Digitalization Without Disembodiment in Early Childhood Dance Education Through Teacher-Mediated Digital Support

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Abstract
Digital resources can support early childhood dance only if they leave room for movement, interpretation, and interaction. This study describes learning ratings and teaching processes during a 12-session Dai Peacock Dance curriculum involving 30 children aged 5–6 in one Chinese kindergarten. Design-Based Research informed curriculum development before teaching; the empirical phase followed one fixed implementation cycle and used descriptive quantitative assessments alongside lesson and interview records. Three curriculum-specific observational instruments received expert content review but were not psychometrically validated. Mean T0–T3 ratings were higher for movement expressiveness, learning interest and classroom participation, and cultural understanding and initial identification. The participation comparison requires particular caution because its two assessment occasions were structured differently. Implementation records repeatedly described shared digital cues followed by teacher interpretation, movement or peer activity, feedback, and further attempts. Routes and partner tasks required additional spatial and adult support as task demands changed. Without a control group or equivalent measures for all outcomes, the findings do not establish effects of technology or a teaching mechanism. The article offers digitalization without disembodiment as a provisional, task-focused pedagogical heuristic and identifies six design propositions for future examination.

1. Introduction

Digital technologies have become familiar resources in early childhood classrooms, but their educational value cannot be inferred from their presence. A visual prompt may attract attention without helping a child complete a learning task. Reviews of digital play and child–teacher engagement suggest that what matters is the activity surrounding the technology: how it is designed, guided, and taken up by children (Chu et al., 2024; Undheim, 2022). Teachers' professional judgment and the conditions of a particular classroom also shape how digital resources are used (Lindeman et al., 2021; Schriever, 2021; Yang & Dong, 2024). Policy analysis also shows that digitalization is shaped by the purposes and instruments through which schools introduce technology (Cao et al., 2024). Recent work on gamified storytelling in early childhood education raises a related concern about developmental fit and educator capacity (Wahono et al., 2026). The practical question, then, is not how extensively a classroom has been digitalized, but what children and teachers are able to do together because a resource is available.

That question becomes more exacting in dance education. Seeing a gesture and performing it are different accomplishments. To dance, a young child has to bring rhythm, direction, coordination, effort, and expression into a moving relationship with space and other people. Studies of children's dance learning describe possibilities for motor competence, social development, and embodied meaning-making (Đošić et al., 2025; Kotaman et al., 2024; Twiner et al., 2022). Yet these possibilities are not interchangeable outcomes; reviews caution against reducing arts learning to a single general measure of improvement (Schneider & Rohmann, 2021). Work on curriculum-integrated dance similarly directs attention to what is actually taught, rather than to movement exposure alone (Sharma et al., 2023).

Traditional dance places another demand on the teacher. Cultural images and stories need to be made accessible to young children without stripping movement of its particular meaning. In Dai Peacock Dance, a child may recognize a peacock image long before being able to connect a movement phrase to musical timing, a route, or a partner. These are distinct teaching tasks. A review of traditional dance education treats physical, cognitive, cultural, and social learning as interdependent (Daryanti et al., 2025). Studies of preschool dance materials

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emphasize usable movement structures and culturally grounded content (Mohd Alim et al., 2023; Zain et al., 2023, 2024). Video-supported instruction may assist this work when placed within a deliberate teaching strategy (Sari et al., 2025); it does not remove the bodily and choreographic knowledge that preschool teachers say dance instruction requires (Pastorek Gripson et al., 2022).

Existing educational approaches help explain why media alone cannot carry these tasks. Guided-play research identifies benefits when adult structure supports, rather than suppresses, children's active involvement (Skene et al., 2022). Accounts of activity-based learning argue that physical action matters educationally only when it is connected to the intended learning (Skulmowski, 2024). Reviews of gamification report variable outcomes across designs and contexts, which makes the instructional arrangement more informative than the mere presence of game-like features (Bai et al., 2020; Sailer & Homner, 2020). For the arts, digitally mediated learning likewise depends on pedagogical choices and teacher learning (Pavlou, 2024). These lines of work establish a useful starting point: guidance and embodiment matter, but neither term tells us precisely how a particular dance task is carried from a screen into shared physical action.

A related literature makes clear that such translation occurs within curricular and institutional constraints. Teacher planning mediates early childhood curriculum frameworks (Keary et al., 2024), while preparation for digital teaching requires more than operational competence with equipment (Masoumi, 2021). Arts educators also draw on professional learning and negotiated teacher–artist roles (Bautista et al., 2021; Kenny & Morrissey, 2021). When broad educational aims dominate, the specific knowledge of an art form can become difficult to identify (Kneen et al., 2020; Peppler et al., 2023). Nor should outcomes promoted by cross-curricular arts policy be assumed to represent the discipline of dance itself (Omasta et al., 2021; Sanz-Camarero et al., 2025). Together, these studies direct attention to the relation among an artistic task, adult support, and the setting in which it is attempted.

