, action and expression, and engagement. Furthermore, there is a lack of comprehensive synthesis that integrates findings across studies to identify effective adaptive media for slow learners. Therefore, a systematic literature review is urgently needed to bridge this gap by mapping, analyzing, and synthesizing adaptive learning media within the UDL framework to better support the diverse needs of slow learner students.

Therefore, studies examining the types of adaptive learning media that can be applied in inclusive elementary schools from UDL perspectives to support slow learner students need to be explored more deeply. Such an in-depth review is necessary to map existing needs for learning media that are still scattered across various studies and have not yet been systematically synthesized, particularly regarding the implementation of UDL in inclusive education contexts, including its procedures and systematic application, which require further comprehensive investigation. Accordingly, this study aims to conduct a systematic literature review to comprehensively examine the types of adaptive learning media for slow learner students, adaptive learning media based on UDL principles for slow learner students, as well as their implementation and contributions in supporting the learning processes of slow learner students. The findings of this review are expected to provide valuable insights and an overview of future research trends for the development of learning media and technologies related to the implementation of UDL and inclusive approaches, particularly for students with special educational needs. This study reviews the use of adaptive learning media within the UDL framework to support slow learner students, while identifying its types, characteristics, implementation, and impact on learning outcomes, motivation, and independence. It also provides practical guidance for educators in creating inclusive and adaptive learning environments aligned with SDG 4 on equitable and quality education (Safitri et al., 2022).

METHOD

This study used a Systematic Literature Review (SLR) approach to analyze the use of adaptive learning media within the Universal Design for Learning (UDL) framework in supporting the learning needs of slow learner students. Systematic Literature Review (SLR) is a rigorous and structured scientific approach used to review, evaluate, and synthesize literature relevant to a specific research topic (Martins & von Wangenheim, 2023). A Systematic Literature Review is an organized and critical research process aimed at compiling and synthesizing scientific literature in a systematic manner, thereby providing valuable contributions to the development of knowledge and understanding across various disciplines (Wada et al., 2024). (Ramayanti et al., 2023) stated that this method is used to collect information on a particular topic in a way that ensures a high level of objectivity, auditability, and replicability. A literature review is important because it helps explain the research background of a topic, demonstrates why a topic is significant to investigate, identifies relationships among existing studies or research ideas, recognizes key themes, concepts, and leading scholars in a given field, and identifies major research gaps while addressing further research questions based on previous studies (University of West Florida, 2020 in (Nursalam et al., 2020)). This method aimed to systematically identify and synthesize relevant research findings.

Data collection in this study was conducted through a documentation study by gathering scientific articles relevant to the research topic. This study employed the PRISMA framework to conduct a systematic literature review. Articles were identified through major databases such as Scopus, Google Scholar (SINTA) and proceeding using keywords related to adaptive learning media, learning media for slow learner students, learning media type for slow learner students, Universal Design for Learning (UDL), and slow learner students. The screening process involved removing duplicates and reviewing titles and abstracts based on inclusion and exclusion criteria. Eligible articles were further assessed through full-text analysis to ensure relevance and methodological quality. Finally, selected studies were analyzed using thematic synthesis to identify patterns in adaptive media use within UDL frameworks to support slow learner students.

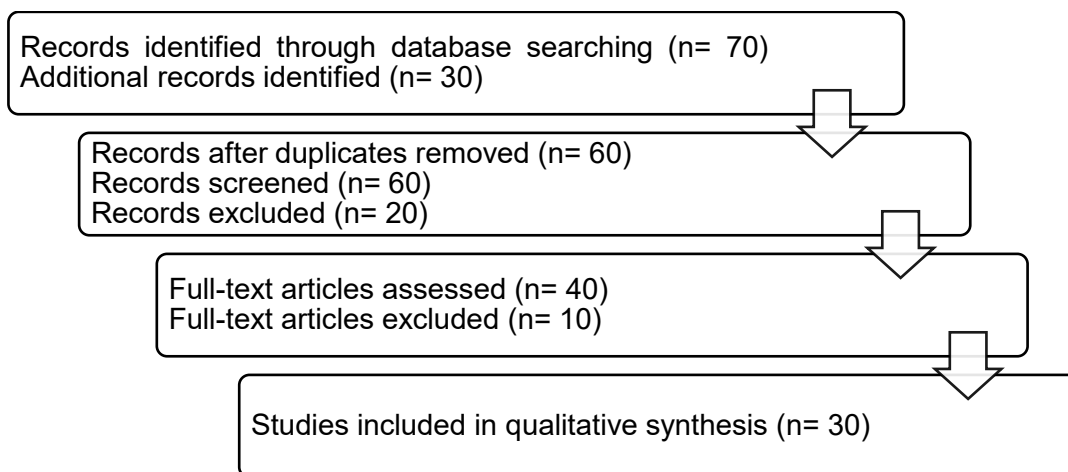


Figure 1.1. PRISMA diagram in qualitative research

Based on the PRISMA selection process, 70 articles were identified from databases and 30 from other sources, yielding 100 initial records. After removing duplicates, 60 articles remained and were screened by title and abstract, with 20 excluded for not meeting the criteria. At the eligibility stage, 40 full-text articles were assessed, and 10 were excluded due to not meeting the inclusion criteria. Finally, 30 articles were included in the qualitative synthesis to analyse the use of adaptive learning media within the UDL framework to support slow learner students. And based on the 30 articles analyzed, the classification of the distribution of research types is as follows:

Research Type	Total
SLR (Systematic Literature Review)	1
Development (R&D / Development)	8
Qualitative	5
Quantitative	16
Total	30

Table 1.1. Recapitulation of Research Types
RESULT AND DISCUSSION

This section presents the results and discussion of the Systematic Literature Review, which aims to comprehensively examine the implementation of adaptive learning media within the Universal Design for Learning (UDL) framework to support slow learner students. The findings were obtained through a systematic process of selection, screening, and analysis of relevant studies that met the established inclusion and exclusion criteria. The analysis focuses on the types of adaptive learning media employed, the characteristics of UDL principles implementation, inclusive education contexts, and their contributions to improving engagement, comprehension, and learning outcomes of slow learner students. Furthermore, this section discusses the key findings in relation to the UDL theoretical framework and previous studies, providing a deeper understanding of effective adaptive learning practices and their implications for the development of inclusive education.

