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Differentiated Learning Media in Early Childhood Education: A Systematic Literature Review of Forms, Design Principles, and Reported Outcomes

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Abstract

Diversity in children's readiness, interests, experiences, language, developmental conditions, and engagement patterns requires early childhood learning media that go beyond transmitting information and provide responsive learning pathways. This review maps the forms of media and learning resources used in differentiated instruction in early childhood education, analyzes the differentiation dimensions they facilitate, identifies reported developmental and engagement outcomes, and formulates practical design principles. A systematic literature review was conducted with reporting informed by PRISMA 2020. ERIC, Garuda, and Google Scholar were searched, followed by publisher/DOI verification and citation tracing, for Indonesian- and English-language journal articles published from January 2019 to 28 August 2026. Twenty-one empirical research reports met the synthesis criteria; 20 were conducted in Indonesia and one in Türkiye. All included studies used qualitative designs; therefore, the findings are interpreted as contextual evidence patterns rather than causal effect estimates. Four dominant media clusters emerged: open-ended, manipulative, and natural materials; play environments, centers, and real-life contexts; choice-based media and multimodal representations; and adaptive media and access supports in inclusive early childhood settings. Process differentiation was the most prominent, whereas product, learning-environment, and assessment differentiation were less consistently documented. Differentiated media were reported to support engagement, autonomy, creativity, critical reasoning, early literacy, cognitive development, and socio-emotional regulation. Empirical evidence on digital and hybrid differentiated media remains limited. The review proposes the D-MEDIA ECE Framework: Diagnosis of needs, Multiple options, Engagement through choice and play, Differentiation of instructional components, Inclusive access and scaffolding, and continuous Assessment and adaptation.

Keywords

Differentiated Instruction; Early Childhood Education; Learning Media; Preschool; Systematic Literature Review

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INTRODUCTION

Early childhood education faces very evident diversity. Children in the same age

group may demonstrate different levels of readiness, interests, experiences, language, self-regulation abilities, sensory needs, and patterns of engagement. Such diversity makes a uniform learning approach likely to benefit some children while limiting the participation of others. Differentiated instruction emerges as a responsive approach that adjusts content, process, product, and learning environment based on information about learners' needs (Subban, 2006; Tomlinson & Imbeau, 2010; Tomlinson, 2014). In early childhood education, differentiation is not intended to rigidly label abilities, but rather to expand every child's opportunity to engage in meaningful play experiences appropriate to their developmental stage.

Learning media occupy a strategic position in implementing differentiation. In early childhood learning, media are not merely visual aids, but also part of the learning environment that enables children to touch, move, arrange, choose, imitate, tell stories, experiment, move around, and express their understanding. The same media can produce different experiences when teachers change the level of complexity, mode of use, form of support, time, or choice of product. Conversely, having many types of media does not automatically indicate differentiation if all children are still required to carry out identical activities in the same way and at the same level of difficulty.

This interpretation is important because differentiation is often simplified as "providing different media for each child." However, differentiation research emphasizes responding to variations in needs through flexible instructional decisions, rather than producing unlimited individualized materials (Bondie et al., 2019). In early childhood education, this flexibility is more appropriately realized through open-ended materials, limited but meaningful choices, play-environment arrangements, varied representations, and scaffolding that can be increased or reduced based on children's responses.

Early childhood education research in recent years has shown practices consistent with this idea. Loose parts and natural materials are used to open space for exploration and diverse products (Maryani et al., 2023; Rosyada, 2024; Setiawati et al., 2024). Play environments and centers are arranged according to children's readiness and interests (Yuliantina & Boki, 2023). Choices of media and activities have been reported to expand participation, autonomy, creativity, and emotional regulation (Sa'ida, 2023; Niswah & Zulfahmi, 2024; Novitasari et al., 2025; Prastyo et al., 2025). In inclusive contexts, visual adaptations, gestures, individual support, individualized learning programs, and environmental arrangements are important for ensuring access for children with different needs (Irmayani & Mahabbati, 2025; Pudyaningtyas & Hayati, 2025; Windiastuti, 2026). Multicultural studies also show that content and process

differentiation are more frequently implemented than environmental and assessment differentiation (Demirci-Ünal & Öztürk, 2025).