What remains less well specified in the literature considered here is the succession of instructional decisions required when one shared digital representation has to become bodily, social, and culturally situated action over several lessons. Recognizing an icon is not the same as connecting movements; following a route is not the same as coordinating with a partner. As tasks become more demanding, teachers may need to reinterpret a cue, demonstrate again, change children's positions, or organize waiting and feedback. The issue is not whether teacher mediation or embodied learning exists both are well established but how their practical conjunction can be described without mistaking a locally observed teaching sequence for a causal explanation. This is the bounded gap addressed by the present classroom case.

The study aimed to describe changes in three curriculum-specific learning domains during a fixed 12-session Dai Peacock Dance program and to examine how teachers and children used digital cues, movement practice, peer interaction, and classroom organization as lesson demands changed. It draws on Design-Based Research-informed curriculum preparation followed by one descriptive mixed-evidence implementation cycle with 30 children. The purpose is to develop an empirically bounded account of instructional practice, not to estimate the independent effect of digital technology or test a mediational pathway.

Two research questions guided the analysis: (1) What T0–T3 differences were observed in movement expressiveness, learning interest and classroom participation, and cultural understanding and initial identification? (2) How were digital cues, teacher mediation, bodily practice, peer interaction, and classroom organization brought together during implementation, particularly as task complexity increased?

2. Method

2.1. Research Design and Analytic Logic

This article reports Design-Based Research (DBR)-informed curriculum development followed by a descriptive mixed-evidence implementation study. DBR informed the pre-implementation problem analysis, curriculum design, expert review, and refinement; the empirical classroom phase then examined one fixed version of the curriculum. This use is consistent with DBR scholarship that connects intervention design with contextual implementation while requiring transparent phase boundaries (Tinoca et al., 2022; Burr & Degotardi, 2025). The three classroom stages are therefore not three DBR cycles. All substantive curriculum refinement occurred before T0 and the first formal lesson. Once teaching began, the teaching model, core movement system, digital-material framework, assessment structure, and three-stage progression remained fixed. Routine teacher responses such as repeating a demonstration, shortening a verbal cue, repositioning children, or making a safety adjustment were instructional support within the fixed design, not redesign iterations.

Within the fixed implementation cycle, the study integrated descriptive quantitative outcome evidence with documentary and interview-based process evidence. T0-T3 child assessments described within-group change, whereas T1 and T2 were stage-specific formative records rather than equivalent repeated-measures occasions. The learning-interest and classroom-participation baseline was itself the mean of two structured

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observations, while T3 was one final assessment; this outcome is therefore reported as a non-equivalent descriptive comparison, not as an equivalent repeated-measures contrast. Observations, lesson records, teacher and teaching-assistant documentation, interviews, and attendance described how the curriculum operated in practice. This analytic structure was designed to answer the two research questions without attributing causal effects to the digital component, the dance curriculum, or any isolated instructional element. Figure 1 summarizes the development-to-implementation sequence.

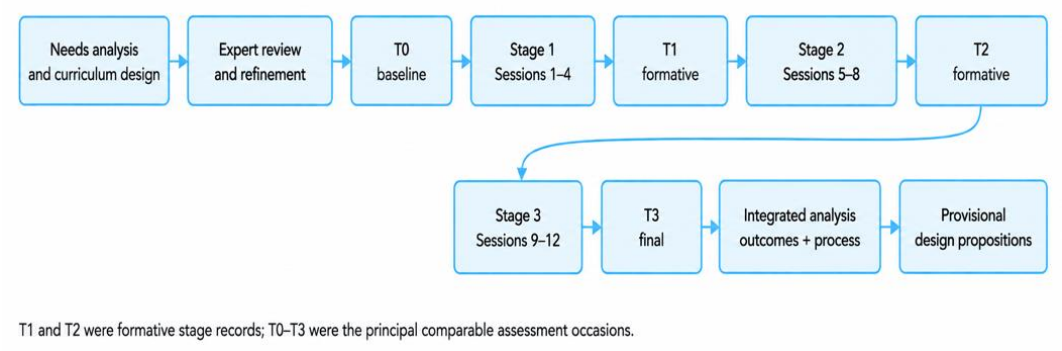


Figure 1. DBR-Informed Development Followed by One Fixed Classroom Implementation Cycle.

2.2. Setting and Participants

The empirical phase took place from March to May 2026 in one final-year kindergarten class in Nanchang City, Jiangxi Province, China. The implementation sample comprised 30 children aged 5-6 years. The wider grade contained three classes and approximately 135 children, but the other two classes provided contextual background only and were not comparison groups. One lead kindergarten teacher delivered all 12 formal lessons, supported by one assistant teacher and two senior undergraduate teaching assistants in preschool education. The researcher designed and coordinated the project but did not serve as the principal classroom instructor or principal outcome rater.

2.3. Curriculum and Digital Arrangement

The curriculum used Dai Peacock Dance as a culturally specific traditional-dance case. Before implementation, the research team selected and simplified movement and cultural content for children aged 5-6 years, prepared digital materials and three-stage lesson scripts, and developed curriculum-specific assessment instruments. Two expert supervisors reviewed the curriculum, research materials, lesson tasks, and assessment dimensions as an integrated pre-implementation package. Documented feedback led to shorter movement combinations, more concrete cultural explanations, lower information density on digital pages, clearer route boundaries and waiting areas, and tighter alignment between classroom tasks and observation dimensions. This review occurred before formal data collection and did not continue as redesign during the fixed implementation cycle.