In this context, the researchers seek to classify several types of adaptive digital media that can be utilized for students with special educational needs, particularly slow learner students, by drawing on previous studies as theoretical references for this research. Adaptive digital media are considered to play a strategic role in creating inclusive learning environments that are responsive to the diverse needs of learners in the era of Society 5.0. Based on (Zahroh et al., 2025) stated that the integration of technologies such as augmented reality (AR), virtual reality (VR), speech-to-text, closed captions, virtual manipulatives, smart book media, digital-based flashcards, flipbooks (flippy kata), e-comics, and digital ethno-web media has been shown to be effective in

addressing accessibility barriers and enhancing the engagement of students with special educational needs.

This study synthesizes findings from 30 relevant articles examining the use of adaptive learning media for slow learner students in inclusive elementary school settings. The analysis highlights trends in media classification, subject areas, and functional roles of media, offering empirical insight into how instructional media supports learning accessibility and effectiveness for slow learners.

Table 1.2. List of Adaptive Learning Media for Supporting Slow Learner Student in Elementary School

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
1	Game Interaktif Berbasis Universal Design Learning Bagi Siswa Slow Learner Di Sekolah Inklusi (Zachrotul Chumairo et al., 2021b)	Audio and visual using flash player dan Unity 3D.	All subject	√	√	√	Video-based interactive game media that integrate audio-visual elements combining narration, textual support, graphics, images, animated visuals, and engaging kinesthetic interactions support the development of students' learning abilities. Additionally, kinesthetic features such as zoom, replay, and adjustable playback speed align with UDL principles through multiple means of representation, action and expression, and engagement, thereby enhancing students' understanding and learning performance.
2	Pengembangan Modul Ajar Akomodatif Berbasis Multimedia Untuk Anak Berkebutuhan Khusus Di Sekolah Inklusi (Rafikayati et al., 2025)	Interactive video animation (Material "Sistem Pencernaan (IPA) and Tata Surya")	Science	√		√	Animated videos with slow-paced narration, illustrative visuals, simplified text, and interactive quizzes support UDL principles through multiple means of representation and engagement, thereby helping slow learner students understand the material more effectively.
3	Pengembangan Vidio Edukasi Berbasis Model Pembelajaran Tarl Untuk Menanamkan Pemahaman	Educational video based on the Teaching at the Right Level (TaRL) approach	Bahasa Indonesia	√		√	TaRL-based educational video media support UDL principles through multiple means of representation and engagement, as they utilize audio-visual design and narration to enhance

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
	Peserta Didik Dengan Kendala Slow Learning Pada Pendidikan Inklusi SD Negeri 1 Melayu (C. Lestari et al., 2025)						students' understanding and involvement in the learning process.
4	Pembelajaran Dengan Media Flashcard Untuk Meningkatkan Kemampuan Membaca Pada Anak Slow Learner Di Kelas Inklusi Sekolah Dasar Negeri Ambulu 01 (Achmad, 2024)	Flashcard media	Indonesia n language	√		√	The use of flashcards supports UDL principles through multiple means of representation and engagement, as they present information visually to enhance understanding, memory, vocabulary development, and the engagement of slow learner students.
5	Multimedia Learning Strategy (Animated Video) for Children With Slow Learner (Fitriani et al., 2024)	Animated videos	Mathemat ic	√		√	The use of animated videos supports UDL principles through multiple means of representation and engagement, as it provides visualizations that enrich the learning experience and help address the diverse needs of students in an inclusive classroom.
6	Use Of Adaptive Learning Media For Children With Special Needs In Inclusive Pilot Madrasas (I. A. Lestari, 2022)	Manipulated media (a set of stone), alphabet cards	Mathemat ic and Bahasa Indonesia	√	√		The use of adaptive learning media based on visual sensory tools and concrete teaching aids, such as alphabet cards and sets of stones, supports UDL principles through multiple means of representation and action and expression, as it helps slow learner students understand mathematical and literacy concepts more effectively while addressing their specific learning needs.
7	Optimizing Slow Learners' Understanding	Manipulative media (ice cream sticks	Mathemat ic	√	√	√	The use of manipulative learning media, such as ice cream sticks and

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	through Environment-Based Manipulative Media on the Number Operation Topic (Jannah et al., 2025)	and seashell boards)					seashell boards, supports UDL principles through multiple means of representation, action and expression, and engagement, as it helps slow learner students understand numerical operation concepts concretely while enhancing their motivation, independence, and classroom participation.
8	Pengembangan Media "Asih" Untuk Meningkatkan Kemampuan Pronunciation Dan Speaking Siswa Slow Learners Di Sdn Balerejo 02 (Sulasih & Nursalim, 2025)	ASIH application media (audio speech integration helper) with audio-lingual approach	Mathematics and Indonesian	√	√		ASIH application supports UDL principles through multiple means of representation and action and expression, as it provides clear and slow audio along with interactive exercises to help slow learner students understand, imitate, and practice pronunciation repeatedly according to their needs.
9	Enhancing Writing Skills in Slow Learners Through Differentiated Learning and Audio-Visual Media (Kamsiah & Pujaningsih, 2025)	Smart TV-based audio-visual materials	Focus on simple command sentence writing skills	√	√	√	This intervention supports UDL principles through multiple means of representation, action and expression, and engagement, as the combination of shortened video content, visual-auditory stimulation, and systematic scaffolding helps slow learner students overcome working memory limitations, enhance motivation, and significantly improve their writing skills.
10	Improving the Beginning Reading Skills of Slow Learner Students Through the Use of Animated	Animated audio-visual media powtoon	Indonesia	√		√	The use of Powtoon animated videos supports UDL principles through multiple means of representation and engagement, as it provides engaging visuals

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
	Audio-Visual Media Powtoon in Indonesian Language Learning at Advent Elementary School (SD) (Purba & Pamungkas, 2025)						and clear audio to help slow learner students understand basic reading concepts, while significantly improving their focus, motivation, and reading fluency.
11	Improving the Numeracy Skills of Slow Learners with Ice Cream Stick Media: Single Subject Research (Rahayu et al., 2024)	Ice cream stick media	Mathematic	√	√		The use of ice cream stick media supports UDL principles through multiple means of representation and action and expression, as this concrete manipulative helps slow learner students understand basic arithmetic concepts, perform counting, and accurately solve addition and subtraction problems. Concrete manipulatives effectively support the development of numeracy skills in slow learner students.
12	Improving Reading and Calculation Ability through Audio Visuals Media in Indonesian Elementary School Student with Slow Learner: A Literature Study (Puspitasari et al., 2021)	Audio visual media	Matematika and Indonesia	√		√	The use of learning media that combine visual and auditory elements supports UDL principles through multiple means of representation and engagement, as it helps slow learner students process material more effectively, enhance understanding, and develop reading and numeracy skills.
13	Web-Based Syllable Reading Learning Media (Basuka) For Beginning Reading For Slow Learner	Web-based syllable reading learning media (Basuka)	Indonesia	√		√	"BASUKA Learning Media" supports UDL principles through multiple means of representation and engagement, as this web-based application provides interactive multimedia tailored to the