Although this literature is growing, media more often appear as supporting elements in studies of differentiated instruction in general than as the main object of analysis. Consequently, it remains unclear what types of media are most frequently used, which components media actually facilitate differentiation in, how they relate to assessment of children's needs, and where the boundary lies between "diverse media" and "media used in a differentiated manner." This gap is practically important because teachers need design principles that can be applied without having to create different materials for every child.

This review defines differentiated learning media as devices, materials, environments, representations, or learning resources that are selected and used flexibly based on information about children's needs, thereby providing more than one pathway to access experiences, engage in processes, receive support, or demonstrate development toward the same goal. Based on this definition, the review addresses four questions: (1) what forms of media and learning resources are used in differentiated learning in early childhood education; (2) which differentiation dimensions are most frequently facilitated; (3) what impacts are reported on children's development and engagement; and (4) what design principles and implementation challenges can be synthesized from previous research.

The novelty of this review lies in focusing the analysis on the function of media as a link between assessment of children's needs and differentiation decisions. Rather than merely inventorying types of media, this review examines when and how media acquire their differentiation function. The synthesis is then formulated into the D-MEDIA ECE Framework as a conceptual guide for selecting, designing, and evaluating responsive, inclusive, and realistically usable media in early childhood learning.

METHODS

Review Design

The study used a systematic literature review to identify, select, assess, and synthesize empirical research on media and learning resources in differentiated learning in early childhood education. Reporting was informed by PRISMA 2020, particularly in the transparency of review rationale, information sources, search strategy, eligibility criteria, selection process, study characteristics, and synthesis of results (Page et al., 2021). Because the selected studies were homogeneous in their tendency toward qualitative designs but heterogeneous in context, participants, developmental focus, and forms of media, synthesis was conducted narratively and

thematically without meta-analysis.

Search Strategy

The search was conducted in two stages. The initial search was conducted on 29 July 2026 and updated on 28 August 2026. The main sources were ERIC, Garuda, and Google Scholar. Google Scholar was used primarily for cross-publisher discovery, while article status, year, volume, pages, DOI, and methodological information were verified on journal, publisher, ERIC, or Garuda pages. Backward and forward citation tracing was conducted for key articles to identify early childhood education studies that used different terminology but still met the operational definition of the review.

The publication period was set from January 2019 to 28 August 2026 to capture recent developments in differentiation practices as well as the period of implementation of the Merdeka Curriculum in Indonesia. The keyword combinations used included:

- ("differentiated instruction" OR "differentiated learning") AND (preschool OR kindergarten OR "early childhood education") AND (media OR materials OR resources OR play OR choice)
- ("differentiated learning" OR "learning differentiation") AND (early childhood education OR "early childhood" OR kindergarten) AND (media OR teaching materials OR play equipment OR "loose parts" OR play environment OR choice)
- (inclusive OR "special needs" OR multicultural) AND "differentiated instruction" AND (preschool OR kindergarten).

Inclusion and Exclusion Criteria

Articles were included if they met all of the following criteria: (1) empirical and peer-reviewed journal articles; (2) published in Indonesian or English; (3) the primary context was early childhood education, preschool, kindergarten, or early childhood educators; (4) differentiated learning was an explicit focus; (5) the article provided information on media, materials, learning resources, environments, activity choices, representations, or access supports; and (6) the full text or main methodological information could be verified. Articles were excluded if they were literature reviews, conceptual articles, proceedings, theses/dissertations, community service reports, studies at primary school level or above, or did not explain the relationship between media/learning resources and differentiation decisions.

