DEVELOPING PRIMARY SCHOOL CHILDREN'S CREATIVE THINKING IN A DIGITAL LEARNING ENVIRONMENT

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Abstract. *This study examines the theoretical foundations and practical potential of fostering creative thinking among primary school children aged 6–10 in a digital learning environment. It synthesizes psychological and pedagogical perspectives on creativity, its principal assessment dimensions—fluency, flexibility, originality, and elaboration—and evidence from international studies. A comparative analysis of traditional and digital learning environments provides the basis for a methodological framework incorporating block-based coding, digital storytelling, and project-based play. The study also describes the design of a pedagogical experiment and the procedure for evaluating the effectiveness of the proposed framework.*

Keywords: *creative thinking, creativity, digital learning environment, primary education, primary school age, divergent thinking, block-based coding, ScratchJr, digital storytelling, project-based learning.*

One of the central challenges facing twenty-first-century education is to cultivate learners who not only reproduce established knowledge but also generate novel ideas and independently devise solutions to non-routine problems. The Law of the Republic of Uzbekistan "On Education" identifies the broad integration of information and communication technologies and the development of independent thinking as key priorities of national education policy [1]. The "Digital Uzbekistan—2030" Strategy envisages the digitalization of all levels of education and the enhancement of learners' digital literacy [2]. Similarly, the

Concept for the Development of the Public Education System until 2030 identifies creative and critical thinking as priority competencies [3].

The international significance of creative thinking was underscored by PISA 2022, which assessed the creative thinking of 15-year-old students in 64 countries and economies for the first time. Singapore achieved the highest mean score, 41 out of 60, compared with the OECD average of 33. Approximately 80% of students believed that creativity can be expressed in almost any school subject; however, only half believed that creativity can be developed [4]. These findings indicate the need for systematic intervention from the earliest stages of schooling.

Primary school age is characterized by particularly active imagination, curiosity, and play. At this stage, the pedagogically purposeful use of digital tools can help unlock children's creative potential. However, a digital environment does not automatically foster creativity; passive screen-based consumption may inhibit creative engagement. Accordingly, the **aim** of this study is to identify and substantiate effective methods for fostering creative thinking among primary school children in a digital learning environment.

J. P. Guilford made a foundational contribution to the scientific study of creativity. In his structure-of-intellect model, he distinguished convergent thinking, which is directed toward a single correct answer, from divergent thinking, which generates multiple solutions to a problem; he regarded the latter as the basis of creativity [5]. E. P. Torrance extended this approach by identifying four principal dimensions of creative thinking: **fluency** (the number of ideas), **flexibility** (the diversity of idea categories), **originality** (novelty), and **elaboration** (the degree of detail) [6]. The Torrance Tests remain widely used to assess creativity among primary school pupils.

L. S. Vygotsky's analysis of imagination and creativity in childhood emphasized that creative activity develops in relation to the richness of a child's experience. From this perspective, creativity is not the preserve of a gifted minority but a natural capacity of every child [7]. Contemporary psychology commonly defines creativity according to two complementary criteria: **originality** and **effectiveness** (usefulness or appropriateness) [8]. Kaufman and

Beghetto's Four-C model further identifies "mini-c" creativity, whereby a child's personally novel understanding or solution constitutes a creative act [9]. This perspective is particularly relevant to primary education.

Based on a longitudinal analysis of Torrance Test results, K. H. Kim found that children's creative-thinking scores had declined since the 1990s, with the decrease being particularly pronounced among preschool and primary school children [10]. This trend underscores the need for targeted pedagogical approaches to fostering creativity.

The influence of digital technologies on children's creativity is theoretically grounded in S. Papert's constructionism. Papert argued that deep learning occurs when children use computers not as "teaching machines" but as tools for constructing and expressing their own ideas [11]. M. Resnick extended this perspective through the 4P model of creative learning: **Projects**, **Passion**, **Peers**, and **Play** [12]. Research by M. U. Bers and colleagues further suggests that educational robotics and block-based programming environments such as ScratchJr can foster both computational thinking and creative expression in children aged 5–7 [13; 14; 15].

An OECD project conducted across 11 countries demonstrated that the systematic integration of creativity and critical thinking into school curricula requires explicit pedagogical rubrics and concrete lesson exemplars [16]. The effective integration of digital tools also depends on teachers' ability to combine technological, pedagogical, and content knowledge, as conceptualized in the TPACK framework [17].

The study employed the following methods: **theoretical analysis** of relevant pedagogical and psychological literature and regulatory documents; **pedagogical observation** of primary school lessons; **interviews with teachers and teacher questionnaires**; **diagnostic assessment** of pupils' creativity using the figural form of the Torrance Tests of Creative Thinking [6]; a **pedagogical experiment** involving experimental and control groups; and **statistical analysis** using Student's t-test.

The intervention was conducted during the 2024–2025 academic year at General Secondary School No. 200 in Tashkent and involved 58 third-grade pupils. The experimental group comprised 30 pupils who received instruction based on the digital methodology described below, whereas the control group comprised 28 pupils who received conventional instruction. Creative-thinking indicators were measured under identical conditions before and after the intervention.