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
	Students At Elementary School Level (Rahmawaty et al., 2023)						early reading stages and characteristics of slow learner students, thereby facilitating understanding, reading practice, and making learning more enjoyable.
14	A Qualitative Approach in Designing Differentiated Numeracy Learning Strategies for Lower Grade Slow Learner Students (Putri et al., 2024)	Concrete objects	Mathematics	√	√	√	These five manipulative activities counting objects, matching numbers with quantities, grouping objects by numbers, matching numbers with flat shapes, and drawing flat shapes support UDL principles through multiple means of representation, action and expression, and engagement, as they provide concrete and interactive learning experiences that help slow learner students understand numbers and geometric concepts while promoting active participation and collaboration.
15	View of Vocabulary learning for slow learner students in inclusive elementary schools_ A case of Magetan Regency, East Java, Indonesia (Cahyono et al., 2024)	Word card and letter puzzle media	Reading and writing skills	√	√		The use of word cards and letter puzzles supports UDL principles through multiple means of representation and action and expression, as these media help slow learner students understand new vocabulary, construct sentences, and practice interactively.
16	The use of pictorial media card to improve the initial reading ability of slow learner students (Widyana & Dewi, 2020)	Pictorial card media	Reading skill	√	√		The use of card-based media supports UDL principles through multiple means of representation and action and expression, as it helps slow learner students improve decoding accuracy, strengthen word or text recall, and reduce

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
17	Peningkatan Kosakata Bahasa Mandarin Menggunakan Audio Book Pada Siswa Lamban Belajar di SD Aletheia Lumajang (Santoso et al., 2023)	Audio book	Mandarin language	√	√	√	reading and pronunciation errors. Audio book media based on visual, auditory, and manipulative elements made of thick paper and equipped with colored images, sound, and a box for inserting cards support UDL principles through multiple means of representation, action and expression, and engagement, as they help slow learner students understand Mandarin vocabulary while enhancing memory, coordination, and learning motivation.
18	Saringgong: An Alternative Media for Slow Learner Students in Learning Mathematics (Sovia et al., 2022)	Traditional game Saringgong	Mathematics		√	√	Game-based learning media such as Saringgong support UDL principles through multiple means of engagement and action and expression, as they involve interactive motor and counting activities to enhance focus, motivation, and numeracy skills of slow learner students.
19	Inclusive Learning Innovation with Mobile-Based Bilingual Interactive Games for Slow Learner Students (Yulia Riska et al., 2024)	Game based learning (bilingual mobile-based interactive game for slow learners in inclusive education)	Science or numeracy skill	√	√	√	The educational game "Safari Kingdom" supports UDL principles through multiple means of representation, action and expression, and engagement, as it provides interactive learning that enhances understanding, engagement, and cognitive abilities of slow learner students, and can be further developed with adaptive features tailored to individual needs.
20	Peningkatan Kemampuan Membaca	Video media	Reading skill	√	√		Learning through video combined with demonstration and hands-

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
	Pemahaman Menggunakan Media Video Pada Anak Slow Learner di Kelas IV SD Taman Muda Ibu Pawiyatan Taman Siswa Yogyakarta (Cahyani, 2019a)						on practice supports UDL principles through multiple means of representation and action and expression, as it helps slow learner students understand the material visually and directly through practical experience.
21	Peningkatan Kemampuan Membaca Pemahaman Menggunakan Media Komik Bagi Anak Slow Learner Kelas IV Sekolah Dasar Negeri Tamansari 1 Yogyakarta (Kurnia, 2019)	Comic Media	Reading skill	√	√		The use of comic media supports UDL principles through multiple means of representation and action and expression, as it combines text and images to facilitate understanding and helps slow learner students retell the content.
22	Pengaruh Penggunaan Media Flashcard Terhadap Hasil Belajar Matematika Siswa Slow Learner (Irawan et al., 2024)	Flashcard	Mathematic	√		√	The use of visual flashcards in teaching three-dimensional shapes supports UDL principles through multiple means of representation and engagement, as it combines images and text to facilitate concept understanding and enhance the engagement of slow learner students.

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
23	Penggunaan Media MBB AR dalam Meningkatkan Kemampuan Literasi dan Karakter Siswa Slow Learner (Firdaus, 2021)	MBB AR Media	Literacy skill (Indonesia)	√		√	The use of MBB AR markers supports UDL principles through multiple means of representation and engagement, as it integrates physical and digital visual media based on augmented reality in the form of cards and digital markers in PNG or JPG formats. These markers are scanned using a smartphone camera to display prepared 3D objects, helping slow learner students understand number concepts in a more concrete and engaging way.
24	Pengembangan The Thing Puzzle Interactive Media untuk Mengasah Keterampilan Verbal bagi Slow Learner (Tintin Susilowati et al., 2025)	The Thing Puzzle Interactive Media	Verbal Communication Skills	√	√	√	The interactive puzzle media supports UDL principles through multiple means of representation, action and expression, and engagement, as it helps slow learner students construct sentences visually and interactively while enhancing their learning motivation. The development of this interactive puzzle with engaging content, design, and layout makes it suitable as a language learning medium for slow learners. However, it is still limited in terms of representation, as it is not equipped with audio and therefore requires teacher assistance.

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
25	Pengembangan Media Story Book Berbasis Android untuk Meningkatkan Perilaku Tanggung Jawab Lingkungan Sekolah Siswa Slow Learner (Julaika & Widajati, 2025)	Android-Based Story Book	Responsible Behavior	√		√	The Android-based digital story book application supports UDL principles through multiple means of representation and engagement, as it integrates illustrations, text, interactive features, and feedback using a multisensory approach to help slow learner students comprehensively understand the value of responsibility in character education.
26	Pengembangan Media Bussy Book Calistung Untuk Siswa Slow Learner Kelas 1 di SDN 3 Lendang Nangka	Bussy book media	CALISTUNG/ literacy and numeracy (reading, writing, and arithmetic)	√		√	Bussy Book Media is an innovative learning media for reading, writing, and arithmetic at the early grade level, specifically designed to support slow learner students. This media attracts attention through its colorful design and activities presented as games, allowing students to learn while playing. By providing multiple means of representation through text, colors, and illustrations, as well as multiple means of engagement through interactive activities, the Bussy Book helps students grasp the material more quickly, increases their confidence, and supports cognitive development and learning motivation.
27	Penerapan Media Pembelajaran FlashCard Untuk Meningkatkan Hasil Belajar Siswa Slow Learner Kelas IV SD Negeri	Flashcard	Learning outcomes for the material based on theme 6 (my aspirations), subtheme	√	√	√	The Flash Card media consists of cards with images and words that can be adjusted to students' needs, either made by themselves or using pre-made cards. This media helps develop memory, independence, and vocabulary. The cards

