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Integrating 21st-Century Skills into Instructional Materials for Sustainable Education

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ABSTRACT

As transmitters of competencies, instructional materials or teaching and learning materials (TLM) ensure that quality education occurs among learners. As education and learners evolve, the use of diversified, interactive, flexible, inclusive, and learner-centered instructional materials is becoming more and more relevant. In light of this, the present study determines the perceptions of educators in various academic institutions on the essential 21st-century skills in developing instructional materials for learners to support and enhance instructional quality. It uses the descriptive survey design of quantitative research to survey key information about 39 purposively selected educators in various provinces in the Philippines who responded to a structured questionnaire, wherein the results are analyzed using descriptive statistics. The findings underscore the need to integrate a broad range of 21st-century skills into instructional materials to prepare learners for modern complexities. Based on expert educators' insights, this study offers a comprehensive list of instructional materials for such integration and highlights the importance of educators' proficiency in selecting and utilizing these materials. Future research can explore the effectiveness of innovative instructional materials in cultivating these skills.

Keywords: *21st-Century Skills, Instructional Materials, Sustainable Education*

INTRODUCTION

In today's education, 21st-century skills are increasingly recognized as critical for learners to adapt to the rapid changes in the world (Herianto et al., 2024) and to prepare them for their future lives and careers (Seker et al., 2023), establishing mastery to succeed (Illene et al., 2023) through the provision of proper context to learn them while schooling (Miliou et al., 2024) and apply the said skills in their everyday lives (Tiengyoo et al., 2024). These skills include creativity, critical thinking, problem-solving, communication, and collaboration, often called the 4Cs or critical thinking, communication, collaboration, and creativity (Haryana et al., 2024). Technological, scientific, and digital literacy are crucial to these skills (Özer & Kuloglu, 2023; Seema, 2024). Despite these efforts, there is still a lack of consensus on what constitutes "21st-century skills," as existing frameworks differ (Chen, 2023). Therefore, developing a

comprehensive understanding of these skills and creating effective instructional materials and strategies to equip learners with the necessary competencies for success in college, future careers, and civic engagement is essential. In education, teachers are mandated to develop, adopt, and implement quality instructional materials to increase learning outcomes (Basalo & Salvador, 2022), leading to the development of higher-order thinking skills (Duraippah et al., 2021).

However, several challenges exist in implementing and developing these skills in education. One of the primary challenges is the lack of qualified teachers, which affects the efficiency of equipping learners with 21st-century skills (Tandika, 2022). To develop learners equipped with 21st-century skills, teachers need to be equipped with these skills and model them in practice as well. As further emphasized by Uyar (2023), one strength of educators is their openness to acquire 21st-century skills themselves, thus reinforcing the need to develop teachers further to enhance their practices (Mopara & Sanrattana, 2023). 21st-century skills are among the needed qualifications among teacher candidates nowadays (Helepliogl u et al., 2023) since they must have the said before they can incorporate them into their practices (Sari & Balkas-Yasar, 2024). Another challenge is the lack of qualified in-service and pre-service training on 21st-century skills (Bolat & Deneme-Gençoglu, 2024). Poor curricula, lack of required materials and infrastructure, and unsupportive attitudes of administrators further hinder the implementation of these skills (Bolat & Deneme-Gençoglu, 2024). Moreover, these skills must be integrated across all curricula rather than taught in specific courses (Yerlikaya & Sahin, 2023). Another pressing concern is the skills gap, wherein the skills taught to graduates are not what the industries need (Gule et al., 2023). Indeed, 21st-century skills are essential for all learners (Yoo, 2022) to succeed in this technologically advanced society.

