

21st Century Skills for Educators

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Abstract: Today's youth face a rapidly changing world, requiring them to move beyond basic formulaic knowledge and skills. Skill education has emerged as a cornerstone of contemporary education systems worldwide, driven by the need to prepare learners for complex socio-economic realities and the modern workplace. Central to this endeavor is the role of teacher education curricula, which must systematically integrate skill development, cognitive, digital, interpersonal, and professional, into teacher preparation programs. The global shift toward knowledge-based economies, digital transformation, and societal complexity has made 21st-century skills essential for effective teaching. This paper synthesizes existing research to examine how skill education is conceptualised, integrated, and implemented within the teacher education curriculum, and identifies key challenges. This paper explores how teacher training programs can develop competencies such as critical thinking, collaboration, communication, creativity (the "4Cs"), digital literacy, and techno-pedagogical integration strategies. Drawing on current scholarship, it synthesizes theoretical frameworks, empirical findings, and best practices in pre-service and in-service teacher professional development. Current educational policy, such as the Common Core State Standards (CCSS), represents a shift away from rote learning and memorisation of facts to the development of the 21st-century skills of creativity, critical thinking, communication, collaboration, and information, media, and technology skills (IMTS) proposes actionable recommendations for teacher educators and policymakers. The study highlights the importance of systemic integration of these skills into teacher education and policy support for sustainable teacher readiness.

Keywords: 21st Century Skills, Teacher Education.

1. INTRODUCTION

Skill education involves the deliberate cultivation of essential competencies beyond traditional subject knowledge, including critical thinking, communication, creativity, collaboration, digital literacy, and life-long learning abilities. Recent educational reforms globally emphasize that teacher education should not only produce subject experts but also instructors equipped to facilitate holistic skill development in learners. A curriculum that integrates skill education components enables teachers to create dynamic, learner-centred environments geared toward future challenges. 21st-century skills encompass a broad set of competencies that extend beyond traditional academic knowledge, including critical thinking, creativity, digital literacy, collaboration, and effective communication. These competencies are widely recognized as necessary for learners to thrive in complex, rapidly changing contexts and for teachers to effectively prepare students for contemporary challenges. Research indicates that successful teacher education must evolve to support these capabilities meaningfully within classroom settings.

Globalisation, technological developments, international competition, economic changes and environmental and political challenges increase the urgency to develop the skills and knowledge students need to succeed in the 21st-century era (Saavedra et al. 2012). In the world of Education, practitioners and experts involved in the field of education have sought to develop the necessary framework for students to be successful in an information and technology-based global society under the concept of 21st-century skills (Tican and Deniz, 2018). The term 21st-century skill is still used today as it is most widely known and used internationally (Saavedra et al. 2012; Boholano 2017). The role of teachers or students who will graduate to become educators will face a rapidly changing society through the teaching process in schools, and schools must respond to the demands of a changing society. Each teacher will later seek to define how they implement 21st-century proficiency in their classrooms (Valli, Perkkilä and Valli 2014).

It is necessary to have intensive research efforts in the scope of education to find out the current development of the implementation of education associated with scientific developments, as well as technology and information. This is in line with the statement (Beglar D. and Nemoto T. 2014) that Educational research has three main objectives. The first is to contribute to the development of the theory, the second is to investigate phenomena that are believed to play an important role in the educational process, and the third is to develop the educational process to be more effective. The purpose of this study focuses on the second goal, which is to identify the phenomenon regarding the implementation of 21st-century skills in the world of education. The important role of 21st-century skills to date has not been in line with the instruments used to measure skill level 21 in learners. Development of the 21st-century skills scale within the scope of education in Indonesia until now has not been widely available. This research aims to identify the development of 21st-century skill scale instruments from various countries, whose results will be used as preliminary research for the next research process.