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				Representation	Action and Expression	Engagement	
	Amsila (Sonbai, Delsri et al., 2023)		1 (Civic, Indonesia, Science)				were tailored to the material for each meeting (2–6), with the class teacher supporting their implementation. Students work in small groups to categorize the cards while responding to the concepts presented by the teacher. By presenting information visually and verbally, students with different learning styles can understand the material (representation), actively interact with the cards to express their understanding (action & expression), and engage in enjoyable group activities and games (engagement), especially benefiting slow learners.
28	Peningkatan Kemampuan Membaca Pemahaman Menggunakan Media Video Pada Anak Slow Learner di Kelas IV SD Taman Muda Ibu Pawaiyan Tamansiswa Yogyakarta (Cahyani, 2019b)	Video	Reading skill	√	√	√	The video media presents learning materials concretely through images, text, and sound, helping slow learner students grasp concepts more easily. The teacher demonstrates practices for maintaining sensory health and using technological tools, allowing students to learn through real experiences. This approach increases students' enthusiasm, participation, and confidence, making them more active in answering questions and performing tasks. By providing information visually, verbally, and audibly (representation), engaging students in hands-on practice (action & expression), and fostering motivation through interactive video activities

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
							(engagement), the media effectively supports diverse learning needs, especially for slow learners.
29	Strategi Pembelajaran Berbasis Media Visual untuk Meningkatkan Pemahaman Anak Slow Learner di Desa Grujugan (Surur et al., 2026)	Visual	Mathematical concept and natural science	√	√	√	Visual media play an important role in transforming abstract concepts into more concrete and easily understood information for students with slower cognitive processing. The implementation of visual media, combined with material repetition techniques and individualized approaches, has been shown to improve students' focus, enthusiasm, and confidence in the learning process. Additionally, neuroscience research demonstrates that appropriate visual stimuli can help optimize children's brain performance in absorbing information, even at a slower pace compared to regular students.
30	Pengembangan Media Board Bow Puzzle Untuk Meningkatkan Hasil Belajar Siswa Slow Learner (Mukaroma & Agustin, 2022)	Board bow puzzle media	fractions and calculating geometric angles	√	√	√	Puzzle media is used to enhance students' understanding of fractions and geometric angle calculations. This activity is engaging because it encourages two-way interaction and promotes strategic, mathematical, and effective thinking. Manipulable educational puzzles stimulate motor skills, concentration, accuracy, patience, and learning enthusiasm. By selecting appropriate shapes or images, the media supports systematic

No	Author's	Type of Adaptive Learning Media	Subject Area/ Competency	UDL Principles			Reasons for the Selection of Media Forms and Their Classification
				Representation	Action and Expression	Engagement	
							thinking and cognitive development. Puzzle media presents concepts visually and manipulatively (representation), allows students to actively assemble pieces to express understanding physically and cognitively (action & expression), and the interactive, challenging nature of the activity boosts motivation, engagement, and confidence, especially for slow learners (engagement).

To obtain a comprehensive understanding of how instructional support is designed for slow learner students, it is essential to first examine the classification of adaptive learning media employed in inclusive education contexts. Analyzing the types of media used provides insight into pedagogical preferences, technological integration, and instructional strategies that align with the cognitive and learning characteristics of slow learners.

A. Classification of Adaptive Learning Media

Based on the analysis of 30 selected studies, adaptive learning media used to support slow learner students can be classified into several main categories, including audio-visual media, manipulatives, game-based media, visual media, and digital or application-based media.

Table 1.3. Classification of Adaptive Learning Media

No	Media Category	Type of Media	Total	Examples of Media
1	Audio-Visual Media	Video, animation, Powtoon, Smart TV, audiobook	10	Animated video, educational video, Powtoon, audiobook
2	Manipulative Media	Concrete objects, teaching aids, physical puzzles	7	Ice cream sticks, seashell board, concrete objects, puzzle
3	Game-Based Learning	Interactive digital and traditional games	3	Unity 3D game, mobile game, Saringgong
4	Visual Media	Flashcards, pictorial cards, comics	6	Flashcard, pictorial card, comic, word card
5	Digital / Application-Based Media	Web, AR, Android applications	4	BASUKA web, AR media, Android storybook, ASIh app
Total			30	

The findings indicate that Audio-visual media are the most dominant type, including animated videos, educational videos, Powtoon, Smart TV-based materials, and audiobooks. These media provide multisensory input through visual and auditory

channels, which significantly enhances students' understanding and engagement. Previous studies indicate that audio-visual media effectively support the principles of multiple means of representation and engagement (Chumairo et al., 2021; Rafikayati et al., 2025; Fitriani et al., 2024; Purba & Pamungkas, 2025; Puspitasari et al., 2021).

Manipulative media, such as ice cream sticks, seashell boards, concrete objects, and physical puzzles, are widely used particularly in mathematics and basic literacy learning. These media allow students to interact directly with learning materials, thereby supporting representation as well as action and expression. Hands-on learning experiences help slow learner students understand abstract concepts more concretely (Jannah et al., 2025; Rahayu et al., 2024; Putri et al., 2024).

Game-based learning media, including both digital and traditional games, also show strong potential in supporting learning. Interactive games developed using platforms such as Unity 3D or mobile applications, as well as traditional games like *Saringgong*, enhance students' motivation, participation, and cognitive engagement. These media support all three UDL principles: representation, action and expression, and engagement (Chumairo et al., 2021; Sovia et al., 2022; Yulia Riska et al., 2024).

Visual media, such as flashcards, pictorial cards, comics, and word cards, remain effective and widely used, especially in early literacy and vocabulary learning. These media primarily support representation and engagement, as they help students process and retain information through visual aids (Achmad, 2024; Widiana & Dewi, 2020; Irawan et al., 2024).

Furthermore, digital and application-based media, including web-based platforms, augmented reality (AR), Android-based storybooks, and speech-assistive applications, represent a growing trend in recent studies. These technologies offer flexible, interactive, and adaptive learning environments tailored to students' individual needs. They support multiple UDL principles, particularly representation and engagement, while also enabling personalized learning experiences (Rahmawaty et al., 2023; Firdaus, 2021; Julaika & Widajati, 2025; Sulasih & Nursalim, 2025).

