

RESEARCH ARTICLE

A Practical Methodology for Developing Preschool Children's Digital Literacy Through Activity-Center-Based Learning

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Abstract

This article presents a practical methodology for developing foundational digital literacy among preschool children through activity-center-based learning. The study addresses a methodological gap between the general recommendation to integrate technology into early childhood education and the concrete pedagogical procedures required to organize such integration. A practice-oriented framework is proposed that connects six components: learning goal, digital tool, child action, teacher mediation, real-world activity and formative assessment. The methodology is organized around five phases: diagnostic orientation, demonstration and safety briefing, guided practice, independent/creative application, and reflection with documentation. Practical examples are provided for language, mathematics, science, construction, art and role-play centers. A developmental assessment matrix with four performance levels is proposed, alongside observation indicators for operational, informational, creative, communicative and responsible digital behavior. The article emphasizes that the purpose of preschool digital literacy is not early technical specialization but the development of purposeful, safe, creative and socially mediated interaction with digital tools. The methodology can be adapted to settings with limited equipment because it does not require one device per child and combines digital and non-digital materials.

KEY WORDS

Preschool children; digital literacy; activity centers; practical methodology; formative assessment; teacher mediation; digital safety; educational technology; early childhood education.

INTRODUCTION

The growing presence of digital technologies in children's everyday lives has made digital literacy an increasingly relevant dimension of early childhood education. Yet the educational challenge is complex. Young children need opportunities to understand and use digital tools, while preschool pedagogy must continue to protect play, physical activity, communication, creativity, sensory exploration and relationships. UNESCO's 2023 Global Education Monitoring Report argues that technology should serve clearly defined educational purposes rather than become an educational objective by itself [1]. UNICEF's work on children's digital

literacy likewise treats digital literacy as a combination of knowledge, skills and attitudes needed for meaningful and safe participation in a digital environment [2].

For preschool settings, these ideas must be translated into concrete classroom procedures. It is not enough to provide a tablet, interactive board, digital story or educational application. The teacher must know what children are expected to learn, what action they will perform, how the tool supports that action, how interaction with peers and adults will be organized, and how progress will be observed. This article

therefore focuses on methodology at the level of practical implementation.

Activity centers are particularly appropriate because they naturally support differentiated tasks, choice, cooperation and learning through action. Digital resources can be embedded into these centers without creating a separate technology lesson. A child can photograph a construction, record a story, classify objects using an interactive activity, observe a magnified natural object, or add a digital element to a physical artwork. The device becomes one element of a broader learning environment.

The aim of the article is to formulate and systematize a practical methodology for developing preschool children's digital literacy in activity centers and to provide an observation-based framework for monitoring its development.

CONCEPTUAL BASIS OF THE METHODOLOGY

The methodology is based on five propositions. First, digital literacy in preschool is developmental: children progress from recognition and basic operation toward purposeful choice, creation, communication and responsible behavior. Second, digital learning should be active rather than passive. Third, technology should be socially mediated through teacher and peer interaction. Fourth, digital experiences should connect to real objects, movement, play and conversation. Fifth, assessment should focus on observable behavior rather than isolated technical performance.

These propositions correspond with guidance from NAEYC and the Fred Rogers Center, which emphasizes intentional, developmentally appropriate and co-engaged use of technology in early childhood programs [3]. They also correspond with research showing that educational applications are more likely to support learning when they promote active, engaged, meaningful and socially interactive experiences [4].

RESEARCH AND METHODOLOGICAL APPROACH

The article uses a theoretical-practical design. The methodology was constructed through analysis and synthesis of international guidance on technology and early childhood education, pedagogical modeling, comparative analysis of activity-center practices and development of observable indicators. The article does not present invented experimental statistics. Instead, it provides a practical intervention framework that can be implemented and empirically evaluated in a subsequent field study.

The central methodological unit is the activity task. Each task contains six linked elements: (1) developmental objective; (2) selected digital resource; (3) child action; (4) teacher mediation; (5) connection to a real-world or non-digital activity; and (6) observation indicator. This structure prevents technology from becoming an isolated component of the lesson.