21st-century education demands a higher skill set to be developed among learners. In this enormous task, teachers are expected to deliver quality education using instructional materials, devices, tools, or platforms that maximize and revolutionize the learning experience, thus ensuring the skill set's attainment. Though teachers are generally considered the best instructional materials, the use of diversified, interactive, flexible, inclusive, and learner-centered materials, devices, tools, or platforms to increase learners' interests, engagements, and outcomes cannot be disregarded. As Rahimi (2024) noted, various instructional materials and strategies need to be employed to address these challenges. ICT-based teaching has evolved into problem-solving, and educators have identified factors that facilitate this process in their classes (Using targeted digital tools to match career-ready practices with 21st-century skills, educators can infuse these skills into lessons and assessments (Marakovits, 2022). Inquiry-based learning is another effective strategy that engages learners in exploring scientific phenomena, examining evidence, performing experiments, and drawing conclusions, thereby promoting scientific literacy (Seema, 2024). Furthermore, project-based learning and digital technologies are recommended to develop teacher efficacy in instruction aligned with 21st-century competencies (Aifan, 2022; Isley, 2022). This attests to the importance of instructional materials in transmitting skills to learners by improving their achievement (Ajoke, 2017). One of the best ways to do such is by using the available resources within the local community as learning materials (Pecson, 2014), especially those locally produced as mandated by the RA 10533 (Enhanced Basic Education Act of 2013), or alternative learning resources that can be

used to enhance instruction further (Pecson, 2015), as Twizeyimana et al. (2020) noted that the use of locally made instructional materials motivated learners and encouraged active participation, thereby improving their overall academic performance and in understanding complex concepts better. More so, there is also a need for diverse teaching and learning resources, including ICT (DepEd Order No. 42, s. 2017). Such details on the use of instructional materials reinforce the need for a continuous evaluation of the instructional materials used in developing the 21st Century among learners (Magno et al., 2016), especially those addressing their learning needs and providing interactive opportunities (Pecson, 2020).

With that information and base at hand, the current study determined the perceptions of educators in various academic institutions regarding the needed 21st-century skills in developing instructional materials for learners. It provided guidelines to sustain high-quality instructional practice, thus significantly contributing to delivering quality and responsive education aligned with Sustainable Development Goal No. 4.

METHODS

The study utilized the descriptive-survey design of quantitative research in detailing the perceived 21st-century skills by the educators that are essential to be equipped among learners using the developed instructional materials in the teaching-learning process. Descriptive research aims to accurately and systematically describe a population, situation, or phenomenon, focusing on what, where, when, and how questions, but not why (Aggarwal & Ranganathan, 2019; McCombes, 2019). The research design was employed to describe educators' perceptions of the essential skills that 21st-century learners need to develop using instructional materials.

Meanwhile, the study's respondents comprised 39 purposively selected educators, including seasoned teachers, master teachers, head teachers, school principals, deans, and directors from various academic institutions in the Philippines, whose positions, experiences, and expertise were deemed essential for identifying the skills needed by today's learners.

More so, the study's primary data were gathered using a structured questionnaire that focused on identifying the essential 21st-century skills that need to be developed among learners and considered in creating instructional materials across various academic levels. The research instrument has a content validity index (CVI) of 0.978 (Excellent) and a consistency index of α=0.9136 (Excellent), making it highly correct and reliable to use for the target respondents.

Lastly, the gathered data were analyzed using descriptive statistics (i.e., frequency and percentage), and a comprehensive description of the skills generated from the respondents' responses was provided alongside a summary table.

RESULTS AND DISCUSSION

The study highlights the perceptions of esteemed educators from various educational levels on the essential 21st-century that must be considered in developing instructional materials.

Table 1. Needed 21st-Century Skills in the Development of Instructional Materials for the Learners

Skill	Frequency	Percentage
Adaptability	1	2.56
Analytical Reasoning	2	5.13
Collaboration	1	2.56
Communication	2	5.13
Creativity	2	5.13

Skill	Frequency	Percentage
Critical Thinking	7	17.95
Cultural Literacy	1	2.56
Futures Thinking	1	2.56
Interpersonal Skills	1	2.56
Learning and Innovation	2	5.13
Life Skills	3	7.69
Practical Skills	3	7.69
Reading Comprehension	2	5.13
Reflective Thinking	2	5.13
Resiliency	1	2.56
Self-discipline	5	12.82
Self-Reliance	1	2.56
Systems Thinking	1	2.56
Time Management	1	2.56
Total	**39**	**100.00**