Overall, the findings reveal that most adaptive learning media emphasize the UDL principle of representation, followed by engagement, while action and expression are mainly facilitated through manipulative and interactive media. This indicates that current research tends to focus more on how learning content is delivered and how students are motivated, rather than on how students actively express their understanding.

B. Subject Areas Addressed by Adaptive Media

Based on the analysis of the selected studies, adaptive learning media for slow learner students are applied across several subject areas, with a primary focus on mathematics and language learning, followed by science and other skill-based domains.

Table 1.4. Subject Areas Addressed by Adaptive Media

No	Subject Area	Total	Topics/ Competency Skill
1	Mathematics	9	Numeracy, number operations, fractions, geometry
2	Language (Literacy)	11	Reading, writing, vocabulary, pronunciation
3	Science	2	Digestive system, solar system
4	Mixed Subjects (Math & Language / Thematic)	3	Basic literacy and numeracy (CALISTUNG), thematic learning
5	Skills & Character Education	5	Responsible behavior, verbal communication, cognitive skills
Total		30	

Mathematics is the most dominant subject area addressed in the studies. Many adaptive media, particularly manipulative tools and visual aids, are designed to support

numeracy skills such as counting, basic operations, fractions, and geometry. These media help transform abstract mathematical concepts into concrete learning experiences, which are essential for slow learner students (Jannah et al., 2025; Rahayu et al., 2024; Putri et al., 2024).

Language learning, including reading, writing, vocabulary, and speaking skills, is also widely represented. Various media such as flashcards, videos, comics, audiobooks, and interactive applications are used to enhance literacy development. These tools support students in improving reading comprehension, vocabulary acquisition, pronunciation, and writing skills through repetitive and engaging activities (Achmad, 2024; Widyana & Dewi, 2020; Santoso et al., 2023).

In addition, several studies address science subjects, particularly topics such as the digestive system and the solar system. Audio-visual and interactive media are commonly used to present scientific concepts in a simplified and engaging manner, making them more accessible to slow learner students (Rafikayati et al., 2025).

Beyond core academic subjects, some studies also focus on skill-based and character education, including responsible behavior, verbal communication, and cognitive development. Media such as digital storybooks, interactive puzzles, and game-based learning environments are used to foster both academic and non-academic competencies (Julaika & Widajati, 2025; Susilowati et al., 2025).

Overall, the findings indicate that adaptive learning media are predominantly used to support foundational skills, particularly literacy and numeracy. However, there is a growing trend toward integrating these media into broader subject areas and competencies, highlighting their potential to support holistic learning for slow learner students.

C. Functions of Adaptive Media for Slow Learner Students

Adaptive learning media serve several important functions in supporting the learning process of slow learner students. These functions are closely aligned with the principles of Universal Design for Learning (UDL), particularly in facilitating understanding, engagement, and active participation.

Adaptive media function as tools to enhance conceptual understanding by transforming abstract concepts into more concrete and accessible forms. Media such as audio-visual content, manipulatives, and visual aids help students process information through multiple sensory channels, making it easier for slow learner students to grasp complex material (Jannah et al., 2025; Fitriani et al., 2024). It played a role in increasing student engagement and motivation. Interactive features such as games, animations, and multimedia elements create enjoyable learning experiences that reduce boredom and anxiety. This is particularly important for slow learner students, who often require more stimulating and supportive learning environments to remain focused and motivated (Chumairo et al., 2021; Yulia Riska et al., 2024). Adaptive media support individualized and flexible learning. Many digital and application-based media allow students to learn at their own pace through features such as replay, adjustable speed, and repeated practice. This flexibility helps accommodate the diverse learning needs and cognitive processing speeds of slow learner students (Rafikayati et al., 2025; Sulasih & Nursalim, 2025). It also facilitated active participation and expression of understanding. Manipulative and interactive media enable students to engage directly with learning materials and demonstrate their knowledge through hands-on activities, discussions, or task completion. This aligns with the UDL principle of action and expression, allowing students to express their learning in various ways (Putri et al., 2024; Rahayu et al., 2024). As the conclusion, adaptive media contribute to the development of foundational and higher-order skills, including literacy, numeracy, communication, and cognitive abilities. By integrating multisensory and interactive approaches, these media not only support academic achievement but also foster confidence, independence, and problem-solving skills among slow learner students. The findings highlight that adaptive learning media

function not only as instructional tools but also as supportive mechanisms that design inclusive, engaging, and effective learning environments tailored to the needs of slow learner students.

D. Integration of Adaptive Learning Media within UDL principles

Adaptive learning media are closely aligned with the three core principles of Universal Design for Learning (UDL): multiple means of representation, action and expression, and engagement. These principles are integrated into various forms of media to support the diverse learning needs of slow learner students.

Table 1.5. Integration of Adaptive Learning Media within UDL principles

No	UDL Principles	Total (n=30)	Description
1	Representation	29	Most studies present learning content through multiple formats such as text, images, audio, video, and animation to support students' understanding.
2	Action and Expression	18	Several studies provide opportunities for students to interact, practice, and express their understanding through hands-on activities, manipulatives, or interactive media.
3	Engagement	22	Many studies incorporate motivational elements such as games, interactivity, and multimedia to increase students' interest and participation.

The principle of multiple means of representation is the most prominently implemented across the studies. Most adaptive media, particularly audio-visual, visual, and digital-based media, present information in various formats such as text, images, audio, animation, and interactive elements. This multimodal presentation helps slow learner students better understand learning materials by accommodating different sensory preferences and cognitive processing abilities (Fitriani et al., 2024; Puspitasari et al., 2021; Rahmawaty et al., 2023). Multiple means of engagement is also widely applied. Many studies incorporate interactive features such as games, animations, and hands-on activities to increase students' motivation, attention, and participation. Game-based learning and multimedia applications, in particular, create enjoyable and meaningful learning experiences that encourage active involvement and sustained engagement (Chumairo et al., 2021; Yulia Riska et al., 2024; Julaika & Widajati, 2025). The principle of multiple means of action and expression is implemented through media that allow students to actively respond, practice, and demonstrate their understanding. Manipulative media, interactive applications, and task-based activities enable students to express their knowledge through various forms, such as physical interaction, verbal responses, or digital input. However, compared to the other two principles, this aspect is less consistently integrated across all studies (Putri et al., 2024; Rahayu et al., 2024).

Furthermore, several studies demonstrate the simultaneous integration of all three UDL principles, particularly in interactive and game-based media. These types of media provide comprehensive learning experiences by combining multimodal content (representation), interactive participation (action and expression), and motivational elements (engagement), thereby maximizing learning outcomes for slow learner students. The findings suggest that while adaptive learning media have successfully incorporated UDL principles, there is still a tendency to prioritize representation and engagement over action and expression. This indicates a need for future research and development to design more balanced learning media that fully integrate all three UDL principles to better support inclusive education.

