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Curricular Promises for a Scientific Community of Alpha Generation

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Abstract

Education not only empowers individuals to contribute meaningfully to their communities and economies but also serves as a driving force in addressing the challenges of the 21st century. The term 21st Century Skills is defined as a comprehensive set of knowledge, skills, work habits, and character traits widely regarded as critical for success in today's world by educators, school reformers, college professors, employers, and other stakeholders, particularly in collegiate programmes and contemporary careers and workplaces. (The Glossary of Education Reform, 2016). Science Teacher Text, SCERT (Kerala) (2019) recommends various methods for the efficient facilitation of science education. A review of literature in the field was carried out by the authors and the conclusions and recommendations are presented. When we prepare a curriculum map, certain gaps could be identified with respect to development of the demanded skills at the secondary level. The gap is to be filled with adequate actions. For this, it is imperative that each and every school in Kerala undertakes the work of the government initiative Atal Thinking Labs and Innovation clubs. Participation in Citizen Science Projects also helps to foster such skills in students effectively.

Keywords: 21st century skills, learning skills, life skills, literacy skills, curricular promises in science education.

Introduction

“Education is the most powerful weapon you can use to change the world” (Mandela, 1994). It is through education that individuals acquire the knowledge, skills and critical thinking abilities needed to adapt and thrive in a changing global landscape. Education not only empowers individuals to contribute meaningfully to their communities and economies but also serves as a driving force in addressing the challenges of the 21st century. These challenges encompass advancements, scientific discoveries and social and environmental issues.

The rapidly changing environment of technology, communication, and social demands in the twenty-first century demands the development of a set of essential skills that individuals need to master in order to flourish in this era. The term 21st Century Skills refers to a comprehensive set of knowledge, skills, work habits, and character traits widely regarded by educators, school reformers, college professors, employers, and other stakeholders as essential for success in today's world, particularly in collegiate programmes and contemporary careers and workplaces (The Glossary of Education Reform, 2016). These are also referred to as transversal competencies or future-ready skills. They encompass a range of cognitive, social, and emotional skills that go beyond conventional academic knowledge and help individuals adapt to the fast-paced, technologically-driven nature of today's world. In contrast to conventional educational knowledge, the introduction of 21st century skills underscores the need for a more comprehensive approach to learning. At this juncture, educators and policymakers must ensure suitable environments and opportunities in order to provide individuals with the skills they need to navigate a complex and dynamic environment.

What are the 21st Century Skills?

The 21st century skills are categorized as Literacy skills, Life skills, and Learning skills—also known as the 3L's (Framework for 21st Century Learning, 2019). This categorization offers an in-depth structure for recognizing the competences needed in globalized society. The acquisition of new knowledge necessitates a set of skills known as Learning Skills, sometimes called as the 4C's. These encompass Critical Thinking and Problem Solving, Creativity and Innovation, Collaboration, and Communication highlighting the capacity to acquire, process, and apply knowledge effectively. Life skills (FLIPS) encompass Flexibility and Adaptability, Leadership and Responsibility, Initiative and Self-Direction, Productivity and Accountability, and Social and Cross-Cultural Interaction emphasizing the personal and interpersonal competencies essential for navigating the complexities of modern life and successful day-to-day living. Literacy skills (IMT) are those that aid in the creation and acquisition of new knowledge via reading, the media, and technological tools. These include Information Literacy, Media Literacy, and Technology Literacy, underscoring the significance of understanding, evaluating, and engaging with the vast array of information and media sources available in the digital age. This classification not only assists educators and policymakers in conceptualizing the breadth of skills required for success, but it also emphasizes their interdependence, as proficiency in one category frequently supports and enhances the development of skills in the other two, making it an essential basis for holistic personal and professional growth in the twenty-first century.

How to Integrate the skills?

Three curricular strategies to promote the skills in an integrated manner are:

Science Entrepreneurship Programmes:

Entrepreneurship programmes in Science enable students to foster literacy skill such as technology literacy and life skills such as productivity and accountability, leadership and responsibility, and initiative and self-direction. For example, all students participate in a Green-Chemistry programme organized by their school, as part of which, they develop new eco-friendly cleaning products and explore their marketing potential. Through such an entrepreneurship programme, students are empowered to take on leadership responsibilities and identify market opportunities for project success. As they learn to manage resources efficiently, there is an increase in their productivity and accountability. In addition, technology is leveraged for product development and marketing opportunities. They become information literate by learning exactly what the science behind each product is. Moreover, in such entrepreneurship programmes, students' social and cross-cultural interaction skills are enhanced by exchanging ideas with mentors, industry experts, and consumers.