As such, there is a call for teacher education programs to facilitate preservice teachers' personal development of these skills as well as their application to educational settings (American Association of Colleges for Teacher Education, 2010; Michaels, Truesdell, & Brown, 2015). While research exists on each of the 21st-century skills in isolation or in pairs, a scarcity of research exists on the process of explicitly facilitating them with preservice teachers (Kagle, 2014; Kokotsaki, 2011; McDonald & Kahn, 2014; Thieman, 2008). Some international examples, such as Singapore's TE21Model of Teacher Education and teacher education in Finland, have elements of 21st-century skill training; however, few studies details how to explicitly facilitate this process (Schleicher, 2012). To that end, this study describes a collaboration in one university between three teacher education programs (multiple subjects, single subject, and education specialist) that explores how and to what extent faculty are developing and modelling the 21st-century skills in preservice teachers. In addition, this study analyses preservice teachers' perceptions of their competence in 21st-century skills and their ability to incorporate them into their own teaching. Relying on the theory of cognitive apprenticeship (Collins, 2006; Collins, Brown, & Newman, 1987), the researchers approached this process primarily for the purpose of promoting expertise in teaching, focusing on teaching methods including modelling, coaching, scaffolding, articulation, reflection, and exploration.

Career and life skills are simply defined as readiness for occupational life and considering career plans as a part of professional life, and paying attention to personal development (Trilling & Fadel, 2009). When the defined 21st-century learner skills are considered, it can be observed that Trilling and Fadel (2009) did not suggest clearly separate topics, but proposed skill topics that explain and interact with each other. In fact, the information and skill rainbow subtopic explains the career and life skills subtopic and a certain part of the digital literacy subtopic. Although there are views in the literature that 21st-century skills could not be clearly separated from each other, similar to this interwoven structure (Prensky, 2003, 2006; Trilling & Fadel, 2009), Wagner (2008) classified 21st-century learner skills under seven topics.

Seven Survival Skills: Wagner (2008) used the expression "survival skills" for 21st century skills, stressing the significance of these skills and the vital importance they possess in the 21st century. These seven skills were based on the "No Child Left Behind (NCLB)" rule (Wagner, 2008). NCLB reflects all skills necessary for every child to be active and successful in learning, career and citizenship processes and every child to effectively apply all acquired skills in life (Bush, 2001; Rudalevige, 2003; Smeeding, 2002; Wright, Wright, & Heath, 2006). NCLB argues that there should be no child left behind who did not acquire these skills in the education process (Wright et al., 2006). Based on this principle, Wagner (2008) listed 21st-century learner skills as critical thinking and problem solving, intersystem and interpersonal collaboration and leadership, an agile mind and adaptability, entrepreneurship and initiative, effective verbal and written communications, access to knowledge and analysis of the acquired knowledge, and curiosity and imagination.

Critical thinking and problem-solving skills reflect the skills of testing the accuracy of the acquired information, questioning the usability of this information, and adequately using acquired knowledge or knowledge to be acquired in solving problems. Collaboration across networks and leading by influence refers to the adaptation of 21st-century learners to the systems they work at, obtaining information from each other based on collaboration, acquiring knowledge about other cultures and adapting to these cultures as a result. Agility and adaptability skills explain the skills of learning or producing novel and creative solutions to everyday problems, adaptation to both learning and professional environments and cultural changes and self-renewal based on these changes (Wagner, 2008).

Despite the need, teachers often encounter challenges such as limited infrastructure, lack of sustained professional training, and insufficient curricular support. Studies note that many teacher education programs still emphasise traditional content knowledge over competencies such as digital literacy and collaborative pedagogy.

2. Conceptual Framework

Defining 21st Century Skills for Teachers

21st Century Skills in education are essential abilities for success in today's world, focusing on Learning & Innovation (Critical Thinking, Creativity, Collaboration, Communication - the "4Cs"), Information & Media Literacy, and Life & Career Skills (Adaptability, Leadership, Initiative, Productivity). These skills prepare students to navigate complex challenges, apply knowledge, and thrive in a rapidly changing, interconnected digital society beyond traditional academics. 21st-century skills frameworks typically cluster competencies into domains such as learning and innovation (4Cs), information and media literacy, technology literacy, and life/career skills. Teachers must not only master these skills themselves but also design learning environments that cultivate them in students.