E. Implications for Inclusive Education

The findings of this study provide important implications for the implementation of inclusive education, particularly in supporting slow learner students through adaptive learning media integrated with Universal Design for Learning (UDL) principles. The use of adaptive learning media contributes to the creation of more inclusive and accessible learning environments. By providing multiple means of representation, such as visual, auditory, and interactive formats, these media enable students with diverse learning needs to access and understand learning materials more effectively (Puspitasari et al., 2021; Fitriani et al., 2024). This aligns with the core goal of inclusive education, which is to ensure equal learning opportunities for all students.

Adaptive media promote equity in learning by accommodating individual differences in learning pace, ability, and style. Features such as replay options, adjustable speed, and interactive exercises allow slow learner students to learn according to their own needs, thereby reducing learning barriers and enhancing academic achievement (Rafikayati et al., 2025; Sulasih & Nursalim, 2025). The integration of adaptive media supports student engagement and participation, which are essential in inclusive classrooms. Game-based learning, multimedia applications, and hands-on activities create meaningful and enjoyable learning experiences that encourage active involvement and reduce anxiety among slow learner students (Chumairo et al., 2021; Yulia Riska et al., 2024).

Adaptive learning media facilitate the development of independence and confidence among slow learner students. By enabling students to interact with content, practice repeatedly, and receive immediate feedback, these media help students build self-efficacy and become more active learners (Jannah et al., 2025; Putri et al., 2024). The findings also highlight that the implementation of UDL principles is still not fully balanced, as most studies emphasize representation and engagement rather than action and expression. This suggests that educators and researchers need to design more comprehensive adaptive media that provide greater opportunities for students to express their understanding in diverse ways. As the conclusion, the integration of adaptive learning media within UDL frameworks has strong potential to enhance inclusive education by making learning more flexible, engaging, and responsive to students' diverse needs. Therefore, future efforts should focus on developing more holistic and student-centred learning media to ensure that all learners, especially slow learner students, can fully participate and succeed in the learning process.

CONCLUSION

This study demonstrates that adaptive learning media integrated with the Universal Design for Learning (UDL) framework play a significant role in supporting slow learner students in inclusive elementary education. Based on the analysis of 30 selected studies, various types of adaptive media such as audio-visual, manipulatives, game based, visual, and digital/application-based media have been widely implemented to enhance students' learning experiences. The findings reveal that audio-visual media are the most dominant, followed by manipulatives and visual media, indicating a strong emphasis on multisensory learning approaches. In terms of subject areas, adaptive media are predominantly used in mathematics and language learning, highlighting their importance in developing foundational literacy and numeracy skills. Additionally, these media also support science learning, as well as skill-based and character education.

From a functional perspective, adaptive learning media contribute to improving conceptual understanding, increasing engagement and motivation, supporting individualized learning, and facilitating active participation. These functions align closely with UDL principles. However, the analysis shows that the principle of multiple means of representation is the most frequently implemented, followed by engagement, while action and expression remain less consistently integrated. Furthermore, the integration of adaptive media within UDL principles has important implications for inclusive

education. These media help create accessible, flexible, and student-centered learning environments, promote equity, and support the development of independence and confidence among slow learner students. Nevertheless, there is still a need for more balanced integration of all three UDL principles, particularly in providing greater opportunities for students to express their understanding.

In conclusion, adaptive learning media have strong potential to enhance the quality of inclusive education. Future research and practice should focus on developing more comprehensive and balanced media designs that fully integrate UDL principles to better accommodate the diverse needs of all learners.

REFERENCE

- Achmad, A. R. (2024). *Pembelajaran Dengan Media Flashcard Untuk Meningkatkan Kemampuan Membaca Pada Anak Slow Learner Di Kelas Inklusi Sekolah Dasar Negeri Ambulu 01*. Universitas Islam Negeri Kiai Haji Achmad Siddiq Jember.
- Cahyani, E. (2019a). Peningkatan Kemampuan Membaca Pemahaman Menggunakan Media Video Pada Anak Slow Learner Di Kelas Iv Sd Taman Muda Ibu Pawiyatan Taman Siswa Yogyakarta. *Jurnal Widia Ortodidaktika*, 8(9), 937–946.
- Cahyani, E. (2019b). Peningkatan Kemampuan Membaca Pemahaman Menggunakan Media Video Pada Anak Slow Learner Di Kelas IV SD Taman Muda Ibu Pawiyatan Tamansiswa Yogyakarta Improving The Ability Of Reading Comprehension Using Video Media For 4 th Grade Slow Learner Student At SD. *Jurnal Widia Ortodidaktika*, 8(9), 937–946.
- CAST. (2018). *Universal Design for Learning guidelines version 2.2*. <http://udlguidelines.cast.org>
- Cahyono, B., Asri, D., & Trisnani, R. (2024). View of Vocabulary learning for slow learner students in inclusive elementary schools_ A case of Magetan Regency, East Java, Indonesia. *Research Journal in Advanced Humanities*, 5(1), 209–220. <https://doi.org/https://doi.org/10.58256/e4hejt58>
- Fauzan, H. N., Francisca, L., Asrini, V. I., Fitriani, I., Firdaus, A. A., & Dahlan, U. A. (2021). Sejarah Pendidikan Anak Berkebutuhan Khusus (Abk) Menuju Inklusi. In *PENSA : Jurnal Pendidikan dan Ilmu Sosial* (Vol. 3, Issue 3). <https://ejournal.stitpn.ac.id/index.php/pensa>
- Firdaus, A. Y. (2021). Penggunaan Media MBB AR dalam Meningkatkan Kemampuan Literasi dan Karakter Siswa Slow Learner. *Jurnal Didaktika Pendidikan Dasar*, 5(3), 781–800. <https://doi.org/10.26811/didaktika.v5i3.354>
- Fitriani, Y., Sadiyyah, E. S., Maryanti, R., & Susetyo, B. (2024). Multimedia Learning Strategy (Animated Video) for Children With Slow Learner. *Proceeding of International Conference on Special Education in South East Asia Region*, 3(1), 303–309. <https://doi.org/10.57142/picsar.v3i1.403>
- Haris, F. I., Zaman, B., Kurniati, E., Apsari, N., Khoerunnisa, S., Sidqia, T. L., Shofia, A. F., Arini, A., & Hamid, A. I. (2025). Universal Design for Learning (UDL) Dalam Pendidikan Anak Usia Dini. *ECRJ : Early Childhood Research Journal*, 8(2), 248–256. <https://doi.org/10.23917/ecrj.v8i2.11119>
- Hall, T. E., Meyer, A., & Rose, D. H. (2012). *Universal design for learning in the classroom: Practical applications*. The Guilford Press.
- Irawan, M. F., Latifah, A., & Rizki, N. (2024). Pengaruh Penggunaan Media Flashcard terhadap Hasil Belajar Matematika Siswa Slowlearner. *Jurnal Dedikasi Pendidikan*, 8(1), 67–76. <http://jurnal.abulyatama.ac.id/dedikasi>
- Jannah, U. R., Sholihah, W., Basri, H., Dewi, N. P., Rahmad, R., & Hafsi, A. R. (2025). Optimizing Slow Learners' Understanding through Environment-Based Manipulative Media on the Number Operation Topic. *Jurnal Pendidikan MIPA*, 26(3), 1679–1704. <https://doi.org/10.23960/jpmipa.v26i3.pp1679-1704>
- Julaika, E., & Widajati, W. (2025). Pengembangan Media Story Book Berbasis Android