Citizen Science Projects:

When there is an active participation of citizens in research works, it will be more beneficial to the society as it helps to disseminate the result to the society. This is where the importance of citizen science programmes comes into play. Citizen science is defined as “scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions” (Oxford English Dictionary, n.d.) and is applied to real-world situations, incorporating various levels of public participation in research. Connecting citizen science to schools will be of great effect in which, students can enhance a wide range of Life skills, such as flexibility and adaptability, leadership and responsibility, initiative and self-direction, and social and cross-cultural interaction.

When students participate in a citizen science project related to science, such as water quality examination in nearby water sources, they plan and execute experiments, take duties as leaders within their teams, and collaborate with different types of participants, fostering social and cross-cultural interaction. While Information Literacy is essential to such efforts, Media Literacy and Technology Literacy are also necessary since they make use of a range of media and technology to connect with a broader community and share their results.

Science Outreach Programmes:

A wide range of life skills and literacy skills can be improved by Science Outreach programmes. When students arrange an "Awareness Programme on Chemical Poisons in Everyday Life," for example, they learn flexibility and adaptation skill by customizing their presentations to different audiences. They grasp leadership and responsibility skills as they plan and execute this educational programme. Furthermore, students exhibit initiative and self-direction skill by generating useful content and hands-on activities to engage participants on their own. They also increase productivity and accountability skills by assuring success of the programme, and they engage in necessary social and cross-cultural interactions by connecting with people from various backgrounds. Furthermore, Science Outreach promotes information literacy by having students perform in-depth studies in order to deliver accurate and accessible information, media literacy by utilizing visual aids, and technological literacy by adding multimedia tools into their presentations.

Strategies for Fostering 21st Century Skills: A Few Examples

We are going through a period where most of the developed and developing countries focus on strategies to develop 21st century skills. In some studies conducted in Turkey, science activities

like Scientists compete, satellite design, planets and artificial satellites (Güven and Alpaslan, 2022), LEGO Educator BricQ Motion Essential training set for gifted students (Babaoglu and Yildirim, 2023) and science activities, creative thinking techniques and problem solving techniques (Cetingöz, 2023) have been found to help foster 21st century skills in students. Similarly, according to an Indonesian study, Online-based inquiry learning model in Physics (Novitra et al., 2021) and a Mexican study, Thinking Critically (Fernandez, 2021) have been found to promote these skills effectively.

Government of India Initiatives for Nurturing 21st Century Skills

The government of India has recognized the importance of developing 21st century skills to prepare its citizens for the challenges of the modern world. Several initiatives have been developed to help the Indian populace acquire these essential skills. The National Skill Development Mission, launched in 2015, is a significant effort aimed at offering skill training to over 400 million individuals by 2022. The endeavour spans various areas, including vocational training, entrepreneurship, and information technology, with a focus on critical thinking and problem solving, as well as communication skills. Likewise, the Atal Innovation Mission (AIM), set up as part of the government's Make in India campaign, encourages young Indians to take part in innovation and entrepreneurship. The AIM involves the formation of Atal Tinkering Labs in schools; with the primary goal of encouraging students develop innovative solutions to real-world problems.

The Rashtriya Avishkar Abhiyan (RAA) is an important initiative in the primary and secondary levels of education. RAA, which was founded in 2015, aims to nurture scientific temperament and innovation among students by enhancing their practical skills and scientific thinking. Through activities such as science exhibitions, science clubs, and science fairs, it

emphasizes hands-on experimentation, problem-solving, and critical thinking, eventually preparing students with essential 21st century skills. Moving on to higher education, the National Institutional Ranking Framework (NIRF) incorporates metrics that rank institutions based on their research output and innovation, highlighting the significance of developing students' 21st century skills. Additionally, under the "Atmanirbhar Bharat" (Self-Reliant India) initiative, higher education institutions are encouraged to focus on research and innovation, thereby fostering a culture of creativity and self-directed learning.

