

How to Develop 21st Century Skills in Students: The Role of LEGO® Education

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“Every skill you acquire doubles your odds of success.” –Scott Adams

THE concept of “21st century skills” emerged in response to the challenges of the modern era. The Partnership for 21st Century Skills (P21) was a pioneering force in this movement and developed the Framework for 21st Century Learning in the early 2000s (Shi et al., 2016). In 2012, the U.S. National Research Council issued a report titled *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*, which marked a new direction for educational reform and development in the U.S. and provided valuable insights for nations worldwide. The report identified three domains of competence that comprise 21st century skills: cognitive, intrapersonal, and interpersonal. Each domain consists of several clusters of relevant competencies. The cognitive domain includes cognitive processes and strategies, knowledge, and creativity. The intrapersonal domain encompasses intellectual openness, work ethic/conscientiousness, and positive core self-evaluation. The interpersonal domain is divided into two clusters: teamwork and collaboration, and leadership (National Research Council, 2012). Developing these skills is not only crucial for personal growth and achievement, but also essential for the progress of society as a whole. Therefore, individuals and educational institutions should prioritize the cultivation of 21st century skills in today’s rapidly evolving social and economic environment.

P21 has proposed comprehensive support systems to promote 21st century skills education and ensure student mastery of these skills. These support systems encompass several key elements, including 21st century standards, assessments, curriculum and instruction, teacher professional development, and learning environments. (i) 21st century standards focus on 21st century skills, content knowledge and expertise, building understanding across key subjects and interdisciplinary themes, and promoting deep understanding rather than superficial knowledge. They also emphasize the value of engaging students with real-world data, tools, and experts they will encounter in learning, in their

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future careers, and in their everyday lives. (ii) The evaluation system for 21st century skills supports a balance of assessments, including high-quality standardized testing, as well as effective formative and summative classroom assessments. The system emphasizes providing useful feedback on student performance that is integrated into everyday learning. It also requires a balance of technology-enhanced, formative, and summative assessments that measure student mastery of 21st century skills. In addition, the evaluation system enables the development of portfolios of student work that demonstrate mastery of 21st century skills to educators and prospective employers. This approach encourages the use of a balanced portfolio of measures to assess the effectiveness of the educational system in reaching high levels of student competency in 21st century skills. (iii) 21st century curriculum and instruction are intended to teach 21st century skills in a discrete manner within the context of key subjects and interdisciplinary themes. They also focus on providing opportunities for applying these skills across different areas and adopting a competency-based approach to learning. Innovative learning methods that integrate supportive technologies, inquiry- and problem-based approaches, and higher order thinking skills are enabled to promote effective learning. Additionally, the integration of community resources beyond school walls is encouraged to create a more holistic learning environment. (iv) Effective teacher professional development programs highlight ways in which teachers can integrate 21st century skills, tools, and teaching strategies into their classroom practice, while balancing direct instruction with project-oriented teaching methods. They also emphasize how a deeper understanding of subject matter can enhance problem-solving, critical thinking, and other 21st century skills. Professional development programs enable the creation of 21st century professional learning communities for teachers, where they can model the kinds of classroom learning that best promote 21st century skills for students. Furthermore, these programs cultivate teachers' ability to identify students' particular learning styles, intelligences, strengths, and weaknesses. (v) 21st century learning environments aim to create learning practices, human support, and physical environments that will facilitate the teaching and learning of 21st century skill outcomes. These environments support professional learning communities that enable educators to collaborate, share best practices, and integrate 21st century skills into classroom practice. They allow students to learn in relevant, real-world 21st century contexts and provide equitable access to quality learning tools, technologies, and resources. Moreover, they support expanded community and international involvement in learning, both face-to-face and online (Partnership for 21st Century Skills, 2019).

Lego is a classic line of toy products, originating from the Danish words LEG and GODT, meaning "playing well". While providing entertainment and fun, it also promotes the development of 21st century skills such as creativity, critical thinking, collaboration and communication in children. With 90 years of experience in toy manufacturing, game development, and game-assisted education, the LEGO® Group is a leader in this field. LEGO® toys and LEGO® education are its main business components, with the latter being established in 1980. Over the last 30 years, LEGO® Education has developed numerous sets of educational tools for children, adolescents, and adults across subjects like science, technology, mathematics, and sociology. The LEGO® Education product range can be used in both classroom teaching and extracurricular activities and skills training (Wang & Wang, 2017). Moreover, LEGO®'s Education Department has partnered with governmental organizations and world-famous educational institutions to promote and apply LEGO® education in basic education across various countries like China, the United States, France, Peru, Russia, Brazil, and South Africa (Liu, 2016).

The Effect on Gifted Students' 21st-Century Skills of Supporting Science Teaching with LEGO® Education® BrickQ Motion Essential and Student Opinions on this Instruction in this issue was a study that investigated the impact of the Lego Education BrickQ Motion Essential Set on the 21st century skills of gifted students in the teaching of Force and Motion. It used a mixed research design that incorporated both quantitative and qualitative analysis. The research findings showed that the Lego Education training program was

effective in enhancing the 21st century skills of gifted students and also received positive feedback from them. Therefore, this study recommended that Lego Education should be applied in the training of gifted students at different grade levels (Babaoğlu & Güven Yıldırım, 2023).

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