Table 1. Protocol and selection decisions

Component	Decision	Methodological rationale
Time range	January 2019–28 August 2026	Captures recent

		developments and the period of expansion of differentiation practices in early childhood education.
Publication type	Empirical, peer-reviewed journal articles	Maintains focus on evidence of practice that can be methodologically examined.
Context	Early childhood education/preschool/kindergarten or early childhood educators	Prevents direct generalization from educational levels with different learning characteristics.
Focus	Explicit differentiation + information on media/learning resources/environment/choice	Ensures that media are analyzed as a concrete part of the pedagogical response.
Main exclusion	Reviews, conceptual papers, proceedings, community service, primary school studies and above, media without differentiation	Prevents mixing empirical evidence with non-empirical arguments.
Final synthesis unit	21 empirical article reports	Two 2023 reports came from overlapping Mover Kindergarten contexts; they were treated as related reports, not two independent effect estimates.

Selection, Extraction, and Quality Assessment

Selection was conducted through title and abstract screening, verification of publication status, followed by reading the full text or available methodological and

results sections. Because the number of Google Scholar results is dynamic and may change according to time, location, and search-engine personalization, the review does not present an unstable "initial result" count as though it were a fully reproducible database count. Selection transparency was maintained through reporting the sources, search strings, eligibility criteria, DOI/publisher verification, and the complete list of articles included in the synthesis matrix. The final synthesis unit consisted of 21 empirical research reports.

The extracted data included author/year, country or location, design and participants, media or learning resources, differentiation dimensions, reported impacts, and implementation constraints. Methodological quality was examined at the domain level by adapting the principles of the Mixed Methods Appraisal Tool (MMAT) 2018, particularly the alignment of questions with design, clarity of context and participants, adequacy of data collection, coherence of analysis, and evidentiary support for interpretation (Hong et al., 2018). Quality assessment was used to weigh the strength of interpretation, rather than to produce an aggregate score or remove studies simply because they used qualitative designs.

Synthesis Strategy

Findings were deductively coded using four differentiation components (content, process, product, and learning environment), with assessment as the mechanism guiding decisions. Inductive coding was then conducted to identify patterns in media forms, differentiation mechanisms, reported outcomes, and challenges. The term "impact" in the results section is understood as the impact reported by the source studies. Given that all included articles used qualitative designs, the review does not interpret these relationships as causal evidence.

RESULTS AND DISCUSSION

Study Characteristics

A total of 21 empirical article reports published in 2022–2026 met the criteria. Twenty reports originated from Indonesia and one from Türkiye. All articles used qualitative approaches, particularly case studies, qualitative descriptive studies, narrative approaches, and phenomenology. These findings indicate that the evidence base concerning differentiated learning media in early childhood education remains in the practice-exploration phase. The available studies are rich in descriptions of teacher decisions, classroom contexts, and children's responses, but are not yet sufficient to draw causal conclusions or compare effectiveness sizes across media types.

Two 2023 publications by Maryani et al. and Ristiyati et al. came from very closely

related Mover Kindergarten contexts and involved the same research team. Therefore, both were retained because they provide different analytical emphases—implementation models and supporting/inhibiting factors—but were not treated as two independent effect units. This approach is important so that the frequency of findings does not create an impression of greater evidentiary strength than actually exists.

Table 2. Synthesis matrix of selected articles

Study	Context & design	Media/learning resources	Main differentiation	Key findings
Astuti & Afendi (2022)	Early childhood education; qualitative descriptive	Various play tools/activities; observation	Process; assessment	Planned and responsively evaluated play supports engagement and cognitive, affective, and psychomotor development.
Maryani et al. (2023)	Mover Kindergarten; case study; principal, 2 teachers, 15 children	Centers, demonstration, outing class, role play; contextual materials	Content; process; environment	Concrete and contextual experiences facilitate varied ways of learning; limited resources, number of teachers, and children's readiness are constraints.
Ristiyati et al. (2023)	Private/Mover Kindergarten; case study	STEAM loose parts; environment; contextual media	Content; process; environment	Use of media, teacher creativity, teacher-child relationships, and environment support