Innovation Hub is a platform to nurture innovative ideas and develop an inquisitive outlook among youth implemented by National Council of Science Museums (NCSM) under the Scheme for Promoting Innovation, Creativity and Engagement in Science (SPICES) approved by Planning Commission and Ministry of Culture, Government of India. The components consist of Resource centre, Idea lab, Tod-fod-Jod, Kabaad-se-jugaad and Idea box. With the defined aim of inculcating the culture of creativity and innovation in students from an early age itself, innovation clubs are being established in schools as part of the SPICES. The primary aim of the School Innovation Club is to generate awareness, educate, develop, and instill a culture of innovation in students, allowing them to produce new ideas and become more inventive. It engages children in innovative and creative activities while providing opportunities for hands-on activities. SPICES implies that the formation of innovation clubs in school is possible when interested schools in the region collaborate with existing innovation hubs.

Kerala School Science Curriculum and 21st Century Skills

In order to facilitate the acquisition of 21st century skills, science education in schools should be up-to-date (Science Teacher Text, Kerala SCERT, 2019). In an era dominated by information technology, significant transformations are occurring in people's life goals and

lifestyles. Consequently, it becomes paramount to nurture not only the students' learning skills but also their life skills and literacy skills. Science Teacher Text, SCERT (Kerala) (2019) recommends various methods for the efficient facilitation of science education, including student-centred classroom teaching and learning, the utilization of EDUBUNDU-ICT possibilities, usage of well-equipped science laboratories, access to comprehensive science libraries, active participation in science clubs, and the organization of science fairs, science exhibitions, and study tours/field trips. A review of literature in the field was carried out by the authors and the conclusions and recommendations are presented. The figures provide an overview of the 21st century skills that students can acquire through the proper implementation of such programmes and learning environments.

Compared to learning skills, opportunities for students to improve life skills and literacy skills are fairly limited in high school science education. Science fairs and science exhibitions are excellent to improve such skills. The fact is that only a small percentage of students, that is selected students, can participate in such programmes. The canvas should be made available to all to play at their own potential levels.