The proposed methodological framework comprises three stages: (1) **exploration**, during which pupils experiment freely in a digital environment—for example, by testing a character's movements in ScratchJr; (2) **creation**, during which pupils independently or collaboratively produce a small-scale project, such as an animated story, digital drawing, or interactive game; and (3) **presentation and reflection**, during which projects are shared with classmates, discussed, and refined. The framework draws on Resnick's "creative learning spiral": imagine, create, play, share, and reflect [12].

The theoretical analysis and classroom observations enabled a comparison of the affordances of traditional and digital learning environments for fostering creative thinking (Table 1).

Table 1

Affordances of Traditional and Digital Learning Environments for Fostering Creative Thinking

Criterion	Traditional learning environment	Digital learning environment
Learner's role	Primarily listener and task performer	Active investigator and product creator
Expression of ideas	Speech, paper, and drawing	Animation, audio, video, and interactive projects
Approach to error	Error as a reason for a lower grade	Error as a rapidly correctable stage of

Criterion	Traditional learning environment	Digital learning environment
		experimentation
Divergent thinking	Often oriented toward one correct answer	Opportunity to test multiple solutions to one problem
Collaboration	Limited to the classroom	Pair work, group work, online projects, and sharing
Individualization	A common pace and uniform task	Adaptation to the child's pace and interests
Main risk	Uniformity and reduced motivation	Passive screen consumption and distraction

As Table 1 indicates, the principal advantage of the digital environment lies in its potential to transform children from consumers of ready-made content into creators. However, this potential is realized only through appropriately designed, teacher-guided activities. Table 2 summarizes digital tools suitable for primary education and the dimensions of creativity they are intended to foster.

Table 2

Digital Tools and the Dimensions of Creative Thinking They Foster

Tool/method	Grade	Learning activity	Primary dimension
ScratchJr (block-based coding)	1–2	Create an animated story with characters	Originality, elaboration
Scratch	3–4	Design an interactive game or project	Flexibility, elaboration
Digital storytelling	1–4	Continue a story using images and audio	Fluency, originality

Tool/method	Grade	Learning activity	Primary dimension
Online board (brainstorming)	2–4	Generate multiple ideas for one problem	Fluency, flexibility
Digital drawing editor	1–4	Transform an incomplete shape into a drawing	Originality, elaboration
Educational robotics	3–4	Build a model that solves a problem	Flexibility, effectiveness

To evaluate the intervention, the mean scores for the four Torrance dimensions will be compared between the experimental and control groups at pre-test and post-test (Table 3).

Table 3

Changes in Creative-Thinking Indicators (Mean Scores)

Dimension	EG (pre-test)	EG (post-test)	CG (pre-test)	CG (post-test)
Fluency	[__]	[__]	[__]	[__]
Flexibility	[__]	[__]	[__]	[__]
Originality	[__]	[__]	[__]	[__]
Elaboration	[__]	[__]	[__]	[__]

Note: EG = experimental group; CG = control group. The table is to be completed using the author's empirical data; the statistical significance of between-group differences will be tested using Student's t-test ($p < 0.05$).

The theoretical and practice-based findings indicate that the effects of a digital learning environment on creative thinking depend less on the technology itself than on the pedagogical approach through which it is employed. As Papert and Resnick argue, creative thinking is activated when the computer functions not as a device that provides answers but as a medium for construction [11; 12].

Classroom observations were consistent with this proposition: although ready-made educational games generated interest, they had a limited effect on the quantity and originality of pupils' ideas, whereas creating their own projects stimulated substantially greater ideational activity.

Several considerations are important. First, screen time for primary school children should be regulated, and digital activities should be balanced with offline creative practices such as craftwork, drawing, and play. Second, from the "mini-c" perspective [9], children's products should be evaluated in relation to their developmental level rather than against adult standards; solutions that differ meaningfully from those of their classmates should be encouraged. Third, the PISA 2022 finding that only half of students believe creativity can be developed [4] highlights the importance of cultivating the belief that "I can create" from the primary grades onward.

The effectiveness of the methodology also depends directly on teachers' digital-pedagogical competence. From a TPACK perspective [17], primary school teachers must know not only how to operate digital tools but also how to align them with specific learning objectives and dimensions of creativity. Professional development programmes should therefore include practice-oriented modules on creative pedagogy and block-based programming [16].

The study yields the following conclusions:

1. Creative thinking is a multidimensional capacity grounded in divergent thinking and can be assessed in terms of fluency, flexibility, originality, and elaboration. Primary school age constitutes a particularly sensitive period for its development.

2. A digital learning environment can transform learners from consumers of content into creators, normalize error as an integral part of experimentation, and support multimodal expression. However, these affordances are realized only when learning activities are pedagogically structured.

3. A framework organized around exploration, creation, presentation, and reflection—and incorporating ScratchJr, digital storytelling, and online

brainstorming—provides a viable approach to fostering creative thinking in primary education.

Recommendations. Project-based tasks involving block-based programming and digital storytelling should be integrated into the primary school curriculum, particularly in technology, informatics, first-language education, and reading literacy. Teachers should be provided with creativity assessment rubrics and methodological guidance for maintaining an appropriate balance between digital and offline creative activities.

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