- untuk Meningkatkan Perilaku Tanggung Jawab Lingkungan Sekolah Siswa Slow Learner. *Jurnal Ortopedagogia*, 11(2020), 94–101. https://journal2.um.ac.id/index.php/jo/article/download/62030/14807?_cf_chl_tk=BP1vtGW_RkWrhlzniMaPEm9__piOnq4RxxhvCw1PSMuM-1755177349-1.0.1.1-2XwacqtCb437pEuYJq8Rt0b2KsOq4OkadzDce_7LWLU
- Kasman. (2020). PENDIDIKAN INKLUSIF BAGI ANAK BERKEBUTUHAN KHUSUS. *Jurnal Education and Development Institut Pendidikan Tapanuli Selatan*, 8(2), 514–518.
- Kamsiah, K., & Pujaningsih, P. (2025). Enhancing Writing Skills in Slow Learners Through Differentiated Learning and Audio-Visual Media. *Journal of Innovation and Research in Primary Education*, 4(4), 1977–1989. <https://doi.org/10.56916/jirpe.v4i4.1911>
- Kurnia, C. P. (2019). Peningkatan Kemampuan Membaca Pemahaman Menggunakan Media Komik Bagi Anak Slow Learner Kelas IV Sekolah Dasar Negeri Tamansari 1 Yogyakarta. *Jurnal Widia Ortodidaktika*, 8(7), 673–683.
- Lestari, C., Hardiningsih, S., Tri Cahyadi, A., & Taman Siswa Bima, S. (2025). Pengembangan Vidio Edukasi Berbasis Model Pembelajaran Tarl Untuk Menanamkan Pemahaman Peserta Didik Dengan Kendala Slow Learning Pada Pendidikan Inklusi SD Negeri 1 Melayu. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 10(2), 2477–2143.
- Lestari, I. A. (2022). Use Of Adaptive Learning Media For Children With Special Needs In Inclusive Pilot Madrasahs. *International Conference of Humanities and Social Science (ICHSS)*, 1, 382–386.
- Lohmann, M. J., Hovey, K. A., & Gauvreau, A. N. (2018). Using a Universal Design for Learning Framework to Enhance Engagement in the Early Childhood Classroom. *The Journal Of Special Education Apprenticeship*, 7(2).
- Mais, A., Lailil, A., Yaum, P., Ngayuningtyas, A., Lili, O., Wirawan, W., Pramurdiasti, O., Dwi, R., Chandra, A., Ali, Z., Syamsiyah, S. F., Wijaya, R., Ade, I., Noviyanti, V., Komalia, N., & Kurnia, S. P. (2025). *Pendekatan Pembelajaran Universal Design for Learning Bagi Peserta Didik Berkebutuhan Khusus* (Budiyanto & S. Masitoh, Eds.). Penerbit Bhineka Pustaka.
- Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and practice*. CAST Professional Publishing.
- Mukaroma, R., & Agustin, I. (2022). Pengembangan Media Board Bow Puzzle Untuk Meningkatkan Hasil Belajar Siswa Slower. *Prosiding Seminar Nasional Penelitian Dan Pengabdian Masyarakat*, 7(1), 1007–1011.
- Nurramadhani, A. Z., Pratama, K. P. S., Amelia, L., Kusuma, A., & Erika, F. (2024). Literature Review: Universal Design for Learning (UDL) Approach of Chemistry Learning in Inclusion Schools. *Hydrogen: Jurnal Kependidikan Kimia*, 12(6), 1324. <https://doi.org/10.33394/hjkk.v12i6.13636>
- Nursalam, Kusnanto, Mishbahatu, E., Yusuf, A., Kurniawati, N. D., Sukartini, T., Efendi, F., & Kusumaningrum, T. (2020). *PEDOMAN PENYUSUNAN LITERATURE DAN SYSTEMATIC REVIEW* (D. Priyantini, Ed.). Fakultas Keperawatan Universitas Airlangga.
- Praveen, A., Bashir, F., Ganie, A. N., Jan, S., & Zimik, P. (2024). The Use of UDL in an Inclusive Classroom-A Review Based Study. *International Journal For Multidisciplinary Research*, 6(4), 1–26. <https://doi.org/10.36948/ijfmr.2024.v06i04.25550>
- Purba, E., & Pamungkas, B. (2025). Improving the Beginning Reading Skills of Slow Learner Students Through the Use of Animated Audio-Visual Media Powtoon in Indonesian Language Learning at Advent Elementary School (SD). *PERSPEKTIF Ilmu Pendidikan*, 39(2), 89–96. <https://doi.org/10.21009/PIP.392.1>
- Puspitasari, F. H., Ediyanto, E., Efendi, M., & Sunandar, A. (2021). Improving Reading