				differentiation; resources and infrastructure constrain practice.
Yuliantina & Boki (2023)	Early childhood education; qualitative descriptive	Arrangement of play areas, tools, and materials	Process; environment	Play environments are arranged according to children's readiness and interests so learning goals can still be achieved through different pathways.
Sa'ida (2023)	Early childhood education; qualitative	Various media choices according to interests; products	Process; product	Media choices provide space for children to create according to their characteristics and interests, thereby facilitating creativity.
Rosyada (2024)	RA; 12 children; qualitative	Loose parts	Process; product	Open-ended materials give children freedom to construct products and support independence in choosing and developing ideas.
Setiawati et al. (2024)	Children aged 4–5; case study	Open-ended and manipulative loose parts	Process; product	Loose-parts media are reported to support participation,

				creativity, collaboration, critical reasoning, and early literacy.
Niswah & Zulfahmi (2024)	RA; 28 children, 2 teachers; qualitative	Activity choices and comfortable environment	Process; environment	Freedom to choose activities according to interests and abilities is associated with cooperation, responsibility, discipline, tolerance, and socio-emotional regulation.
Yuliani et al. (2024)	Early childhood education; qualitative	Activities and materials allowing independent action	Process; product	Teacher strategies in differentiated activities stimulate independence through opportunities to make decisions and complete activities.
Demirci-Ünal & Öztürk (2025)	Türkiye; 4 preschool teachers; multiple case study	Visuals, demonstrations, physical support, activity variation, classroom resources	Content; process; environment; assessment	Content and process are differentiated most often; environment and assessment remain limited, especially in multicultural classrooms.
Fitriani & Fajriana	2 Mover Early Childhood	Intra/project teaching	Content; process;	Differentiation appears from

(2025)	Education schools; case study	modules; varied approaches and assessment instruments	product; assessment	learning organization and modules to projects and assessment instruments.
Wijaya et al. (2025)	Kuncup Melati Early Childhood Education; case study	Media/activities adjusted to readiness, interests, and child profile	Content; process; product	Children are reported to be more active and confident; teacher competence, facilities, and parental expectations are challenges.
Tanjung et al. (2025)	Tunas Muda Kindergarten; qualitative	Adaptive activities and media for socio-emotional interaction	Process; environment	Responses to children's needs and rhythms are associated with support for socio-emotional development.
Irmayani & Mahabbati (2025)	Inclusive Islamic early childhood education; ADHD and hearing impairment; 3 teachers	Simplified materials, visuals, gestures, adaptive activities	Content; process; product; environment	Media adaptation and individual support expand access; teacher competence and collaboration are required.
Novitasari et al. (2025)	Kindergarten; 1 teacher, 15 children aged 4–5, principal, 3 parents	Choice menu of activities and response forms	Content; process; product	Meaningful choices are reported to increase participation, focus, autonomy,

				motivation, and emotional regulation while reducing passive behavior.
Prastyo et al. (2025)	Rural kindergarten; 22 children aged 5–6; case study	Choice of materials and difficulty levels	Content; process; product	Children demonstrate independence in choosing materials/challenges; product differentiation and systematic assessment remain limited.
Ratnawati et al. (2025)	Model kindergarten; case study	Loose parts and exploratory play media	Content; process; product; environment	Exploration and varied media are associated with logical thinking, pre-mathematics, problem solving, and creativity.
Pudyaningtyas & Hayati (2025)	2 inclusive early childhood education settings; 4 teachers; narrative qualitative	Varied media, flexible grouping, task adjustment	Content; process; product; environment	Media and tasks are adjusted to children's developmental profiles; facilities and teacher competence are major challenges.
Ahwan et al. (2025)	2 kindergartens; qualitative case study	Variation in activities, environment, and assessment-based support	Content; process; environment	Needs assessment, activity variation, and continuous evaluation are associated with motivation,