FIVE-PHASE PRACTICAL METHODOLOGY

Phase	Teacher procedure	Child activity	Evidence to observe
1. Diagnostic orientation	Identify children's prior experience, confidence, language needs and basic safety knowledge through conversation and observation.	Talks about familiar devices, explains what they are used for and demonstrates known actions.	Prior knowledge; vocabulary; willingness to explore; safe/unsafe behavior.
2. Demonstration and safety briefing	Demonstrate only the functions needed for the task; explain one or two concrete safety rules.	Observes, repeats essential actions and verbalizes simple rules.	Attention to instructions; safe handling; ability to imitate purposeful action.
3. Guided practice	Give a short problem; ask questions; support turn-taking and gradually reduce help.	Explores, chooses, compares, sorts, records or communicates with support.	Operational skill; problem solving; communication; persistence.

4. Independent/creative application	Offer an open-ended challenge and provide minimal assistance.	Creates a digital/hybrid product, documents real work or explains a choice.	Independence; creativity; purposeful choice; peer cooperation.
5. Reflection and documentation	Ask what the child did, why the tool helped and what could be improved; record observations.	Explains actions, evaluates the result and connects it to real experience.	Metacognition; transfer; vocabulary; responsible attitudes.

PRACTICAL APPLICATION IN ACTIVITY CENTERS

The following examples illustrate how one methodology can

be adapted to different centers. The examples are deliberately hybrid: children first encounter a real object, social situation or physical task, and digital tools are then used to extend, document, represent or communicate the experience.

Center	Task	Digital element	Methodological result
Language and communication	Children sequence picture cards for a familiar story, retell it and record a short audio version.	Audio recorder / digital story resource	Vocabulary, narrative sequence, listening and communication.
Mathematics	Children count real objects, group them by a chosen property and photograph the groups.	Camera / simple classification activity	Counting, classification, purposeful digital documentation.
Center	Task	Digital element	Methodological result
Science and nature	Children examine a leaf, seed or stone directly and then compare it with a magnified digital image.	Digital camera / microscope	Observation, comparison, descriptive language and curiosity.
Construction	Children build a bridge or house with blocks, photograph it and explain how it can be improved.	Camera / simple drawing tool	Planning, problem solving, reflection and communication.
Art	Children make a physical picture, photograph it and add a digital frame, sound or narrated explanation.	Camera / drawing or presentation tool	Creative expression and explanation of artistic choices.
Role-play	Children perform a short scenario, record it and discuss how characters could act differently.	Camera/audio recorder	Social-emotional language, reflection and collaboration.

TEACHER MEDIATION STRATEGIES

Teacher mediation is the mechanism that converts a digital resource into a learning experience. Five strategies are recommended.

Model briefly. Demonstrate only the functions needed for the task. Long technical demonstrations increase passive observation and reduce children's active time.

Ask purposeful questions. Questions such as "Why did you choose this?", "What changed?", "Can you show another

way?" and "How does the digital picture compare with the real object?" promote thinking beyond button pressing.

Use gradual release. At first the teacher demonstrates and guides; later the child performs familiar actions independently. Assistance should decrease as competence increases.

Require explanation. A child should have opportunities to explain what was done, what was learned and why the digital tool was useful.

Link digital and real experiences. After a digital activity,

children should return to physical materials, movement, conversation or direct observation whenever appropriate. This is consistent with developmentally appropriate practice recommendations [3,5].

FORMATIVE ASSESSMENT FRAMEWORK

Assessment should be continuous and embedded in normal activity. A four-level scale can be used: 1—emerging, 2—developing, 3—functional, and 4—-independent. The same child may demonstrate different levels across different indicators; therefore, a single total score should not be interpreted as a fixed ability.

Domain	1 — Emerging	2 — Developing	3 — Functional	4 — Independent
Purpose	Uses a tool mainly after prompting.	Identifies a simple purpose with help.	Chooses a suitable tool for a familiar purpose.	Explains and justifies a purposeful choice.
Operation	Needs continuous assistance.	Performs familiar actions after demonstration.	Performs basic actions safely.	Uses familiar functions independently and helps peers appropriately.
Information	Focuses mainly on visual effects.	Compares or sorts with prompts.	Identifies relevant information and differences.	Asks questions and explains conclusions.
Creation	Copies a demonstrated action.	Produces a simple product with help.	Creates a meaningful digital/hybrid product.	Creates, revises and explains an original product.
Communication	Uses digital media mainly individually.	Shares with prompts.	Uses media to communicate with peers/adults.	Collaborates, listens and communicates purposefully.
Safety	Needs frequent reminders.	Follows rules after prompts.	Consistently follows familiar rules.	Recognizes risk and seeks adult help independently.