Technology use was deliberately bounded. A shared interactive classroom display presented narrative scenes, cultural images, movement icons, musical cues, route diagrams, and partner or role prompts. Children did not use individual tablets during formal lessons. The teacher used the display to establish a common reference and then shifted attention to explanation, demonstration, bodily practice, spatial organization, safety, peer coordination, and feedback. The three curriculum stages are summarized in Table 1.

Table 1. Structure of the 12-Session Dance Curriculum

Stage	Sessions	Primary learning focus	Main digital support	Embodied/social task
1. Cultural and movement entry	1-4	Narrative context; basic movement vocabulary	Cultural images; narrative scenes; movement icons	Imitate and stabilize basic movements; connect image, meaning, and action
2. Connection and navigation	5-8	Music; movement connection; direction; routes	Musical cues; movement icons; route diagrams	Connect movements to rhythm; navigate shared spatial pathways
3. Cooperation and presentation	9-12	Partner work; role exchange; cooperative expression	Partner/role prompts; music; route cues	Coordinate with peers; exchange roles; present in small groups

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2.4. Evidence Sources and Child Assessments

The evidence architecture separated design, implementation/process, outcome, and supplementary contextual evidence so that each source had a defined analytical role and claim boundary. This separation mattered because agreement among observations, adult reports, and child assessments contextualized implementation rather than establishing an independent causal mechanism. Table 2 summarizes the evidence architecture.

Table 2. Evidence Architecture of the Empirical Case

Evidence function	Principal sources	Analytical use	Claim boundary
Design	Needs analysis; curriculum/model records; digital materials; expert review	Document how the fixed curriculum and materials were prepared before formal teaching	Does not treat classroom stages as three redesigned versions
Implementation/process	Classroom observations; attendance; task records; teacher post-lesson records; two teaching-assistant journals; four educator interviews	Describe how digital cues, teacher action, bodily practice, routes, and peer roles operated	Process correspondence is not proof of an independent causal mechanism
Outcome	Three child scales at T0 and T3; T1/T2 formative records	Describe within-group change and stage-specific learning states	Descriptive only; no control group or inferential causal claim
Supplementary context	Eight parent semi-structured telephone interviews (10-15 min)	Contextualize home extension (talk, imitation, presentation, sharing)	Not merged into child outcome scores

Three researcher-developed, curriculum-specific observational instruments were administered at T0 and T3. The Movement Expressiveness Assessment comprised six 1-4 dimensions: movement accuracy and completeness; rhythm and timing; space and directional coordination; body coordination and force control; facial expression and emotional engagement; and repetition stability and task persistence. The Learning Interest and Classroom Participation Assessment comprised four 1-4 dimensions: emotional engagement, attention maintenance, active participation and sustained effort, and cooperation and rule awareness. Its T0 score was the mean of two structured observations, whereas T3 was one full final assessment. The Traditional Dance Cultural Understanding and Initial Identification Assessment comprised four 1-3 dimensions: knowledge understanding, cultural-symbol recognition, emotional attitude, and behavioral tendency. Initial identification was defined narrowly as recognition, liking or closeness, and willingness to imitate, present, discuss, or share curriculum content; it was not treated as evidence of mature cultural identity.

2.5. Instrument Development, Content Review, and Evidentiary Status

The three instruments originated within this project rather than from a pre-existing standardized battery. Their dimensions were derived from the intended curriculum outcomes and observable classroom behaviors that the 12-session program was designed to elicit: embodied movement performance, learning participation, and early cultural learning. Before T0, the two expert supervisors reviewed the instruments together with the curriculum, digital materials, and lesson scripts for relevance to the learning goals, age appropriateness, observability in a shared kindergarten classroom, and alignment between tasks and scoring dimensions. The documented revisions to the wider research package included shorter movement combinations, more concrete cultural explanations, reduced digital information load, clearer spatial boundaries, and tighter task-to-observation alignment.

The available study documentation supports expert content review and curriculum alignment, but it does not document a numerical content-validity index or Aiken's V, a separate psychometric pilot sample, factor-analytic construct validation, test-retest reliability, or standardized norms. No such statistics are inferred or manufactured here. Pre-implementation refinement is therefore described as expert review of researcher-developed observational measures, not as full psychometric validation. This boundary matters because observational ratings in early childhood settings can vary by observation context and format (Thorpe et al., 2020), and rating-based assessments may not align perfectly with direct measures (Vitiello & Williford, 2021). The present measures are not equated with established observational systems; they are used only for curriculum-specific descriptive reporting. Likewise, the source records do not document a separate pilot cohort; formal classroom outcome reporting begins at T0. Table 3 states the development basis and evidentiary boundary for each instrument.