				cognition, creativity, and teacher-child relationships.
Windiastuti (2026)	Inclusive kindergarten; principal, 2 teachers, 1 special education teacher; case study	Individual Learning Program, special education teacher support, Montessori environment, activity adaptation	Content; process; product; environment	Screening and assessment form the basis for individual programs and media/activity adjustments; specialized support strengthens individual access.
Yulidawati et al. (2026)	Inclusive kindergarten; 4 teachers; phenomenology	Multisensory inquiry, hands-on science, flexible product representation, peer support	Content; process; product; environment	Differentiation emerges as dynamic needs-based adjustment; adaptive environments and flexible representations broaden participation in science.

Forms of Differentiated Learning Media in Early Childhood Education

The synthesis shows that the differentiation function of media in early childhood education is determined not primarily by technological sophistication, but by flexibility of use, its relationship with assessment, and the space for choice given to children. Four dominant media clusters can be identified from the selected studies.

1. Open-ended, manipulative media and natural materials

Loose parts are the most prominent form of media. Objects that can be moved, combined, separated, arranged, and given new meanings allow one set of materials to be used at different levels of complexity. Children who are newly familiar with a

concept can classify objects by color or size, while more ready children can build patterns, create symbolic representations, or explain the reasons for their choices. This flexibility makes loose parts suitable for process and product differentiation without requiring different media for every child (Ristiyati et al., 2023; Rosyada, 2024; Setiawati et al., 2024; Ratnawati et al., 2025).

However, being "open-ended" does not automatically make media differentiated. If the teacher determines a single example product that all children must imitate, loose parts once again function as uniform media. Conversely, simple materials can acquire a differentiation function when teachers provide variations in challenge, quantity of materials, prompting questions, scaffolding, or forms of expression based on children's responses. Thus, the characteristics of media provide potential, while pedagogical decisions determine whether that differentiation potential actually occurs.

2. Play environments, centers, and real-life contexts

Media in early childhood education are not always individual objects. Centers, play areas, outing classes, role play, demonstrations, and surrounding environments can function as ecological media that provide different pathways of engagement within the same theme. Children can observe, imitate, touch, move, converse, take roles, or construct products according to their readiness and interests. Maryani et al. (2023), Yuliantina and Boki (2023), and Ristiyati et al. (2023) show that spatial arrangements, material variations, and the proximity of experiences to children's lives are important components of differentiation implementation.

These findings broaden the meaning of learning media from "tools" to "pedagogically mediated environments." In early childhood education, the arrangement of reachable shelves, quiet areas, movement spaces, quantity of materials, display locations, and flexibility to move between activities can be as important as the form of the media itself. Environmental differentiation is still insufficiently documented as an intentional design, even though in early childhood the environment directly determines levels of access and autonomy.

3. Choice-based media and multimodal representations

Choice is an important mechanism that transforms ordinary media into differentiated media. Teachers can provide two to four alternative materials, books, picture cards, concrete objects, art tools, or response modes such as storytelling, drawing, arranging, moving, role play, or constructing. Sa'ida (2023) shows that variations in media that can be selected according to interests create space for creativity. Novitasari et al. (2025) reported increases in participation, focus,

enthusiasm, autonomy, and emotional regulation when children received meaningful choices. Prastyo et al. (2025) also showed that opportunities to choose materials and challenge levels were associated with independence.

Effective choice is not unlimited choice. Alternatives need to be curated by teachers, safe, equivalent in terms of goals, and not create unnecessary decision-making burdens. The important principle is that developmental goals may remain the same, while the pathways to achieve and demonstrate understanding may differ. Therefore, multimodality in early childhood education should be understood as variation in ways of accessing and expressing experiences, rather than as fixed labeling that a child is only "visual," "auditory," or "kinesthetic."