SAMPLE OBSERVATION CARD FOR THE TEACHER

For practical implementation, a teacher can maintain a short observation card after selected activities. The purpose is not bureaucratic scoring but identification of the next pedagogical step.

Child: _____ Date: _____ Center: _____

Task: _____

Observed _____ strength: _____

Current level (1–4): _____ Support needed: _____

Next _____ step: _____

A useful observation note should describe behavior rather than label the child. For example, “selected the camera independently and explained that it was needed to record the construction” is more informative than “has good digital skills.”

DIGITAL SAFETY AND ETHICAL ROUTINES

Preschool digital literacy must include basic safety habits. UNICEF's framework emphasizes children's participation and safety in digital environments [2]. At preschool level, safety teaching should be concrete and repetitive. Recommended routines include asking permission before opening an unfamiliar resource; not entering names, addresses or other personal information into digital services; informing an adult when an unexpected screen appears; handling equipment with clean hands and appropriate care; respecting another child's turn; and asking permission before photographing or recording another person.

Privacy should be treated as a classroom routine rather than

a technical topic. Teachers should avoid unnecessary collection or publication of children's images and recordings. Where digital platforms require accounts or data collection, institutional policies and applicable laws should guide their use. In low-resource settings, offline resources and locally stored documentation can reduce unnecessary exposure to external platforms.

BALANCING DIGITAL AND NON-DIGITAL LEARNING

The methodology is intentionally designed around balance. A practical rule is to ask whether the digital element adds value to the activity. If the same objective can be achieved more effectively through direct manipulation, conversation, outdoor observation or imaginative play, the digital tool should not automatically be preferred. Technology is especially useful when it allows documentation, magnification, replay, audio recording, visual comparison, creative recombination or access to a representation that would otherwise be difficult to obtain.

A useful lesson architecture is "experience → digital representation → discussion → new action." For example, children first build a physical structure, then photograph it, discuss its features and finally rebuild it differently. Such sequencing protects active learning while developing digital competence.

EXPECTED PEDAGOGICAL OUTCOMES

If implemented consistently and developmentally appropriately, the methodology is expected to support five groups of outcomes: (1) more purposeful basic interaction with digital tools; (2) improved ability to use digital media for communication and creation; (3) stronger comparison, classification and problem-solving behaviors; (4) development of simple safety and responsibility routines; and (5) improved teacher capacity to document and respond to children's emerging digital competencies. These are expected outcomes of the proposed methodology, not claims of measured experimental effect.

The strongest outcome should not be the number of digital operations children can perform. The more meaningful indicator is whether children increasingly use digital tools intentionally, explain their choices, create rather than merely consume, collaborate with others and transfer learning between digital and real contexts.

DISCUSSION

The practical contribution of the framework is its focus on the teacher's activity design. Many technology-in-education discussions remain at the level of equipment or applications, whereas preschool implementation requires a micro-level methodology. The six-element activity task—goal, tool, child action, teacher mediation, real-world connection and observation indicator—provides a compact planning structure that can be applied regardless of the specific device available.

The methodology also addresses equity. A preschool institution does not need a one-to-one device model to develop foundational digital literacy. A single shared device can support collaborative documentation, audio recording, observation, photography and group reflection. This is consistent with UNESCO's broader emphasis on equity, teacher capacity and context-sensitive use of technology [1].

An important limitation is that the framework has not been presented as a completed experimental intervention with statistical results. Its next research stage should involve pilot implementation in preschool groups, development of inter-rater observation procedures, pre/post assessment and comparison of children's performance across activity centers. Researchers should also examine whether digital integration affects language, creativity, collaboration and problem solving, rather than measuring only device operation.

CONCLUSION

A practical methodology for preschool digital literacy should begin with pedagogical purpose, not technology. Activity centers provide a natural environment for this purpose because they allow children to explore, create, communicate and solve problems through action. By integrating digital tools into language, mathematics, science, construction, art and role-play activities, teachers can develop foundational digital competence without displacing real-world experiences.

The five-phase methodology proposed in this article—diagnostic orientation; demonstration and safety briefing; guided practice; independent/creative application; and reflection with documentation—offers a practical cycle for teachers. Its assessment framework makes children's progress visible through observable behaviors in purpose, operation, information use, creation, communication and safety.

Ultimately, effective preschool digital literacy is not defined by how early a child learns to operate a device. It is defined by

whether the child can use an appropriate digital tool purposefully, safely, creatively and socially while remaining an active participant in real learning experiences.

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