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Table 3. Specification and Evidentiary Status of the Child Assessment Instruments

Instrument	Dimensions and scale	Development/content review basis	Evidentiary status and boundary
Movement Expressiveness Assessment	Six dimensions; 1-4 scale: accuracy/completeness; rhythm/timing; space/direction; coordination/force; facial/emotional expression; repetition/persistence.	Researcher-developed from movement objectives and observable performance tasks; reviewed with curriculum/materials by two expert supervisors; review tightened task-observation alignment.	Curriculum-specific observational measure. No numerical CVI/Aiken's V, separate psychometric pilot, factor analysis, test-retest estimate, or standardized norms documented.
Learning Interest and Classroom Participation Assessment	Four dimensions; 1-4 scale: emotional engagement; attention maintenance; active participation/sustained effort; cooperation/rule awareness.	Researcher-developed from participation objectives and structured classroom observation; included in the same expert review. T0 was the mean of two observations; T3 was one final assessment.	Study-specific descriptive measure; T0 and T3 observation structure was not identical. No standardized external validation documented.
Traditional Dance Cultural Understanding and Initial Identification Assessment	Four dimensions; 1-3 scale: knowledge; cultural-symbol recognition; emotional attitude; behavioral tendency.	Researcher-developed from age-appropriate cultural-learning objectives; expert review favored concrete explanations and links among symbol, movement, music, and meaning.	Construct is deliberately narrow and does not represent mature cultural identity. No external psychometric validation or standardized norms documented.

2.6. Data Analysis and Integration

Quantitative analysis was descriptive. For each instrument, dimension means, child-level sample standard deviations, scale-total means and standard deviations, individual change scores and change ranges, counts, and percentages were examined within that instrument's scoring range. No inferential test was used to label T0-T3 differences statistically significant. One trained student teaching assistant rated all 30 children at T0 and T3. A second trained student teaching assistant independently scored the three scale totals for a prespecified subsample of 10 children selected at fixed intervals from the coded sequence, producing 60 paired verification records: 50 ratings were identical (83.3%) and 10 differed by one point (16.7%). The check was treated as descriptive scale-total scoring consistency, not as Cohen's kappa, an intraclass correlation coefficient, or a formal dimension-level inter-rater reliability estimate. For learning interest and classroom participation, T0 was the average of two structured observations while T3 was one final assessment; its T0-T3 difference is explicitly treated as a non-equivalent descriptive comparison.

2.7. Process and Qualitative Analysis

Process evidence was treated as structured descriptive implementation evidence rather than as a stand-alone thematic or grounded-theory study. For each of the 12 formal sessions, records were organized through the chain session-classroom event-child response-adult support-stage record. The implementation archive included date and attendance, principal task, digital materials, lesson flow, child-level task-completion records, the lead teacher's post-lesson record, and observation notes from both student teaching assistants. After the curriculum, the lead teacher, assistant teacher, and two student teaching assistants each participated in an on-site semi-structured interview. Eight parents (P01-P08) completed 10-15-minute semi-structured telephone interviews. Educator sources were used to document digital-material use, demonstration, route support, classroom organization, cooperation, and feedback; parent sources were used only as supplementary evidence of home extension and were not incorporated into child scores. Analysis was organized descriptively around predefined implementation categories aligned with the research question and curriculum design: task clarity, teacher mediation, bodily practice, route use, feedback, participation, peer cooperation, role exchange, classroom organization, cultural expression, and support needs. Planned lesson tasks were read alongside enacted session records, and sources describing the same classroom phenomenon were treated as complementary implementation evidence rather than as proof of an independent mechanism. The available records do not document interview language, audio recording, verbatim transcription, a formal inductive theme-generation procedure, independent qualitative coding, or saturation; accordingly, no such procedure, intercoder reliability statistic, or saturation claim is made.

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3. Results and Discussion

3.1. Descriptive Changes in Children's Learning Outcomes

Descriptive T0-T3 patterns were higher at T3 in all three assessed domains, with variability evident across children. For movement expressiveness, the dimension mean changed from 1.97 (SD = 0.34) to 3.01 (SD = 0.30), and the scale-total mean from 11.83 (SD = 2.05) to 18.03 (SD = 1.83); individual total-score changes ranged from +3 to +9. For learning interest and classroom participation, the dimension mean changed from 2.03 (SD = 0.37) to 3.07 (SD = 0.32), and the scale-total mean from 8.10 (SD = 1.48) to 12.27 (SD = 1.28); individual total-score changes ranged from +1.5 to +7.0. Because T0 was the average of two structured observations and T3 was one final assessment, this second pattern is a non-equivalent descriptive comparison and is interpreted more cautiously than the other two domains. For cultural understanding and initial identification, the dimension mean changed from 1.67 (SD = 0.37) to 2.62 (SD = 0.33), and the scale-total mean from 6.67 (SD = 1.47) to 10.47 (SD = 1.33); individual total-score changes ranged from +1 to +6. All 30 children completed paired T0 and T3 assessments and had higher scale totals at T3 in each domain. Table 4 summarizes these descriptive outcomes.

