



METHODOLOGY FOR DEVELOPING DIGITAL LITERACY IN PRESCHOOL CHILDREN THROUGH DIGITAL LEARNING TOOLS IN ACTIVITY CENTERS

Jo'rayeva Gulira'no Nazirjon qizi

Norin Pedagogical College, Uzbekistan

Article type: Theoretical and methodological research

<https://doi.org/10.5281/zenodo.23254442>

ABSTRACT

The rapid expansion of digital technologies has changed the learning environment in which preschool children grow and develop. However, digital literacy in early childhood should not be reduced to the ability to operate a smartphone or tablet. It includes age-appropriate knowledge, practical skills, attitudes and safe patterns of interaction with digital information and tools. This article develops a methodological framework for forming preschool children's digital literacy through purposeful use of digital learning tools in activity centers. The study uses theoretical analysis, comparative analysis of international guidance, pedagogical modeling and methodological generalization. The proposed framework integrates digital tools into language, mathematics, science, construction, art, role-play and music-oriented activity centers while preserving hands-on, social and movement-based learning. A four-stage model—motivation and orientation, guided exploration, creative production, and reflection and transfer—is proposed. The article also identifies methodological principles, teacher roles, criteria for selecting digital content, indicators for monitoring children's progress, and safeguards related to screen balance, privacy, accessibility and adult co-engagement. The proposed approach positions technology as a pedagogical means rather than an independent learning goal and can be adapted to preschool institutions with different levels of technological provision.

Keywords: preschool education; digital literacy; digital learning tools; activity centers; early childhood education; digital competence; pedagogical methodology; interactive media; teacher mediation; developmentally appropriate practice.

INTRODUCTION

Digital technologies have become an ordinary part of children's social and cultural environment. Consequently, early childhood education faces a dual task: children need opportunities to develop basic digital competence, but technology must be introduced in ways that protect developmentally important experiences such as play, communication, movement, manipulation of real objects and direct interaction with adults and peers. UNESCO's Global Education Monitoring Report emphasizes that technology should be used on the terms of educational goals, equity, evidence and sustainability rather than treated as an end in itself [1]. UNICEF similarly defines children's digital literacy broadly, encompassing knowledge, skills and attitudes that enable children to participate, learn and remain safe in an increasingly digital environment [2].

The issue is particularly important in preschool education because early childhood is a period of rapid cognitive, linguistic, social-emotional and motor development. The National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center argue

that technology and interactive media can support young children's learning when they are used intentionally, appropriately and in combination with active, hands-on experiences [3]. Thus, the methodological question is not whether preschool institutions should simply “add technology”, but how digital tools can be embedded into an existing child-centered learning environment.

Activity centers provide a suitable organizational structure for such integration. In an activity-center approach, children choose, explore, create, communicate and solve problems through differentiated tasks. Digital tools can extend these experiences: a tablet can document a construction project; a projector can visualize a story; an audio recorder can capture a child's narration; a digital microscope can support observation; an interactive drawing application can complement—not replace—traditional art materials. This is consistent with evidence-based recommendations that technology should extend children's access to content and skills while not replacing real-world exploration and social interaction [3,4].

The purpose of this article is therefore to develop and substantiate a methodological model for forming preschool children's digital literacy through digital learning tools in activity centers. The novelty of the proposed approach lies in connecting the content of digital literacy with the organizational logic of activity centers and in defining a sequence of teacher-mediated learning actions that moves the child from basic orientation to purposeful, creative and responsible use of digital tools.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Digital literacy as a multidimensional competence

Digital literacy is broader than technical operation. UNICEF's review of children's digital literacy frameworks describes it as a combination of knowledge, skills and attitudes that supports safe and empowered participation in a digital world [2]. For preschool education, this definition requires developmental adaptation. A young child does not need the same competencies as an adolescent or adult; instead, digital literacy at this stage can be represented through observable foundational behaviors.

