Vol.3 No. 02 (2026) November Online Conference

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Website:

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DEVELOPING INTELLECTUAL, CREATIVE AND SOCIAL-EMOTIONAL COMPETENCIES OF PRESCHOOL CHILDREN THROUGH STEAM TECHNOLOGIES, DIGITAL LEARNING RESOURCES AND INNOVATIVE PEDAGOGICAL METHODS

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Abstract. This article examines how STEAM technologies, digital learning resources and innovative pedagogical methods can be combined into a coherent system for developing the intellectual, creative and social-emotional competencies of children in preschool education. Drawing on constructivist and sociocultural theories of learning, the study analyses current research on play-based STEAM activities, early coding and robotics, educational applications and interactive methods. On this basis, an integrated pedagogical model is proposed in which each component of STEAM is linked to specific digital tools, teaching methods and expected developmental outcomes. The article argues that technology improves early learning only when it is embedded in meaningful play, guided by a competent educator and balanced with hands-on and social experience. Practical recommendations are formulated for preschool teachers, methodologists and administrators, with particular reference to the State Curriculum "Ilk qadam" of the Republic of Uzbekistan.

Keywords: preschool education, STEAM, digital learning resources, innovative pedagogical methods, intellectual development, creativity, social-emotional learning, competency-based approach.

The early years of life are widely recognised as the period in which the foundations of thinking, imagination, communication and self-regulation are laid. What a child experiences between the ages of three and seven shapes not only school readiness but also the attitudes towards learning that accompany a person throughout life. For this reason, many countries now treat preschool education as a strategic investment rather than a simple form of childcare, and they expect kindergartens to do more than prepare children for reading and counting.

At the same time, today's children are growing up in an environment saturated with digital devices, and the skills they will need as adults are changing rapidly. Employers and researchers increasingly emphasise critical thinking, creativity, collaboration and the ability to solve unfamiliar problems. These so-called competencies of the twenty-first century cannot be transmitted through memorisation; they emerge through active exploration, experimentation and interaction with peers and adults. This creates a demand for pedagogical approaches that connect knowledge from different fields and place the child in the position of a researcher and creator.

STEAM education, which integrates science, technology, engineering, the arts and mathematics, is one of the most promising responses to this demand. Unlike traditional subject-based instruction, it organises learning around real problems and projects in which children observe, ask questions, build, test and present their ideas. When STEAM activities are supported by carefully selected digital resources and

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implemented through interactive methods, they can stimulate several areas of development at once: cognitive processes, creative expression and the emotional and social skills needed to work in a team.

In the Republic of Uzbekistan, the reform of preschool education has become a state priority. The Law “On Preschool Education and Upbringing” adopted in 2019 and the State Curriculum “Ilk qadam” introduced a competency-based framework that focuses on the holistic development of the child. However, kindergartens still face practical questions: how exactly STEAM should be organised for young children, which digital tools are appropriate for this age, and how innovative methods can be used without overloading children or replacing play with screens.

The purpose of this article is to analyse the pedagogical potential of STEAM technologies, digital learning resources and innovative methods and to propose an integrated model for developing the intellectual, creative and social-emotional competencies of preschool children. To achieve this purpose, the study sets the following objectives: to clarify the theoretical foundations of the problem; to identify the role of each component of the model; to describe the conditions for its effective implementation; and to formulate recommendations for practitioners.

The conceptual roots of STEAM in early childhood can be traced to constructivist theory. J. Piaget showed that children build knowledge through their own actions on objects, and S. Papert later developed this idea into constructionism, arguing that learning is especially powerful when children create tangible artefacts that they can share and discuss. From this perspective, building a bridge out of blocks, programming a simple robot or mixing colours to obtain a new shade are not merely games but genuine acts of knowledge construction.

L. S. Vygotsky’s sociocultural theory adds an equally important dimension. According to Vygotsky, higher mental functions first appear in joint activity with adults and peers and only later become the child’s own. The concept of the zone of proximal development explains why the educator’s role in STEAM is not to give ready answers but to provide timely support, pose questions and gradually transfer responsibility to the child. Collaborative projects also create natural situations in which children learn to negotiate, listen to others and manage emotions.