Table 1 highlights the importance of various 21st-century skills in developing instructional materials for learners. Among the skills listed, critical thinking is the most frequently cited (17.95%), emphasizing the need to foster learners' analytical and evaluative abilities. Self-discipline is also highly valued (12.82%), indicating the significance of learners' self-management skills. Other crucial skills include life and practical skills (7.69% each), communication, creativity, analytical reasoning, and learning and innovation (5.13% each). Skills such as adaptability, collaboration, cultural literacy, future thinking, interpersonal skills, reflective thinking, resiliency, self-reliance, systems thinking, and time management are also mentioned, albeit less frequently (2.56% each), suggesting a broad range of competencies necessary for learners to thrive in complex, modern environments.

The prominence of critical thinking and self-discipline in Table 1 underscores educators' recognition of the importance of analytical abilities and self-management for learners. The diverse range of other 21st-century skills mentioned highlights the multifaceted competencies required for navigating today's complex world. The findings align with Shukla's (2018) assertion that instructional materials significantly influence student learning, as the emphasis on various 21st-century skills indicates the need for resources that motivate, stimulate, and foster a broad range of competencies essential for navigating modern complexities.

Table 2. Instructional Materials for the Development of 21st-Century Skills of Learners Toward a Sustainable Education

Skill	Description	Instructional Materials
Adaptability	It is the skill of effectively navigating and succeeding in new or changing environments by leveraging strategic thinking, open-mindedness, and key competencies like critical thinking, resilience, and responsiveness to feedback (Kaplan, 2023b; Miles, 2023).	Role-playing activity sheets, simulation rubrics, case study materials, maps, globes, dioramas, problem-solving activity sheets, etc.
Analytical Reasoning	It is the skill to discern patterns, apply logic, and predict outcomes from given information (Indeed Editorial Team, 2024d). It is often assessed to evaluate skills like attention to detail, critical thinking, and decision-making (Mellett, 2023).	Data analysis activity sheets, problem-solving/analytical exercise sheets, puzzles, board games, digital games, diagrams, flashcards, infographics, graphic organizers, metacards, data visualization tools, etc.
Collaboration	It is the skill to work well with others to achieve a common goal, encompassing building relationships, resolving conflicts, and creating an inclusive and respectful environment (Moseley, n.d.), essential for efficient teamwork and problem-solving (Kaplan,	Group projects, collaborative activity sheets, conflict resolution exercise sheets, digital games, board games, team-building activity sheets, etc.