The Three 21st Century Skills Categories

Each 21st Century skill is broken into one of three categories:

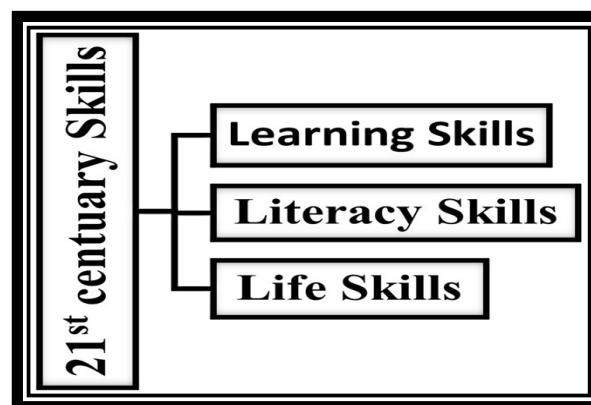


Fig.1: 21st Century Skills

1. Learning skills:

Learning skills (the four C's) teach students about the mental processes required to adapt and improve in a modern work environment.

2. Literacy skills:

Literacy skills (IMT) focus on how students can discern facts, publishing outlets, and the technology behind them. There's a strong focus on determining trustworthy sources and factual information to separate it from the misinformation that floods the Internet.

3. Life skills

Life skills (FLIPS) take a look at intangible elements of a student's everyday life. These intangibles focus on both personal and professional qualities.

The four C's are by far the most popular 21st-century skills. These skills are also called learning skills.

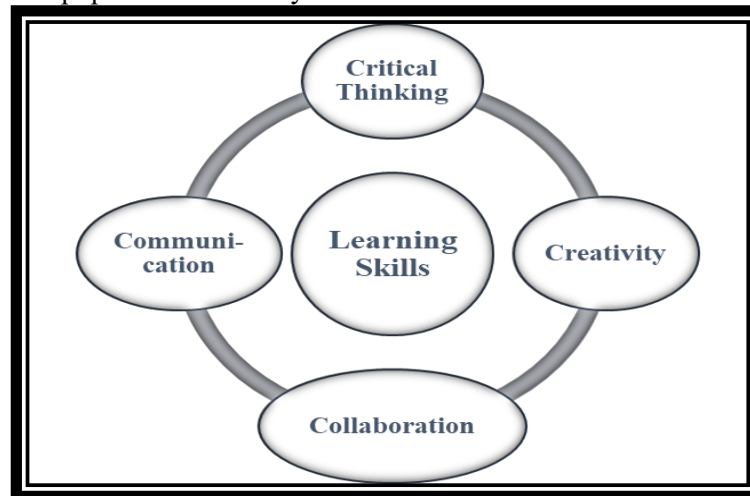


Fig. 2: Learning Skills

More educators know about these skills because they're universal needs for any career. They also vary in terms of importance, depending on an individual's career aspirations. The 4 C's of 21st Century Skills are as follows.

1. Critical thinking: Finding solutions to problems
2. Creativity: Thinking outside the box
3. Collaboration: Working with others
4. Communication: Talking to others

Critical Thinking

Critical thinking is one the most important qualities for today's professionals to have. In the classroom, effective critical thinking inspires students to solve problems and make new discoveries. It's what helps students figure things out for themselves when they don't have a teacher at their disposal. In business settings, critical thinking is essential for improvement. It's the mechanism that eliminates obstacles and replaces them with fruitful endeavours.