The idea of adding the arts to the STEM framework is associated with G. Yakman, who proposed STEAM as a model of integrative education in which the arts serve as a bridge between technical disciplines and human experience. For preschool children this integration is particularly natural, because drawing, music, movement and storytelling are their primary means of expressing ideas. M. Resnick describes this kind of learning through the “four P’s” – projects, passion, peers and play – and stresses that creativity develops when children design and experiment in a playful atmosphere.

Research on early coding and robotics offers empirical support for these ideas. M. U. Bers and her colleagues have demonstrated that, with developmentally appropriate tools such as programmable robots without screens and visual programming environments, children aged four to seven can master basic concepts of sequencing, cause and effect and debugging. Importantly, these studies describe coding not only as a technical skill but also as a new form of literacy and a means of self-expression.

The social-emotional dimension of development is grounded in the framework of social and emotional learning, which includes self-awareness, self-management,

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social awareness, relationship skills and responsible decision-making. A large meta-analysis by J. A. Durlak and co-authors found that well-implemented social-emotional programmes improve not only behaviour and well-being but also academic performance. This finding supports the view that intellectual and emotional development should not be separated in educational practice.

Finally, research on digital resources warns against uncritical use of technology. K. Hirsh-Pasek and her colleagues argue that educational applications are beneficial only when they promote active, engaged, meaningful and socially interactive learning. A device that merely entertains or encourages passive viewing adds little to development. Consequently, the value of a digital resource depends less on the technology itself than on the pedagogical design and the way the educator integrates it into children's activities.

The study is theoretical and analytical in nature. It relies on the analysis and synthesis of scientific literature on early childhood education, STEAM, educational technology and social-emotional learning, as well as on the review of regulatory documents governing preschool education in Uzbekistan. Comparative analysis was used to identify common features of successful international practices, while the method of pedagogical modelling made it possible to bring the identified principles together into a single structured model. The model was further refined through the generalisation of practical experience of preschool educators described in methodological publications.

The proposed model rests on the assumption that STEAM content, digital resources and innovative methods are not separate tools but mutually reinforcing components of one learning environment. STEAM defines what children explore, digital resources expand how they can explore it, and innovative methods determine the way the educator organises interaction. The outcome of their joint action is the development of three interconnected groups of competencies.

Intellectual competencies include observation, comparison, classification, logical and algorithmic thinking, spatial reasoning and the ability to formulate and test simple hypotheses. Creative competencies cover fluency and originality of ideas, imagination, the ability to transform materials and to express oneself through different artistic means. Social-emotional competencies embrace recognising and naming emotions, self-control, empathy, cooperation, communication and the confidence to try again after a mistake.

Table 1 summarises how each STEAM component can be linked to digital resources, methods and the competencies it primarily develops.

Table 1. Components of the integrated STEAM model in preschool education

STEAM component	Digital resources and tools	Innovative methods	Main competencies developed
Science	Digital microscopes, interactive whiteboards, nature observation apps, short	Children's experimentation, inquiry-based learning, "question of the day"	Observation, cause-and-effect reasoning, curiosity

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	educational videos		
Technology	Screen-free programmable robots (e.g. Bee-Bot), tablets with visual coding apps (e.g. ScratchJr)	Unplugged coding games, learning stations, guided discovery	Algorithmic thinking, sequencing, digital literacy
Engineering	LEGO Education sets, construction kits, simple 3D design applications	Design thinking, project-based learning, "build – test – improve" cycle	Problem solving, spatial reasoning, persistence
Arts	Digital drawing and animation apps, music and sound-recording tools, storytelling software	Creative workshops, digital storytelling, role play and dramatisation	Imagination, originality, emotional expression
Mathematics	Interactive counting and pattern games, augmented reality cards, logic puzzles	Game-based learning, math trails, cooperative problem tasks	Number sense, logic, classification and measurement
Cross-cutting (social-emotional)	Emotion recognition cards and apps, digital portfolios, photo and video documentation	Group projects, "circle time" reflection, peer teaching, cooperative learning	Cooperation, empathy, self-regulation, communication

The model functions in three stages. At the motivational stage, the educator introduces a problem situation that is close to children's experience: for example, a toy animal needs a house that will not be blown away by the wind, or a robot must find its way to a "lost" friend. At the exploratory stage, children search for solutions individually and in small groups, using natural materials, construction sets and digital tools. At the reflective stage, they present their products, explain what worked and what did not, and discuss their feelings during the activity. Such a cycle ensures that the use of technology always serves a meaningful purpose.