Dimension	Preschool manifestation	Teacher support
Operational	Recognizes basic device functions; taps, drags, selects, starts/stops a learning activity with support.	Models actions; uses simple instructions and gradual release.
Informational	Distinguishes a learning image, sound or symbol from unrelated content; asks questions about digital information.	Uses guided questions and compares digital representations with real objects.
Creative	Creates a drawing, photo record, audio story, simple digital composition or presentation of own work.	Provides open-ended tasks and values children's original choices.
Communicative	Uses digital media to tell, show, listen, cooperate and share a product with peers.	Organizes pair/group work and co-viewing.

Safety and responsibility	Follows simple rules: asks before using a device, handles equipment carefully, avoids sharing personal information, seeks adult help.	Explains rules through modeling, stories and repeated routines.
---------------------------	---	---

Developmentally appropriate technology use

The NAEYC/Fred Rogers Center position statement provides a central theoretical principle: digital technologies should be selected, integrated and evaluated intentionally, with attention to content quality, the child's experience and opportunities for co-engagement [3]. The more recent NAEYC developmental-practice guidance similarly stresses that effective technology use is active, hands-on, engaging and empowering, and should function as one option among many rather than displace real experiences [5].

Hirsh-Pasek and colleagues identify four learning pillars for educational applications: active, engaged, meaningful and socially interactive learning, supported by a clear learning goal [6]. These principles are especially useful for preschool activity centers because they provide a practical test for deciding whether a digital resource is pedagogically justified. A visually attractive application that merely occupies children is not sufficient; the resource should require thinking, choice, communication, creation or problem solving.

Activity centers as a methodological environment

Activity centers create differentiated micro-environments in which children learn through action. The digital component can be incorporated without changing the fundamental logic of play-based and activity-based preschool education. For example, in a language center children may listen to a short audio story and then retell it; in a construction center they may photograph a structure and explain its design; in a science center they may observe magnified objects and compare the digital image with the real specimen; in an art center they may create a digital version of a previously made physical drawing.

This model also reflects UNESCO's warning that digital technology should reinforce human interaction rather than substitute for it [1]. Accordingly, the teacher remains the designer of the learning situation, while the device is a mediating tool.

METHODOLOGY

Research design

The article employs a theoretical-methodological design. The analytical base consists of international policy documents, professional guidance and research literature on technology in education, early childhood development and educational applications. The methods include: (1) analysis of scientific and policy literature; (2) comparative analysis of recommendations on digital technology and young children; (3) pedagogical modeling; and (4) synthesis of methodological principles and assessment indicators. The objective is not to report fabricated experimental data but to formulate a theoretically grounded methodology that can subsequently be tested in preschool settings.

Methodological principles

Goal orientation. Every digital activity begins with a clearly defined developmental or educational objective. Developmental appropriateness. The complexity of the task corresponds to children's age, language, attention, motor and cognitive abilities. Active participation. Children manipulate, choose, create, explain and solve rather than passively watch. Co-engagement. The adult or peer interaction remains part of the activity. Integration. Digital tasks

are linked to physical materials, play, conversation and real-world exploration. Creativity. Children are given opportunities to produce digital or hybrid products rather than only consume content. Safety and ethics. Teachers establish simple rules for device handling, privacy and respectful communication. Equity and inclusion. Tasks are adapted so that children with different developmental profiles can participate.

THE PROPOSED METHODOLOGICAL MODEL

The proposed model contains four consecutive stages. The stages are not rigid lessons; they form a repeating cycle that can be adapted to different activity centers.

Stage	Teacher action	Child action	Expected result
1. Motivation and orientation	Introduces a real problem or play situation; demonstrates one or two essential functions; states the learning goal.	Observes, predicts, asks questions, identifies the tool and its purpose.	Initial understanding of why the digital tool is needed.
2. Guided exploration	Provides a short task, prompts choices, supports turn-taking and corrects unsafe or ineffective actions.	Explores, selects, compares, manipulates and collaborates.	Basic operational and informational competence.
3. Creative production	Offers an open-ended challenge and minimizes unnecessary assistance.	Creates a drawing, photo story, audio narration, classification, digital model or other product.	Creative and communicative use of digital tools.
4. Reflection and transfer	Asks children to explain what they did, what they learned and how the tool helped.	Describes actions, evaluates the result, connects digital experience to real life.	Metacognitive awareness and transfer of digital literacy to new contexts.