Table 4. Descriptive T0-T3 Outcomes with Child-Level Variability (n = 30)

Outcome area	Dimension mean T0 (SD)	Dimension mean T3 (SD)	Scale-total T0 (SD)	Scale-total T3 (SD)	Individual total-score change
Movement expressiveness (1-4; total 6-24)	1.97 (0.34)	3.01 (0.30)	11.83 (2.05)	18.03 (1.83)	+3 to +9
Interest and participation† (1-4; total 4-16)	2.03 (0.37)	3.07 (0.32)	8.10 (1.48)	12.27 (1.28)	+1.5 to +7.0
Cultural understanding / identification (1-3; total 4-12)	1.67 (0.37)	2.62 (0.33)	6.67 (1.47)	10.47 (1.33)	+1 to +6

Note. SD values are child-level sample standard deviations from the 30-child records. †The interest-and-participation comparison is non-equivalent: T0 is the mean of two structured baseline observations, whereas T3 is one final assessment. No inferential significance test or control group was used; values therefore describe within-program patterns rather than standardized or causal effects.

These patterns should not be interpreted as causal effects of the teaching model or digital component. The study had no control group, no random assignment, and no inferential test; the instruments used different scoring ranges; the interest-and-participation measurement occasions were not structurally equivalent; and the second-rater check covered only a subsample at the scale-total level. Standard deviations and individual change ranges show that the mean pattern coexisted with child-level variation. The results therefore establish descriptive within-program change, not independent effectiveness, statistical significance, or a causal digital-technology effect.

3.2. The Instructional Chain from Digital Cue to Embodied Action

Across the 12 sessions, the shared display introduced recognisable aspects of the next task, but movement and interaction took place beyond the display. Cultural images gave narrative context, movement icons identified actions to try, music supported timing, route diagrams showed intended pathways, and partner prompts clarified roles. Lesson records repeatedly described digital prompting followed by teacher explanation or demonstration, bodily or peer attempts, feedback, and further attempts. Figure 2 represents this recurring order in the documentation. Its arrows are a descriptive summary of classroom events, not a tested temporal mechanism or evidence that any one step caused the next.

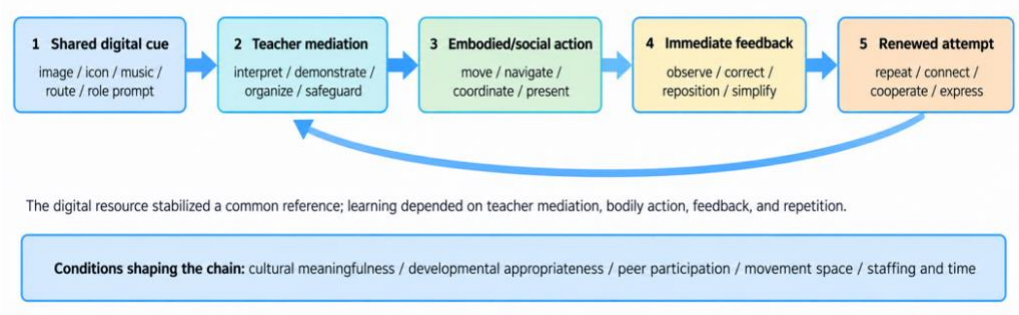


Figure 2. Descriptive Reconstruction of Recurring Instructional Events; Arrows Do Not Imply a Tested Causal Mechanism.

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The limits of a cue became apparent when children had to act on it. Recognition of an icon did not ensure that several movements could be joined; seeing a route did not guarantee that a child could follow it; a partner symbol did not resolve questions of position, waiting, or role exchange. The teacher responded with explanation, another demonstration, repositioning, and immediate feedback. Later tasks called for more complicated forms of support, although these records cannot isolate the contribution of any individual support action.

3.3. Task Complexity and Classroom Support Across Stages

Stage-specific records show that difficulty changed form across the curriculum rather than disappearing. Early difficulty concerned connecting movement cues; later difficulty involved coordinating rhythm with spatial routes and then coordinating position, waiting, role exchange, and another child. Table 5 summarizes the principal stage indicators and the support demands documented during implementation.

Table 5. Stage-Specific Implementation Indicators and Support Demands

Stage	Selected implementation indicators	Persistent difficulty	Support that became educationally necessary
Stage 1	Narrative context 24/30 (80.0%); movement-icon recognition 22/30 (73.3%); principal basic movements 20/30 (66.7%)	10/30 (33.3%) still needed prompting when cues had to be connected into a sequence	Repeated demonstration; shorter verbal cues; one principal cue at a time
Stage 2	Musical start cue 25/30 (83.3%); principal route 23/30 (76.7%); connected movement combination 21/30 (70.0%)	9/30 (30.0%) still needed reminders during turning, circling, or returning	Floor markings; visible start/return points; spatial guidance; adult positioning
Stage 3	Core movement combination 26/30 (86.7%); partner tasks 24/30 (80.0%); role exchange with teacher prompting 23/30 (76.7%); small-group presentation 25/30 (83.3%)	Waiting, position, role exchange, and coordination with another child remained demanding	Waiting areas; partner markers; role cues; rotation time; immediate feedback

These records indicate that digital provision alone was insufficient. Route-based tasks required usable movement space, stable markers, and adults positioned to correct spatial errors safely. Cooperative tasks required waiting areas, partner markers, role cues, and time for rotation. The display's educational function therefore depended on a broader learning ecology that included space, staffing, pacing, and repeated feedback.