4. Adaptive media and access supports in inclusive early childhood education

Inclusive studies show the most explicit dimension of differentiation: access. Adaptations may include reducing the amount of information, visual assistance, gestures, tactile materials, instructions broken into small steps, repetition, additional time, support from special education teachers (GPK), flexible grouping, or individualized learning programs. Irmayani and Mahabbati (2025), Pudyaningtyas and Hayati (2025), and Windiastuti (2026) show that media and activity adjustments need to be based on children's developmental profiles and actual needs, rather than diagnosis as a single label. Yulidawati et al. (2026) add the importance of multisensory inquiry, flexible product representation, and adaptive classroom ecology in inclusive science learning.

From a design perspective, differentiated media in inclusive contexts must be physically, sensorily, communicatively, and socially accessible. This principle prevents differentiation from becoming covert segregation. Children may require different forms of support, but they still need access to shared experiences, peer interaction, and meaningful learning goals.

Digital and Hybrid Media: A Prominent Evidence Gap

In contrast to the popularity of digital media in educational discourse, the empirical studies meeting the criteria of this review almost entirely focus on concrete media, environments, activity choices, or direct teacher adaptations. Digital media, adaptive applications, interactive videos, augmented reality, or personalization systems have not yet become a strong empirical focus in the context of differentiated early childhood education. Therefore, digital media are not positioned as an evidence cluster equivalent to the four previous categories, but rather as a research gap.

This gap also serves as a warning not to equate digitalization with personalization. In early childhood, the value of digital media needs to be assessed in terms of

pedagogical goals, quality of social interaction, adult support, duration of use, accessibility, and connection to concrete activities. Future research needs to compare nondigital, digital, and hybrid media using clear differentiation indicators, rather than only indicators of children's interest in technology.

Differentiation Dimensions Facilitated by Media

Process differentiation is the most dominant dimension. Teachers more often change how children interact with media through activity choices, levels of assistance, flexible grouping, pacing, sequence of steps, and difficulty levels. Content differentiation appears when the same experience is presented through concrete objects, pictures, stories, demonstrations, projects, or direct experiences. Product differentiation is evident when children can demonstrate understanding through arrangements of objects, pictures, stories, movement, constructions, or other forms of response. However, documentation of products remains less consistent than documentation of processes.

Environmental differentiation includes the arrangement of centers, access to materials, safe areas, peer support, and space management that allows children to work at different paces. The study by Demirci-Ünal and Öztürk (2025) specifically shows that environmental and assessment differentiation are less frequently implemented than content and process differentiation. The same pattern appears in Prastyo et al. (2025), who found that formative assessment and product differentiation were not as strong as process variation. Thus, the practical challenge is not merely a lack of media, but the fact that assessment, environment, and developmental documentation have not yet been connected as a single differentiation cycle.

Table 3. Synthesis of media forms and differentiation mechanisms

Cluster	Examples	Differentiation mechanism	Design note
Open-ended/manipulative	Loose parts, natural materials, concrete objects	Variation in complexity, manipulation methods, and product forms	One set of materials can serve multiple challenge levels; avoid one model product for all children.
Environmental/contextual	Centers, play areas, outing class, role	Variation in access, position,	Spatial arrangement

	play	roles, interaction, and direct experience	is part of the media; access to materials should be easy and safe.
Choice/multimodal	Cards, books, art materials, movement, stories, construction	Choice of materials, learning methods, and ways to express understanding	Choices should be limited but meaningful; all options should still lead to the same goal.
Adaptive/inclusive	Visuals, gestures, tactile materials, Individual Learning Program, special education teacher support, task steps	Adjustment of access, scaffolding, time, amount of information, and response demands	Adaptation should be based on assessment of actual needs while maintaining shared participation.
Digital/hybrid	Videos/apps/digital media (evidence remains limited)	Potential variation in representation, pacing, and feedback	Insufficient empirical evidence in early childhood education; needs testing alongside interaction quality and concrete activities.