Creativity

Creativity is equally important as a means of adaptation. This skill empowers students to see concepts in a different light, which leads to innovation. In any field, innovation is key to the adaptability and overall success of a company. Learning creativity as a skill requires someone to understand that "the way things have always been done" doesn't necessarily inspire progress or growth. It's the realisation that change may be necessary to solve problems with innovative solutions.

Collaboration

Collaboration means getting students to work together, achieve compromises, and get the best possible results from solving a problem. The benefits of team collaboration are as follows.

- Increase productivity
- Improves decision making
- Increase creativity and innovation
- Enhance problem-solving skills
- Greater job satisfaction

Communication

In school, students learn far more than formulas and facts. They know how to express themselves, listen to others, and share ideas clearly. That is the true power of communication. The Importance of Communication Skills for Students extends beyond textbooks, it shapes confidence, fosters strong friendships, and prepares them for life after school. A student with strong communication skills doesn't just score well in exams but also thrives in group projects, debates, interviews, and even everyday conversations.

Communication is a requirement for any company to maintain profitability. It's crucial for students to learn how to effectively convey ideas among different personality types. That has the potential to eliminate confusion in the workplace,

which makes your students valuable parts of their teams, departments, and companies. Without understanding proper communication, students in the 21st Century will lack a pivotal skill to progress in their careers.

But the four C's are only the beginning. 21st Century skills also require students to understand the information that's around them.

Constructivist learning theories, adult learning principles, and transformational leadership concepts suggest that professional development should be continuous, collaborative, and grounded in practice. These theories support training models where teachers actively construct knowledge about integrating 21st century skills rather than passively receive information. The 21st-century skills of creativity, critical thinking, communication, collaboration, and IMTS are not novel to today's educational and business settings (Rotherham & Willingham, 2009; Silva, 2009). Indeed, these skills have been integral elements throughout human history; however, how these skills are taught and developed in K–12 schools has evolved. The CCSS represents a shift away from basic drill and recitation of simple facts to an emphasis on the multifaceted processes of learning (NGA & CCSSO, 2010)

Table 1: Definitions of 21st-century skills for preservice teachers (Michaels et al., 2015)

Creativity	Creativity is the ability to develop, choose, and integrate novel, unconventional, and innovative approaches to teaching and learning.
Critical Thinking	Critical thinking is the ability to effectively use higher-order thinking skills to plan, teach, and reflect on instructional practice while integrating and applying theories of teaching, learning, and development.
Collaboration	Collaboration is the ability to work productively and equitably while valuing others in diverse educational settings.
Communication	Communication is the ability to successfully use interpersonal skills and components of literacy (reading, writing, speaking, and listening) to contribute to teaching, learning, and development.

Nature of Skill Education

Skill education transcends rote memorization, focusing on transferable competencies needed in personal, academic, and professional domains. Educators and researchers assert that teachers must be skilful facilitators capable of guiding students in applying knowledge to real-world problems.

Teacher Education Curriculum as a Vehicle for Skill Development

The teacher education curriculum encompasses all planned learning experiences designed to prepare future teachers, including course content, pedagogical methods, technology use, and assessment strategies. Integrating skill education into teacher training involves reorienting traditional curricula toward competency-based and experiential frameworks that position teachers as facilitators of skills rather than mere transmitters of information.

Competency Based and 21st Century Frameworks

Current frameworks like the Partnership for 21st Century Learning (P21) and international frameworks (OECD, UNESCO) have influenced teacher education curriculum design by identifying core competencies—critical thinking, communication, collaboration, creativity, digital literacy, global citizenship, and adaptability—that future teachers must model and nurture in classrooms.

Cognitive, Digital, and Socio-Emotional Skill Integration

Effective curricula embed multifaceted skills across subject areas rather than siloed modules. Cognitive skills (e.g., reasoning, problem-solving), digital skills (e.g., ICT integration), and socio-emotional capabilities (e.g., empathy, collaboration) are woven into content courses, practicum experiences, and assessment tasks to develop teachers who can adapt to complex learning environments.