3.4. Sustained Participation and Cultural Learning

Of 360 expected child-session attendances, 349 were recorded, an overall attendance rate of 96.94%. Twenty-one children attended all 12 sessions, seven missed one session, and two missed two. Attendance does not identify the source of engagement because the curriculum combined narrative, music, movement, peer roles, teacher feedback, and culturally recognizable imagery. It does show that the multi-session design was sustained with high participation and that all 30 children completed the principal T0 and T3 assessments.

Cultural learning was interpreted developmentally rather than as acquisition of a mature cultural identity. At T0, 19/30 children mainly described peacock images or actions using concrete action terms, six used general descriptions such as dancing or imitating an animal, and only five referred to Dai dance or Dai Peacock Dance. At T3, 17/30 children received the highest rating (3) on the knowledge-understanding dimension, 19/30 on cultural-symbol recognition, 23/30 on emotional attitude, and 15/30 on behavioral tendency. These ratings are curriculum-specific and do not establish stable cultural identity. Parent data were kept supplementary: among eight parent interviews, six reported spontaneous imitation of curriculum movements at home and six reported use of curriculum-related language, while two reported a child inviting family members to watch a presentation and one reported repeating a route task. These parent reports were not incorporated into the child scale scores. Together, the records provide bounded evidence of early recognition, participation, liking, and willingness to express or share Dai Peacock Dance content.

3.5. Interpreting Outcome Change Together with Implementation Evidence

The T0–T3 observations show a consistent direction of change in the three curriculum-specific scores. Mean scale totals rose for movement expressiveness, learning interest and classroom participation, and cultural understanding and initial identification (Table 4). Every child had a higher recorded total at T3 in each domain, although the size of the difference varied. This finding is descriptively relevant; it is not a controlled estimate of learning attributable to this curriculum. The instruments were devised for the project, one teacher team implemented the lessons, and no comparison group was observed. Nor were the two occasions for interest and participation equivalent: T0 averaged two structured observations, whereas T3 was a single final assessment. Variation across observation occasions is a known concern in early childhood assessment (Thorpe et al., 2020). For that domain in particular, the difference should not be read as if identical measurements had been repeated.

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The lesson documentation gives these numbers a more intelligible educational setting. Dance learning here involved practising movement phrases, following musical cues, finding routes, coordinating with partners, and discussing cultural images. This is consonant with work that locates dance learning in embodied and social activity (Kotaman et al., 2024; Twiner et al., 2022), and with studies arguing that traditional dance curricula must connect cultural content to actions teachers can actually teach (Daryanti et al., 2025; Mohd Alim et al., 2023; Zain et al., 2024). The records nonetheless do not separate the influences of rehearsal, maturation, adult attention, cultural narrative, and digital prompts. Their principal value is to show what the instructional arrangement required in practice, not to assign responsibility for the higher final scores.

3.6. Digitalization Without Disembodiment as a Provisional Pedagogical Heuristic

The heuristic digitalization without disembodiment names an instructional priority rather than a discovery about how learning is caused. Guided-play research already explains the value of responsive adult structure (Skene et al., 2022). Embodied-learning accounts show why acting with the body cannot be treated as a decorative supplement to cognition (Skulmowski, 2024; Twiner et al., 2022). Work on early childhood technology also makes teacher agency and context central to implementation (Undheim, 2022; Yang & Dong, 2024). The present case does not supersede these perspectives. It brings them to a narrower point of practical decision: what happens when a visible or audible prompt is no longer enough for the next dance task to be performed.

Consider the change in the demands placed on children across the three stages. During introductory movement work, 10 of 30 children still required prompting to connect cues into a sequence. In the route stage, nine needed reminders while turning, circling, or returning. During partner and presentation work, the task records show that role exchange remained supported by teacher prompts; 23 of 30 were recorded as completing role exchange with that support (Table 5). These figures do not track one comparable skill across stages and should not be read as a difficulty trajectory. They locate different points at which recognition had to be turned into coordinated action. A shared display offered a stable reference, but teachers had to judge when to repeat, simplify, reposition, designate waiting space, or give feedback.

This is the additional work performed by the heuristic. Teacher mediation is not treated simply as a general condition for effective digital learning, and embodiment is not invoked only as a principle that children must move. Instead, the heuristic asks the curriculum designer to examine the handover from representation to movement, and then from individual movement to coordination with others. It also requires attention to the material conditions of that handover: a marked route, sufficient space to turn safely, adults positioned to assist, and time for a child to try again. A cue that is easy to recognize can still be difficult to enact. That distinction is particularly consequential in a culturally specific dance, where symbols, rhythm, movement quality, and social presentation need to remain connected rather than becoming separate screen-based exercises.