DIGITAL TOOLS ACROSS ACTIVITY CENTERS

The methodological value of the model becomes clearer when digital tools are connected to specific centers rather than introduced as a separate “computer lesson.”

Activity center	Possible digital tools	Example methodological task
Language and communication	Audio recorder, digital storybook, projector, simple voice-recording app	Listen to a short story, sequence pictures, record a retelling, then discuss the story with peers.
Mathematics	Interactive sorting/counting application, digital camera	Count real objects, photograph groups, classify them digitally, explain the rule used.

Science and nature	Digital microscope/camera, short teacher-selected visual materials	Observe a leaf or natural object directly, magnify it digitally, compare visible features and describe findings.
Construction	Camera, digital drawing/modeling tool	Build a structure from blocks, photograph it, identify stable/unstable parts and suggest an improvement.
Art and creativity	Digital drawing, photo collage, audio narration	Create a physical artwork first, photograph it, add a digital element or narration explaining the work.
Role-play and social interaction	Camera/video, audio recorder, projector	Record a short role-play, watch it together and discuss characters, emotions and alternative endings.
Music and movement	Audio player, rhythm/recording tool	Listen to a rhythm, reproduce it with real instruments/body percussion, record and compare performances.

TEACHER'S METHODOLOGICAL ROLE

Successful digital integration depends less on the number of devices than on the teacher's ability to design purposeful experiences. The teacher performs five interconnected roles. First, as a curator, the teacher selects content that is accurate, age-appropriate, accessible and free from unnecessary distractions. Second, as a designer, the teacher embeds the tool in a meaningful task. Third, as a mediator, the teacher asks questions, models strategies and supports collaboration. Fourth, as an observer, the teacher documents children's actions and emerging competencies. Fifth, as a protector, the teacher establishes safe routines and prevents digital activities from displacing essential developmental experiences.

The teacher should avoid two opposite mistakes. The first is technological substitution: replacing real materials, conversation, movement or play with a screen. The second is technological decoration: using a projector, tablet or application simply because it looks modern, without changing or improving the learning process. A digital tool is methodologically justified when it gives the child a learning opportunity that is difficult, inefficient or less accessible without that tool—or when it meaningfully enriches an otherwise strong hands-on activity.

CRITERIA FOR SELECTING DIGITAL LEARNING RESOURCES

Before introducing a digital resource, the teacher can apply a seven-question filter: (1) What developmental goal does it serve? (2) Does the child actively think or create? (3) Is the content accurate and age-appropriate? (4) Does it encourage interaction rather than isolation? (5) Can it be connected with real objects or experiences? (6) Does it avoid unnecessary advertising, links or data collection? (7) Is there an equally good low-tech alternative that would be more appropriate for this particular goal? This filter operationalizes the evidence-

based principle that technology should be selected according to learning needs, not novelty [1,3,6].

MONITORING DIGITAL LITERACY DEVELOPMENT

Assessment at preschool level should be formative, observational and activity-based. Formal tests of technical knowledge are inappropriate for most learning situations. Instead, teachers can use a four-level observation scale: emerging, developing, functional and independent. The scale should be applied to observable behaviors across several contexts.

Indicator	Emerging	Developing	Functional/independent
Purposeful use	Uses device mainly after direct prompting.	Explains simple purpose with support.	Chooses an appropriate tool for a familiar task and explains why.
Indicator	Emerging	Developing	Functional/independent
Operational skill	Needs step-by-step physical assistance.	Performs familiar actions after demonstration.	Performs basic actions independently and safely.
Information and thinking	Responds mainly to surface features.	Compares or classifies with prompts.	Explains a choice, identifies differences and asks relevant questions.
Creation and communication	Reproduces a demonstrated action.	Creates a simple product with assistance.	Creates and explains an original digital or hybrid product.
Safety and responsibility	Needs reminders about rules.	Follows familiar rules after prompts.	Consistently follows rules and seeks adult help when unsure.

SAFETY, EQUITY AND BALANCE

Digital literacy includes responsible behavior. Preschoolers should learn simple, concrete rules: ask an adult before opening an unfamiliar resource; use devices carefully; do not share personal information; stop and ask for help when something unexpected appears; respect another child's turn; and use digital images or recordings only with adult guidance. These rules should be taught through routines, stories, role-play and modeling rather than abstract lectures.