Reported Impacts on Children's Development and Engagement

The most consistent pattern is engagement. Children are reported to be more active, focused, enthusiastic, and persistent in activities when media and challenge levels match their interests and readiness. Providing choices is also associated with a sense of ownership of activities, autonomy, and reduced passive behavior (Novitasari et al., 2025). Regarding independence, children are given space to choose materials, determine challenge levels, complete activities, and make simple decisions (Yuliani et al., 2024; Prastyo et al., 2025).

In the cognitive domain, open-ended media and exploratory play are associated with classification, patterns, pre-mathematics, problem solving, creativity, and critical reasoning (Setiawati et al., 2024; Ratnawati et al., 2025). In early literacy, objects and symbols can be connected through conversation, stories, and constructed products. In the socio-emotional domain, structured choices and needs-based support are reported to be associated with cooperation, confidence, motivation, discipline, tolerance, and emotional regulation (Niswah & Zulfahmi, 2024; Tanjung et al., 2025). In inclusive contexts, the main benefit is not merely "higher outcomes," but more equitable access to activities, communication, and classroom participation (Irmayani & Mahabbati, 2025; Pudyaningtyas & Hayati, 2025; Windiastuti, 2026).

Although the outcome pattern tends to be positive, all studies in this synthesis used qualitative designs. Terms such as "increased," "effective," or "impact" in the source articles are often based on observations, interviews, documentation, or teacher assessments, rather than comparative tests with control groups. Therefore, the conclusion of this review is limited to stating that differentiated media are reported to support or be associated with these changes. Effect sizes, duration of benefits, and the superiority of one type of media over another cannot yet be determined.

Differentiated Media Design Principles: The D-MEDIA ECE Framework

Based on the cross-study synthesis, this review proposes the D-MEDIA ECE Framework. This framework is not a new learning model, but a decision-support tool so that teachers do not equate differentiation with simply increasing the number of media. Each element connects assessment, media choices, support, and evaluation within one cycle.

Table 4. D-MEDIA ECE Framework

Element	Principle	Guiding question for teachers
D — Diagnosis of needs	Media are selected after the teacher observes readiness, interests, language,	What can the child already do, what interests the child, and

	experiences, motor abilities, sensory needs, and engagement patterns.	what support appears to be needed?
M — Multiple options	Provide several choices of materials, representations, challenge levels, or response forms toward the same goal.	Which options truly provide different pathways while remaining equivalent in their goals?
E — Engagement through choice and play	Media invite exploration, interaction, curiosity, and children's decision-making.	Is the child actively involved or merely imitating one example determined by the teacher?
D — Differentiation of components	Consciously determine whether content, process, product, environment, or a combination is changed.	Which part needs adjustment, and why is the adjustment relevant to the child?
I — Inclusive access & scaffolding	Media are safe, affordable, physically/communicatively accessible, and allow gradual support.	Who still has difficulty accessing this activity, and what support can be added without reducing participation?
A — Assessment & adaptation	Children's responses are observed during play; choices, difficulty levels, and assistance are changed based on evidence.	What is evident from the child's response today, and what needs to be adjusted next time?

The D-MEDIA ECE Framework emphasizes that differentiated media are not special packages for particular categories of children. Media function as an "ecosystem of possibilities" that enables teachers to respond dynamically to children's variation. Developmental goals may remain the same, but pathways of engagement, support, pacing, challenge level, and forms of expression may differ. Thus, good differentiation does not increase teachers' workload through unlimited media production, but improves the quality of decisions about how available media are used.

Implementation Challenges

The main challenge lies in teachers' assessment competence. Without sufficient information about children's needs, media choices can easily be based on assumptions, habits, or overly simple labels. The next challenges are planning time, class size, availability of materials, infrastructure, number of educators, and documentation burden. Several studies also emphasize children's psychological conditions, communication with parents, support from school principals, and community networks as factors affecting the consistency of differentiation (Maryani et al., 2023; Ristiyati et al., 2023; Wijaya et al., 2025).