Fig. 2 should therefore be read as a reconstruction of events commonly described in this classroom, not as a verified chain of mediators. The records show correspondence among digital prompts, teacher responses, physical attempts, and feedback, but they do not establish their necessary order across all lessons or the effects of removing any one element. No non-digital or individual-device comparison was conducted. The heuristic is useful at this stage as a way of asking better design and observation questions where did the representation cease to guide action, what support was supplied, and what could children attempt afterward? Whether this arrangement produces different learning outcomes remains an empirical question.

3.7. Provisional Design Propositions

The six propositions in Table 6 are working hypotheses for instructional design, not a validated model with six independent factors. They retain the empirical specificity of this case: screen prompts were followed by bodily attempts; teachers interpreted and adjusted cues; images and music were connected to Dai Peacock Dance movement; information density was reduced for young children; partners and routes required explicit coordination; and implementation depended on space, staffing, and pacing. Embodiment, teacher mediation, cultural meaningfulness, developmental appropriateness, social participation, and implementation feasibility are therefore names for decisions that future studies can document and challenge, rather than standards already shown to improve scores.

To test them, subsequent research would need more than another positive pre–post pattern. It would have to specify, for example, what forms of teacher feedback accompany difficult transitions when children return from a screen prompt to movement, whether cultural references remain evident in performance, and how spatial or staffing arrangements alter participation. Designs comparing different instructional configurations would then be able to examine which propositions transfer to other classrooms and traditions. Without such comparisons, the present observations support plausible design questions, not an explanatory account of effectiveness.

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Table 6. Provisional Design Propositions for Teacher-Mediated Digital Dance Learning

Proposition	Empirical trace in this case	Design implication	Boundary for interpretation
Embodiment	Digital pages were followed by movement attempts; most lesson time occurred away from direct screen interaction	Use digital information as a short prompt that returns children quickly to artistic action	The study did not compare different screen durations or digital intensities
Teacher mediation	Teachers translated cues, demonstrated, reorganized space, corrected, and simplified as complexity increased	Preserve teacher interpretation and feedback as part of the digital learning design	The independent effect of teacher mediation was not estimated
Cultural meaningfulness	Narrative, peacock imagery, music, movement meanings, and presentation were linked within the curriculum	Connect digital symbols to culturally situated movement, narrative, and participation	A short curriculum supports early understanding, not stable cultural identity
Developmental appropriateness	Expert review reduced information load; classroom use favored one principal cue at a time and progressive combinations	Match information density, language, and task complexity to children's developmental level	Alternative digital designs were not experimentally compared
Social participation	A common display supported routes, partners, role exchange, and group presentation	Use digital resources to organize shared participation rather than defaulting to isolated device use	The study did not compare shared displays with one-device-per-child arrangements
Implementation feasibility	Routes and partner tasks depended on space, floor markings, waiting areas, adult positioning, and feedback time	Treat space, staffing, planning, and pacing as part of digital pedagogy	These implementation requirements are context-specific and require replication

3.8. Implications for Teaching, Curriculum Design, and Schools

For teachers, the relevant digital competence is partly the ability to stop relying on the display. A movement icon can make a task visible; the teacher still decides whether children have understood it bodily, whether to demonstrate again, and whether the next attempt calls for a shorter cue or a change of position. This kind of judgment depends on dance knowledge as well as classroom knowledge. Preschool teachers have identified bodily and choreographic demands in dance instruction (Pastorek Gripson et al., 2022; Zain et al., 2023), while studies of digital early childhood practice describe teachers as active interpreters rather than passive operators of technology (Lindeman et al., 2021; Undheim, 2022). Training should therefore connect digital-material selection to movement demonstration, observation, and feedback, not merely to confidence in operating a device (Masoumi, 2021).

For curriculum designers, the sequence of decisions should start with the dance task. What must children learn to do with their bodies, what cultural meaning should accompany that action, and what interaction will make it possible? Only then is it useful to decide whether an image, a musical cue, a route diagram, or a role prompt would clarify the next attempt. This protects artistic content from being displaced by generic technological engagement. Research on curriculum integration raises precisely this concern about losing disciplinary knowledge (Kneen et al., 2020), and arts-learning scholarship argues that the knowledge generated through artistic activity warrants examination in its own right (Peppler et al., 2023). A traditional-dance lesson should consequently preserve rhythm, spatial decisions, movement quality, expression, and cultural interpretation as explicit learning purposes.

For schools, the lesson's physical organization is part of its digital design. A route on a screen did not provide floor space or safe turning points; a partner prompt did not create a waiting area or settle the timing of role changes. During these sessions, teachers and assistants supplied such arrangements alongside the digital material. The case therefore makes a concrete addition to ecological accounts of classroom technology use (Schriever, 2021; Yang & Dong, 2024): in embodied arts, staffing, movement space, floor markers, and feedback time need to be planned with the media itself. This concern also accords with research identifying observable teacher–child interaction as an important dimension of early education quality (Pianta & Hofkens, 2023). This is a context-bound implication. Other schools may organize dance differently, and the present study offers no comparison showing that a shared display is preferable to other arrangements.