Balance is equally important. NAEYC emphasizes that technology should not displace imaginative play, outdoor experiences, physical activity, conversation, creativity or real-world exploration [4]. Therefore, a methodological unit can follow a “digital–real–digital” sequence: digital stimulus or documentation, hands-on exploration, then digital reflection or creation. This structure reduces passive consumption and turns technology into a bridge between representation and experience.

Equity requires attention to differences in children's access, language, abilities and prior experience. UNESCO identifies access, teacher preparedness and governance as important conditions for effective educational technology [1]. In resource-constrained settings, the model can operate with one shared device, a teacher's smartphone used for documentation, an audio

recorder, a projector or offline digital materials. The methodological objective is not one device per child; it is meaningful participation and equitable learning opportunities.

DISCUSSION

The proposed model brings together three perspectives that are sometimes treated separately: digital literacy, activity-based preschool pedagogy and developmentally appropriate technology use. The first perspective clarifies what children should gradually be able to do; the second defines where learning can occur; the third defines how technology should be introduced. Their integration produces a more balanced approach than either technology-centered instruction or a complete rejection of digital tools.

The framework also responds to a central problem identified in international literature: the availability of educational applications does not automatically guarantee educational value. Hirsh-Pasek et al. argue that educational applications should support active, engaged, meaningful and socially interactive learning [6]. Consequently, the same application may be useful in one methodological situation and inappropriate in another. The decisive factor is the learning design surrounding the tool.

A second implication concerns teacher professional development. UNESCO notes that teacher preparation is a system-wide condition for effective technology use [1]. Preschool teachers therefore need more than technical training. They need competencies in evaluating digital content, designing child-centered tasks, facilitating co-engagement, documenting learning and protecting children's privacy and well-being.

A third implication concerns research. The proposed model is a methodological hypothesis that should be empirically tested. Future studies should compare activity-center groups using the model with comparable groups receiving conventional activity-center instruction, while measuring not only operational digital skills but also language, problem solving, creativity, collaboration and children's engagement. Such research should avoid interpreting increased device use as an educational success in itself.

CONCLUSION

Digital literacy in preschool education should be understood as an emerging, age-appropriate competence rather than as early technical specialization. The most productive approach is to embed digital tools in meaningful activity-center experiences where children explore, communicate, create, reflect and connect digital representations with real-world experiences.

The methodological model proposed in this article consists of four stages—motivation and orientation, guided exploration, creative production, and reflection and transfer—and can be implemented across language, mathematics, science, construction, art, role-play and music centers. Its effectiveness depends on intentional teacher mediation, high-quality content, active participation, social interaction, safety, equity and a balanced combination of digital and non-digital experiences.

The principal methodological conclusion is that the question should not be “How much technology should preschool children use?” but rather “What meaningful developmental opportunity does this digital tool create, and how does it strengthen the child's active learning?” When the answer is clear, technology can become a useful component of a child-centered preschool environment rather than a substitute for childhood experiences.

References:

1. UNESCO. (2023). Global Education Monitoring Report 2023: Technology in education—A tool on whose terms? Paris: UNESCO. <https://doi.org/10.54676/UZQV8501>.
2. Nascimbeni, F., & Vosloo, S. (2019). Digital literacy for children: Exploring definitions and frameworks. UNICEF Office of Research—Innocenti.
3. NAEYC & Fred Rogers Center for Early Learning and Children's Media. (2012). Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8. Joint Position Statement.
4. Donohue, C. (Ed.). (2015). Technology and Digital Media in the Early Years: Tools for Teaching and Learning. Routledge/NAEYC.
5. National Association for the Education of Young Children. (2020). Developmentally Appropriate Practice: Position Statement. NAEYC.
6. Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in “educational” apps: Lessons from the science of learning. *Psychological Science in the Public Interest*, 16(1), 3–34. <https://doi.org/10.1177/1529100615569721>.
7. UNESCO. (2023). Technology in education: A tool on whose terms?—Summary. Global Education Monitoring Report.
8. NAEYC. (2017). Technology and interactive media in early childhood programs: What we've learned from five years of research, policy, and practice. *Young Children*, 72(4).