Among innovative methods, project-based learning occupies a central place because it allows a single theme to be studied over several days or weeks from different angles. Design thinking teaches children that the first attempt is rarely perfect and that mistakes are a normal part of creating something new. Inquiry-based learning develops the habit of asking questions, while game-based learning and role

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play keep motivation high and provide a safe space for practising social roles. Digital storytelling, in which children create short animated or illustrated stories, combines language development with artistic and technological skills.

The analysis shows that the developmental effect of STEAM in preschool settings depends on several conditions. The first condition is the priority of play. Young children learn best when activities are voluntary, enjoyable and allow freedom of choice. STEAM tasks that turn into rigid instructions lose their value, no matter how advanced the equipment is. Therefore, the educator should design open-ended tasks with several possible solutions and leave room for children's own initiative.

The second condition concerns the balance between digital and physical experience. Screen time for young children should be limited, purposeful and accompanied by adult interaction. Screen-free robots, construction kits and unplugged coding activities make it possible to develop algorithmic thinking with minimal use of screens, while tablets and interactive whiteboards can be reserved for tasks where they add real value, such as observing processes invisible to the naked eye or documenting children's work.

The third condition is the professional competence of the educator. A teacher who is unsure about technology tends either to avoid it or to use it in a passive way. Consequently, continuous professional development should cover not only technical skills but also the methodology of guiding inquiry, asking open questions and observing children's progress. Professional learning communities and exchange of experience between kindergartens can play an important role here.

The fourth condition relates to the learning environment and cooperation with families. STEAM centres or corners equipped with natural materials, simple tools, construction kits and a limited number of digital devices encourage children to experiment independently. Involving parents in joint projects and informing them about the purposes of digital activities helps extend learning into the home and builds a shared understanding of responsible technology use.

It is also necessary to acknowledge the limitations and risks of the approach. Unequal access to equipment between urban and rural kindergartens may increase educational inequality; therefore, low-cost and unplugged STEAM solutions deserve special attention. In addition, the assessment of creative and social-emotional competencies remains a challenge. Pedagogical observation, digital portfolios and the documentation of children's projects appear to be more appropriate for this age than formal testing, as they reflect the process of development rather than a single result.

The study leads to the conclusion that STEAM technologies, digital learning resources and innovative pedagogical methods have the greatest impact on preschool children when they are applied as an integrated system rather than as isolated innovations. STEAM provides interdisciplinary content based on real problems, digital resources broaden opportunities for exploration and expression, and interactive methods create conditions for cooperation, reflection and emotional growth. Together they contribute to the simultaneous development of intellectual, creative and social-emotional competencies.

For practical implementation, it is recommended to include STEAM projects in the thematic planning of kindergartens in line with the State Curriculum "Ilk qadam"; to equip groups with developmentally appropriate and, where possible, screen-free tools; to organise systematic professional development for educators; and to use

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observation and portfolios to monitor children's progress. Further research should focus on empirical evaluation of the proposed model in Uzbek kindergartens and on the development of valid instruments for assessing creativity and social-emotional skills in early childhood.

References

1. Bers, M. U. (2018). Coding as a playground: Programming and computational thinking in the early childhood classroom. New York: Routledge.
2. Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. Child Development, 82(1), 405–432.
3. 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.
4. Law of the Republic of Uzbekistan "On Preschool Education and Upbringing" No. ZRU-595 of 16 December 2019.
5. OECD. (2021). Starting strong VI: Supporting meaningful interactions in early childhood education and care. Paris: OECD Publishing.
6. Papert, S. (1980). Mindstorms: Children, computers, and powerful ideas. New York: Basic Books.
7. Resnick, M. (2017). Lifelong kindergarten: Cultivating creativity through projects, passion, peers, and play. Cambridge, MA: MIT Press.