3. Methods of Training

Pre-Service Teacher Education

Pre-service training programs incorporating content such as technology integration, collaborative lesson design, and reflective practice have shown promise in enhancing teacher readiness for 21st century classrooms. Research demonstrates that deliberate curriculum redesign, including flipped learning and hands-on technology use, can raise awareness and competence in essential skills among teacher candidates.

In-Service Professional Development

In-service training often focuses on enhancing digital literacies and techno-pedagogical competencies using frameworks like TPACK (Technological Pedagogical Content Knowledge). Systematic reviews show that technology-based professional development can significantly improve competencies in innovation, collaboration, and instructional design when sustained and contextually relevant.

Collaborative and Reflective Models

Encouraging professional learning communities (PLCs), peer coaching, and design-based learning models enables teachers to learn from practice and peers. These models align with constructivist approaches that foster deeper integration of 21st-century competencies.

Evidence of Skill Integration in Teacher Education

Empirical Findings on Curriculum Impact

Research conducted at Nelson Mandela University indicates that pre-service teacher education curricula positively impact prospective teachers' development of 21st-century skills—particularly collaboration, communication, critical thinking, and creativity—even while challenges persist in digital competencies and assessment mechanisms.

Teaching Materials and Instructional Plans as Skill Indicators

Studies analyzing instructional plans and evaluations found that curricula incorporating 4C skills (communication, collaboration, critical thinking, creativity) tend to foster more comprehensive skill awareness among teacher candidates, although in many cases these competencies remain underdeveloped without targeted professional development.

Challenges in Integrating Skill Education

Despite advances, research highlights multiple systemic and practical barriers:

- **Traditional orientation:** Many programs remain focused on content mastery rather than competency development, limiting skill emphasis.
- **Teacher preparedness:** A significant number of educators lack pedagogical training in skill-oriented instruction and digital fluency.
- **Institutional constraints:** Limited infrastructure, insufficient professional development, and rigid assessment models restrict the meaningful integration of skills.

Implications for Policy and Practice

To develop meaningful teacher readiness for 21st century skills, policymakers and educational leaders should:

- Embed 4Cs and digital literacy explicitly in teacher education curricula.
- Support ongoing professional development that is sustained, practice-based, and linked to classroom realities.
- Provide resources and institutional support to foster teacher innovation and experimentation.

Develop metrics and assessment frameworks that recognize teacher growth in competencies, not just content mastery.

4. Strategic Recommendations

To strengthen skill education within teacher education curricula, several recommendations emerge:

1. **Curriculum Redesign:** Embed skill development outcomes explicitly across all coursework and practicum experiences.
2. **Professional Development:** Offer ongoing, contextualised training for teacher educators to build pedagogy that promotes skills integration.
3. **Assessment Reform:** Develop assessment practices that evaluate competency growth (e.g., portfolios, performance tasks) rather than rote knowledge recall.

Technology Integration: Invest in digital infrastructure and learning technologies to enhance teaching and learning of digital and collaborative skills

5. Conclusion

Training for 21st-century skills for teachers is vital for transforming education to meet current and future challenges. Research underscores the need for systemic approaches that integrate theoretical grounding, practical application, and continuous professional growth. Empowering teachers with these competencies ultimately enhances student learning and prepares learners for the complexities of the 21st century. Skill education is central to modern teacher preparation. A curriculum that systematically incorporates essential competencies prepares teachers not only to navigate evolving educational landscapes but also to empower their students with the capabilities required for life and work in a complex world. Ongoing research and curriculum innovation must continue to refine integrative practices that translate skill education from theory to practice.

The study concluded that the 21st-century skills scale has been developed according to the needs of each developer. The implication of this research is that academics/education practitioners need to take a role in developing scale. This research can be used as a reference for procedures and analysis of 21st-century skill scale development. Researchers can use the results of this study to expand research efforts related to the development of the 21st-century skills scale, especially in the scope of education.

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