3.9. Limitations and Directions for Research

The study has substantial limitations. It involved one kindergarten class, 30 children, one culturally specific dance case, one teacher team, and no control group. T0-T3 comparisons were descriptive; T1 and T2 were stage-specific formative records rather than equivalent repeated measures; and the interest-and-participation baseline averaged two observations whereas T3 used one final assessment. The three child

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instruments were researcher-developed and expert-reviewed for curriculum alignment, but the available documentation does not support a numerical content-validity coefficient, a separate psychometric pilot, factor analysis, test-retest reliability, standardized norms, or a formal dimension-level inter-rater reliability statistic. The principal outcome rater was a trained student teaching assistant, and student teaching assistants also had implementation-support and classroom-observation roles; assessor blinding is not documented. This role overlap may have introduced expectancy or observational bias. The second-rater check on 10 children at the scale-total level provides a limited consistency check but does not eliminate that concern. The process analysis was structured and descriptive rather than a formal thematic-analysis design: the available records do not document interview language, audio recording, verbatim transcription, independent qualitative coding, or saturation. These limitations prevent causal claims about the teaching model, shared display, teacher mediation, or any individual component and limit the strength of qualitative-mechanism claims.

Future studies should test the provisional propositions across different early childhood settings, dance traditions, teacher-expertise levels, and technology configurations. Comparative or quasi-experimental designs could contrast teacher-mediated shared displays with non-digital instruction or individualized devices. Larger studies should use independently validated instruments, equivalent observation occasions, preregistered scoring protocols, assessor blinding where feasible, and formal inter-rater reliability estimates. Because observational scores can be sensitive to the context and format of assessment (Thorpe et al., 2020), future designs should standardize observation windows and tasks; where rating-based and direct assessments are combined, their convergence should be examined explicitly rather than assumed (Vitiello & Williford, 2021). Qualitative work should document interview language, recording and transcription procedures, coding steps, analytic reflexivity, and procedures for checking interpretive credibility. At school and system levels, research should also test whether the implementation conditions identified here generalize across settings with different arts access, staffing, and digital infrastructures. Such evidence is necessary before digitalization without disembodiment can be treated as a transferable framework rather than a heuristic generated from one educational case.

4. Conclusion

In this 30-child, 12-session Dai Peacock Dance case, mean T0–T3 scale totals were higher for movement expressiveness (11.83 to 18.03), learning interest and classroom participation (8.10 to 12.27), and cultural understanding and initial identification (6.67 to 10.47), with variation across children. The interest-and-participation comparison is not equivalent across occasions because its baseline averaged two observations and the final assessment used one. Lesson records also described a recurring classroom arrangement: a shared digital prompt was interpreted by the teacher, attempted through movement or peer activity, and followed by feedback or another attempt. As tasks shifted toward routes and partner work, spatial organization and adult guidance remained important. These findings support a limited claim. Digitalization without disembodiment offers a practical way to examine how visual and musical resources are handed over to bodily, cultural, and social work; the observed sequence is not a tested causal mechanism. The six related design propositions embodiment, teacher mediation, cultural meaningfulness, developmental appropriateness, social participation, and implementation feasibility remain provisional. One classroom, no comparison group, researcher-developed measures, the non-equivalent participation assessment, limited scale-total agreement checking, and no documented assessor blinding prevent causal or generalizable conclusions. Comparative studies with stronger measurement and transparent process analysis are needed to assess whether the propositions hold elsewhere.

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All authors contributed equally to this paper. All authors have read and approved the final manuscript.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics and Consent Declarations

The university approved the study and participant-protection procedures before formal implementation. Study procedures, learning activities, data collection, participant rights, and withdrawal provisions were explained to the participating kindergarten and to parents or legal guardians. Because the participants were 5-6-year-old children, written informed consent was obtained from parents or legal guardians before research data were collected, and children's ongoing willingness to participate was respected during classroom activities; participation could be discontinued without academic or classroom penalty. Child records were anonymized as C01-C30, and teacher, teaching-assistant, expert, and parent materials were coded. The documentation available for this manuscript records university-level approval of the study and participant-protection procedures but

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does not state a separate ethics-committee name or protocol/approval number; none is inferred or fabricated here. The study therefore reports the approval information supported by the source documentation and follows the documented requirements for privacy, voluntary participation, and protection of minors

Data Availability

The study contains child-level research data and qualitative materials subject to participant-protection and institutional requirements. De-identified data supporting the reported analyses may be made available by the corresponding author on reasonable request where sharing is compatible with consent, privacy, and institutional obligations.

Declaration on AI Use

The authors used OpenAI ChatGPT as a language-editing and manuscript-restructuring aid to improve clarity and coherence. It was not used to generate or analyze underlying study data, recruit participants, score observations, or make research decisions. The authors remain responsible for checking the revised manuscript, sources, interpretations, and compliance with the journal's disclosure requirements. No generative AI image model was used to create or alter the submitted figures; both are schematic representations of the documented study design and implementation sequence.

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