- and Calculation Ability through Audio Visuals Media in Indonesian Elementary School Student with Slow Learner: A Literature Study. *Indonesian Journal of Disability Studies*, 8(2), 481–486. <https://doi.org/doi.org/10.21776/ub.ijds.2021.008.02.14>
- Putri, A. Y., Mariana, N., & Muhimmah, H. A. (2024). A Qualitative Approach in Designing Differentiated Numeracy Learning Strategies for Lower Grade Slow Learner Students. *Didaktika: Jurnal Kependidikan*, 13(001), 797–807. <https://jurnaldidaktika.org>
- Rafikayati, A., Badiah, L. I., Jauhari, M. N., Fisabilillah, S. N., & Fuanindah, L. (2025, November 15). Pengembangan Modul Ajar Akomodatif Berbasis Multimedia untuk Anak Berkebutuhan Khusus Di Sekolah Inklusi. *Universitas PGRI Adi Buana Surabaya*.
- Rahayu, N. P., Prastiwi, L., & Setiawan, W. (2024). Improving the Numeracy Skills of Slow Learners with Ice Cream Stick Media: Single Subject Research. *EDUMATSAINS JURNAL PENDIDIKAN MATEMATIKA DAN SAINS*, 9(1), 235–245. <https://doi.org/10.33541/edumatsains>
- Rahmawaty, S. N., Karsidi, R., & Yuwono, J. (2023). Web-Based Syllable Reading Learning Media (Basuka) For Beginning Reading For Slow Learner Students At Elementary School Level. *Journal of Disability*, 3(2), 43–57.
- Ramayanti, R., Rachmawati, N. A., Azhar, Z., & Azman, N. H. N. (2023). *Langkah Demi Langkah Systematic Literature Review dan Meta-Analysis* (111th ed.). Rajawali Pers PT Rajagrafindo Persada.
- Rao, K. (2021). Digital Tools and UDL-Based Instructional Strategies to Support Students With Disabilities Online. *Journal of Special Education Technology*, 36(2), 105–112. <https://doi.org/10.1177/0162643421998327>
- Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal Design for Learning*. ASCD.
- Safitri, A. O., Yuniarti, V. D., & Rostika, D. (2022). Upaya Peningkatan Pendidikan Berkualitas di Indonesia: Analisis Pencapaian Sustainable Development Goals (SDGs). *Jurnal Basicedu*, 6(4), 7096–7106. <https://doi.org/10.31004/basicedu.v6i4.3296>
- Santoso, C. F., Adi, P. N., & Ariyanto, D. (2023). Peningkatan Kosakata Bahasa Mandarin Menggunakan Audio Book Pada Siswa Lamban Belajar di SD Aletheia Lumajang. *SPEED Journal: Journal of Special Education*, 7(1), 8–15. <https://doi.org/10.31537/speed.v7i1.1188>
- Sonbai, Delsri, O., Saingo, Y. A., & Lao, H. A. . (2023). Penerapan Media Pembelajaran Flash Card Untuk Meningkatkan Hasil Belajar Siswa Slow Learner Kelas IV SD Negeri Amsila. *JUARA SD : Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, 2(2), 221–230.
- Sovia, A., Harisman, Y., & Rifandi, R. (2022). Saringgong: An Alternative Media for Slow Learner Students in Learning Mathematics. *Rangkiang Mathematics Journal*, 1(1), 10–15.
- Sulasih, & Nursalim, M. (2025). Pengembangan Media Asih Untuk Meningkatkan Kemampuan pronunciation Dan Speaking Siswa Slow Learners di SDN Balerejo 02. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 10(1), 1123–1128.
- Surur, M., Salma, H. I. S., Islamiyah, Utomo, D. A., & Hady, A. F. (2026). Strategi Pembelajaran Berbasis Media Visual untuk Meningkatkan Pemahaman Anak Slow Learner di Desa Grujugan. *Jurnal Akademik Pengabdian Masyarakat (JAPM)*, 4(1), 599–604. <https://doi.org/https://doi.org/10.61722/japm.v4i1.8547>
- Sweller, J. (2011). *Cognitive load theory*. *Psychology of Learning and Motivation*, 55, 37–76.
- Tantika, Y. S., Arbarini, M., & Suminar, T. (2025). The Influence of Universal Design for Learning (UDL) on the Learning Outcomes of IPAS Students in Inclusive Classes.

- Tarbiyah Wa Ta'lim: Jurnal Penelitian Pendidikan Dan Pembelajaran*, 12(2), 279–287. <https://doi.org/10.21093/twt.v12i2.6285>
- Tintin Susilowati, Nugroho, P. W., Rianto, & Anis Rahmadhani. (2025). Pengembangan The Thing Puzzle Interactive Media untuk Mengasah Keterampilan Verbal bagi Slow Learner. *G-Couns: Jurnal Bimbingan Dan Konseling*, 9(3), 2504–2517. <https://doi.org/10.31316/g-couns.v9i3.7161>
- Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners* (2nd ed.). ASCD.
- UNESCO. (2020). *Global education monitoring report 2020: Inclusion and education—All means all*. UNESCO Publishing.
- Wada, F. H., Pertiwi, A., Hasiolan, M. I. S., Lestari, S., Sudipa, I. G. I., Boari, Y., Ferdinan, Puspitaningrum, J., Ifadah, E., & Rahman, A. (2024). *Buku Ajar Metodologi Penelitian* (Sepriano & Efitra, Eds.; 1st ed.). PT. Sonpedia Publishing Indonesia. www.buku.sonpedia.com
- Wati, M. L., & Hendriani, W. (2024). Strategi Mengajar Siswa Lamban Belajar (Slow Learner): A Narrative Review. *Journal of Basic Educational Studies*, 4(2), 901.
- Widyana, R., & Dewi, N. S. (2020). The use of pictorial media card to improve the initial reading ability of slow learner students. *Jurnal Psikologi Ulayat*. <https://doi.org/10.24854/jpu121>
- Yulia Riska, S., Adharyanty Rahayu, W., & Aziz Muslim, A. (2024). Inclusive learning innovation with mobile-based bilingual interactive games for slow learner students. *ABDIMAS: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, 9(4), 923–934. <http://jurnal.unmer.ac.id/index.php/jpkm>
- Zachrotul Chumairo, P., Efendi, M., Samawi, A., Hidayaturrehman, D., & Sunandar, A. (2021a). Game Interaktif Berbasis Universal Design Learning Bagi Siswa Slow Learner Di Sekolah Inklusi. *Jurnal Pendidikan, Volume 06 Nomor 2*, 123–128.
- Zahroh, N., Wardani, E., Salimah, N., Putri, R. A., Delta, R., & Nusa, M. (2025). EDU-INCLUCIF: Potensi Media Digital Adaptif sebagai Solusi Pembelajaran Inklusif dalam Menyongsong Tantangan Pendidikan di Era Society 5.0. *EDU-INCLUCIF: Potensi Media Digital Adaptif Sebagai Solusi Pembelajaran Inklusif Dalam Menyongsong Tantangan Pendidikan Di Era Society 5.0*, 227–240.
- Zachrotul Chumairo, P., Efendi, M., Samawi, A., Hidayaturrehman, D., & Sunandar, A. (2021b). Game Interaktif Berbasis Universal Design Learning Bagi Siswa Slow Learner Di Sekolah Inklusi. *Jurnal Pendidikan, 06 Nomor 2*, 123 – 128.