Resource limitations do not always mean that differentiation is impossible. Natural materials, safe recycled objects, loose parts, simple choice cards, and rearranging centers can provide varied learning pathways at relatively low cost. More important is teachers' ability to formulate clear goals, observe children's responses, and adjust the level of support. However, a low-cost approach should not be used as a reason to ignore access facilities that are genuinely needed by children with special needs.

Another challenge is the conceptual boundary between media, methods, activities, and environments. In many early childhood education articles, a single practice may simultaneously be called media, an activity, a center model, or a learning strategy. This review addresses the issue by focusing the analysis on pedagogical function: something is treated as media/learning resources when it mediates children's access to, interaction with, or expression of learning experiences. This operational boundary needs to be clarified in future research so that the role of media can be distinguished from the effects of methods or the quality of teacher interaction.

Five research gaps were identified. First, the evidence base is dominated—even in this synthesis it consists entirely of qualitative studies from one or several locations—so generalization and causal conclusions are limited. Second, the term "differentiated media" has not been used consistently; some articles discuss centers, activity choices, modules, loose parts, or inclusive supports without defining the function of the media. Third, research rarely compares types of media, measures implementation fidelity, or separates the contribution of media from the quality of teacher scaffolding. Fourth, evidence on product, environment, and assessment differentiation remains less extensive than evidence on process differentiation. Fifth, digital/hybrid media, adaptive technology, children's participation in media design, and continuity of media use between home and school remain very limited.

Future research needs to use mixed-methods, quasi-experimental, design-based research, or longitudinal designs with measurable developmental indicators and detailed documentation of the differentiation process. Research also needs to report

"why a particular medium is given to a particular child at a particular time," rather than only listing the available media. Thus, evidence can move from media inventory toward testing differentiation mechanisms.

This review has several limitations. First, the search included Google Scholar, whose results and record counts are dynamic; therefore, the review deliberately does not present unstable initial counts as seemingly precise PRISMA numbers that are difficult to reproduce. Second, restricting the languages to Indonesian and English may exclude relevant studies in other languages. Third, all selected articles used qualitative designs, so meta-analysis was not possible and effectiveness claims must be interpreted cautiously. Fourth, two 2023 publications came from overlapping Mover Kindergarten contexts; they were retained as reports with different focuses but were not considered independent evidence. Fifth, some articles did not clearly separate the role of media from methods, models, and environments, so the synthesis was conducted based on the reported pedagogical function.

CONCLUSION

Differentiated learning media in early childhood education primarily take the form of open-ended and manipulative media such as loose parts, natural materials, play-environment and center arrangements, contextual experiences, choices of materials and activities, multimodal representations, and adaptive media and access supports in inclusive contexts. The meaningfulness of differentiation is not determined by the quantity or sophistication of media, but by its connection to assessment of children's needs and flexibility of use in providing different pathways of access, process, support, challenge level, and forms of expression toward the same developmental goals.

Process differentiation is the most frequently documented form, while product, environmental, and assessment differentiation still require strengthening. The reviewed studies consistently report positive associations with engagement, independence, creativity, critical reasoning, early literacy, cognitive development, and socio-emotional regulation. However, because the entire selected evidence base is qualitative, these findings cannot yet be interpreted as causal effect sizes. Evidence on digital and hybrid media also remains very limited.

The D-MEDIA ECE Framework—Diagnosis of needs, Multiple options, Engagement through choice and play, Differentiation of instructional components, Inclusive access and scaffolding, and continuous Assessment and adaptation—is offered as an initial guide for connecting media with pedagogical decisions. The framework's main contribution is to shift the focus from "how many media are available" toward "how responsively media are used based on evidence about

children's needs."

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