Figure 1

Futuristic Skills and it's Component Skills

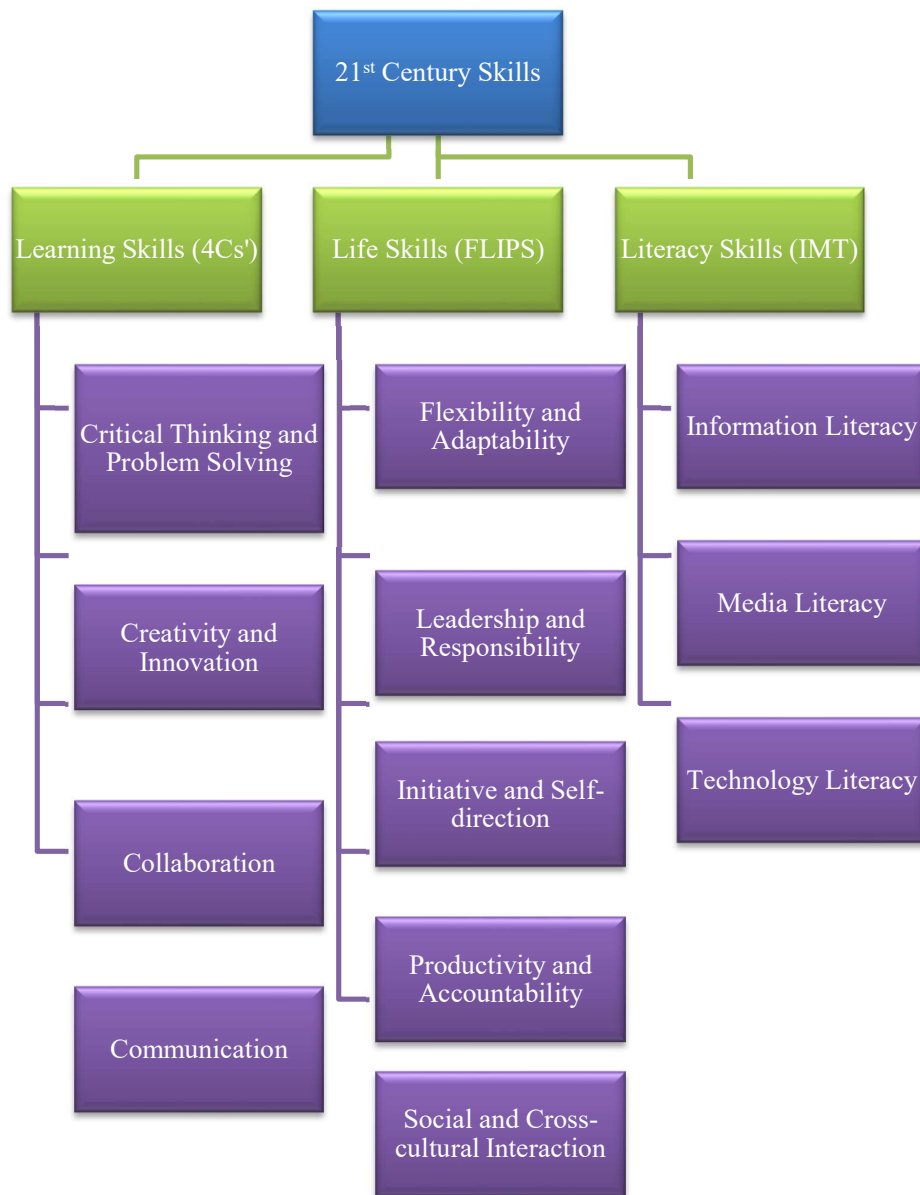


Figure 2

The Integration of Learning Environment and Programmes with Learning Skills

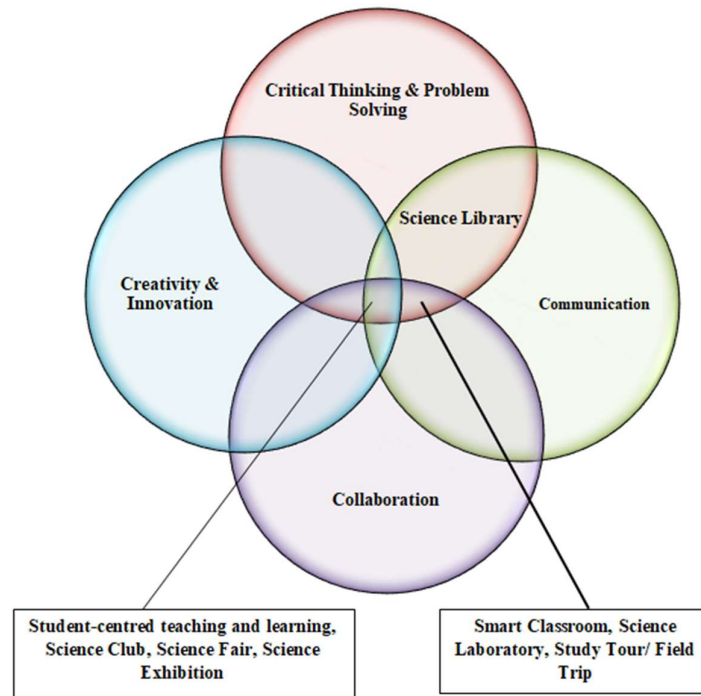


Figure 3

The Integration of Learning Environment and Programmes with Life Skills

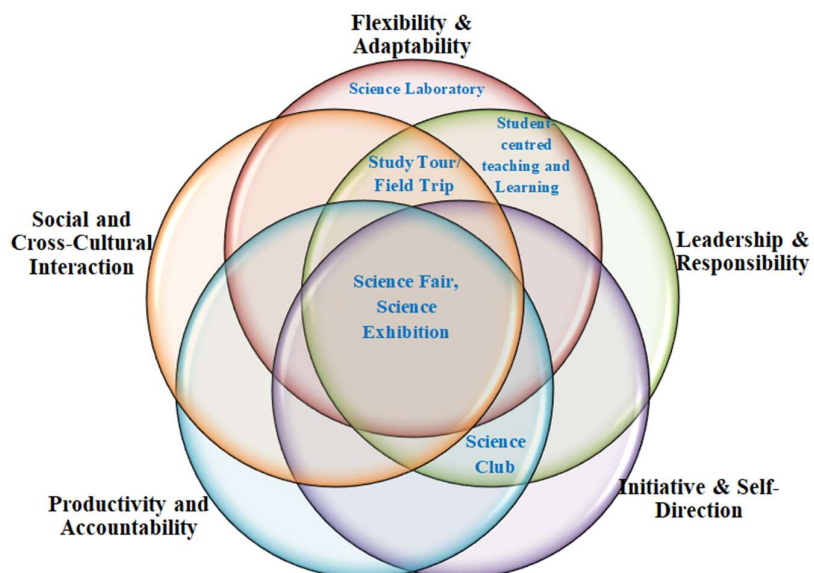
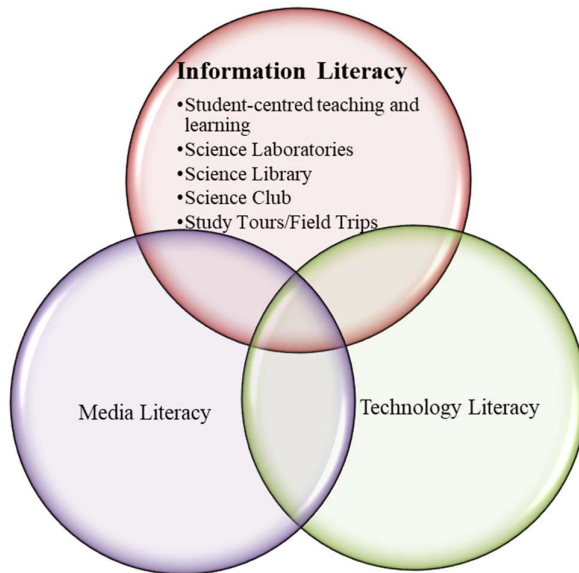


Figure 4

The Integration of Learning Environment and Programmes with Literacy Skills



Recommendations

When we prepare a curriculum map, certain gaps could be identified with respect to development of the demanded skills at the secondary level. The Kerala Curriculum for School Education provides instruction in textbooks and teacher texts on a range of strategies and activities that are almost adequate for students to acquire 21st century skills. However, anomalies in their implementation create obstacles for students to acquire such skills fruitfully. The gap is to be filled with adequate actions.

In order to acquire 21st century skills effectively, various activities with appropriate weightage is given to each component skill. For this, it is imperative that each and every school in Kerala undertakes the work of the government initiative Atal Thinking Labs. Currently, ATL is functioning in 372 schools in Kerala. Moreover, in July 2023, Oppo India in association with NITI Innovation Mission has set up the first Public-Private Partnership (PPP) model ATL in Kerala.

Through such collaborations, if ATL is set up in every school, it will be possible to enhance the entrepreneurship and technological skills of the students and develop an empowered and future-ready work force. Schools need to constantly strive for this in which the programme outcome should be the component skills of 21st century skills. Instructions can also be given to contextualize them according to the availability of the resources. For successful functioning of ATL, adequate training needs to be provided to selected teachers. Moreover, the government should monitor such activities properly.

If every school in Kerala or school cluster starts functioning of Innovation Clubs in collaboration with nearby Innovation Hubs, it will be a great asset to the Indian education system and the sustainable future of our country. Currently, Regional Science Centre & Planetarium, Calicut and Kerala State Science & Technology Museum, Trivandrum are functioning as the innovation hubs of Kerala. Moreover, Regional Science Centre, Chalakkudy has been featured in the list of upcoming Innovation Hubs in India. In the coming years, we can expect more innovation hubs in Kerala. As PPP model is introduced in ATLs, if Public-Private Partnership is introduced in innovation hubs, it will enable more schools to start innovation clubs. Currently, the lack of adequate resources, training of voluntary teachers, suitable infrastructure, and periodic assessment often hinders the activities of Innovation clubs. It is imperative that Government and schools jointly find and implement solutions to these problems.

If schools becoming a part of any Citizen Science Project, it can create a fresh start for students and teachers. It makes learning more meaningful, interesting and futuristic. In India, there are many Citizen Science Projects, both private and with government support, like the projects of 'CitSci India'. Schools can also collaborate on such projects and make students a part of them. Also, citizen science projects can be implemented by associating with the different levels of three-

tier system. If students who are suitable for each stage are found, grouped and trained, such projects will be a success. Moreover, they will also stimulate the uplift of the immediate society.

However, it is essential to ensure equal and active participation of students in such programmes and it is the responsibility of the schools to make efforts towards that end. In this way, such activities will become a milestone towards the fulfillment of India's vision of becoming a developed country by 2047. Let's hope for an enriched curriculum in its broad sense to realize the dream.

References

- Babaoglu, G., & Yildirim, E. G. (2023). The effect on gifted students' 21st-century skills of supporting science teaching with LEGO® Education® BricQ motion essential and student opinions on this instruction. *Science Insights Education Frontiers*, 15(2), 2305-2324. <https://doi.org/10.15354/sief.23.or216>
- Buckle, J. (n.d.). A Comprehensive Guide to 21st Century Skills. *PanoramaEd Blog*. <https://www.panoramaed.com/blog/comprehensive-guide-21st-century-skills>
- Cetingoz, D. (2023). Development of 21st century skills during preschool period: A phenomenological study in Turkiye. *International Journal of Educational Administration and Policy Studies*, 15 (1), 46-63. <https://academicjournals.org/journal/IJEAPS/article-full-text-pdf/D29AD7C70671>
- Citsci projects (n.d). Citsci-india.org. <https://citsci-india.org/projects/>
- Fernandez, J. H. (2022). Implementation of the 2012 upper secondary school curriculum in Mexico: A 21st-century framework enquiry. *Educare Electronic Journal*, 26 (1), 1-21. <http://doi.org/10.15359/ree.26-1.22>
- Government of India, Ministry of Education. (2015). *Rashtriya avishkar abhiyan*.

education.gov.in.

https://www.education.gov.in/sites/upload_files/mhrd/files/raa/Order_of_RAA_Guidelines.pdf

Government of India, Ministry of Education. (2020). *21st Century Skills: A Handbook*.

education.gov.in. https://www.education.gov.in/covid-19/Hindi/assets-hi/img/pdf/21st_Century_Skill_Handbook.pdf

Government of India, Ministry of Skill Development and Entrepreneurship. (2015). *Mission*

objective. vikaspedia.in. [https://vikaspedia.in/social-welfare/skill-development/national-skill-development-](https://vikaspedia.in/social-welfare/skill-development/national-skill-development-mission#:~:text=The%20National%20Skill%20Development%20Mission,terms%20of%20skill%20training%20activities.)

[mission#:~:text=The%20National%20Skill%20Development%20Mission,terms%20of%20skill%20training%20activities.](https://vikaspedia.in/social-welfare/skill-development/national-skill-development-mission#:~:text=The%20National%20Skill%20Development%20Mission,terms%20of%20skill%20training%20activities.)

Government of India, NITI Aayog. (2016). *Overview*. aim.gov.in. <https://aim.gov.in/overview.php>

Guven, I., & Alpaslan, B. (2022). *Investigation of the effects of interdisciplinary science activities on 5th grade students' creative problem solving and 21st century skills* (EJ1337803).

ERIC. <https://files.eric.ed.gov/fulltext/EJ1337803.pdf>

Mandela, N. (1994). *Long walk to freedom: The autobiography of Nelson Mandela*. Little, Brown and Company.

Novitra, F., Festiyed., Yohandri., & Asrizal. (2021). Development of online-based inquiry learning model to improve 21st-century skills of physics students in senior high school.

Journal of Mathematics, Science and Technology Education, 17(9), 2-20.

<https://doi.org/10.29333/ejmste/11152>

Oxford English Dictionary. (n.d.). Citizen science. In *Oxford English Dictionary online*. Retrieved November 2, 2023, from

<https://www.oed.com/search/dictionary/?scope=Entries&q=Citizen+Science>

Partnership for 21st Century Learning. (2019, December). *Framework for 21st century learning.*

https://static.battelleforkids.org/documents/p21/P21_Framework_Brief.pdf

Partnership for 21st Century Learning. (2019, December). *Framework for 21st century learning definitions.*

https://static.battelleforkids.org/documents/p21/P21_Framework_DefinitionsBFK.pdf

SCERT. (2019). *Basic Science Teacher Text for standard VIII.* Thiruvananthapuram.

The Great Schools Partnership. (2016, August 25). *21st century skills.* Edglossary.org.

<https://www.edglossary.org/21st-century-skills/>