Skill	Description	Instructional Materials
	2023a).	
Communication	It is the skill to effectively transmit and receive ideas, instructions, opinions, or emotions and to convey information and messages appropriately and powerfully, typically evoking a response or feedback (Nazaruk, 2024; The University of New Mexico, n.d.).	Debate rubrics, presentations, writing assignments, group discussion rubrics, public speaking rubrics, active listening activity sheets, photographs/pictures/photos/images, audios, videos, multimedia presentations, diagrams, flashcards, infographics, metacards, and graphic organizers.
Creativity	It is the skill to generate novel ideas or approaches by considering tasks or problems from fresh perspectives, enabling innovative problem-solving and unique task engagement (Birt, 2024; Tomaszewski, 2024).	Design thinking activity sheets, brainstorming rubrics, mind-mapping tools, creative writing rubrics, illustrations, multimedia, art projects, and do-it-yourself (DIY) materials.
Critical Thinking	It is the skill of collecting and analyzing information to reach a conclusion. This involves analyzing, evaluating, and synthesizing information logically and objectively, questioning assumptions, recognizing biases, and assessing evidence to reach well-reasoned conclusions (Herrity, 2024b; Martins, 2024).	Complex problem-solving activity sheets, logic puzzles, argument analysis tools, research articles, debate rubrics, research projects, graphic organizers, infographics, critical thinking rubrics, metacards, board games, digital games, etc.
Cultural Literacy	It is the skill of a broad network of contextual information that helps people understand and dialogue with various media, from books to music to podcasts to movies, enabling culture to function and thrive (McKay & McKay, 2022). It helps develop a critical cultural perspective, allowing individuals, especially those from the 'dominant culture,' to evaluate their own cultural beliefs and practices in the context of many cultures (Flavell et al., 2013).	Multicultural literature, global studies, cultural reading materials, localized/indigenized materials, cultural awareness activity sheets, cultural mapping worksheets, cultural exchange activity sheets, maps, globes, dioramas, field trips/immersion worksheets, broadcast media, social media, etc.
Futures Thinking	It is the skill of exploring new paths, dimensions, and paradigms, anticipating trends, identifying signals, and envisioning potential scenarios to make better decisions (Angelo, 2024). It involves considering a range of possibilities to better prepare for potential outcomes (Gorbis, 2019).	Futures wheel activity sheets, concept mapping worksheets, scenario planning activity sheets, dioramas, models and mock-ups, simulation rubrics, etc.
Interpersonal Skills	These are the skills that facilitate effective communication and cooperation with others. They encompass the ability to build relationships and interact effectively, and they are often referred to as people skills, soft skills, or emotional intelligence (Doyle, 2024; Herrity, 2024a).	Group projects, collaborative activity sheets, conflict resolution exercise sheets, role-playing rubrics, team-building activity sheets, conflict resolution activity sheets, social-emotional learning activity sheets, multimedia, social media, board games, digital games, etc.
Learning and Innovation	It is the skill to navigate complex 21st-century life and work environments, emphasizing creativity, critical thinking, communication, and collaboration as essential for future preparation (Bellevue College, 2016; Landa, 2002).	Independent projects, goal-setting exercise sheets, time management tools, infographics, graphic organizers, audio-visual materials, multimedia, self-assessment rubrics, online resources, teacher-made tests, apps, etc.
Life Skills	These skills acquired through learning and/or direct life experience enable individuals and groups to handle issues and problems commonly encountered in daily life effectively (British Council, n.d.). These encompass psychological, behavioral, cognitive, and interpersonal skills that help individuals succeed in various areas of life (Hodge et al., 2013).	Role-playing activity sheets, problem-solving activity sheets, decision-making activity sheets, goal-setting exercise sheets, simulation rubrics, group projects, case studies, career exploration worksheets, realia, job shadowing/work immersion experience rubrics, etc.

Skill	Description	Instructional Materials
Practical Skills	These are the skills needed to perform their duties efficiently, including interpersonal, physical, creative, hard, or soft skills, which can be gained through direct, hands-on experience, training, or application in real-life scenarios (Indeed Editorial Team, 2024a). They stand in contrast to theoretical knowledge, which is often abstract and not immediately applicable to real-world tasks (Piippo, n.d.).	Project-based activity sheets, real-world problem-solving exercise sheets, internship worksheets, work experience worksheets, realia, maps, globes, hands-on activity sheets, multimedia, apps, etc.
Reading Comprehension	This is the skill to read, analyze, and understand text, involving active and intentional processes before, during, and after reading (Indeed Editorial Team, 2024c), relying on word reading (decoding symbols) and language comprehension (understanding words and sentences) (Zimmerman & Hutchins, 2003).	Reading materials, reading comprehension exercise sheets, writing assignments, vocabulary development activity sheets, summarization activity sheets, graphic organizers, think-aloud strategy worksheets, etc.
Reflective Thinking	It is a form of critical thinking skill that involves considering the larger context, meaning, and implications of experiences and learnings (Branch & Paranjape, 2002; MasterClass, 2022).	Reflective journals, self-assessment activity sheets, metacognitive exercise sheets, journals, diaries, reflection papers, metacards, peer feedback worksheets, etc.
Resiliency	It is the skill to face and adapt to challenges to overcome them, enabling individuals to handle disappointments and setbacks without impeding their progress (Indeed Editorial Team, 2024b). This skill is helpful in facing challenges and difficulties in life, improving one's ability to feel better and cope better (Riopel, 2019).	Resilience-building worksheets, problem-based learning activity sheets, simulation rubrics, case studies, mindfulness exercise sheets, journals, diaries, group discussion worksheets, etc.
Self-discipline	It is the skill to manage oneself to achieve a goal, encompassing self-control, organization, time management, self-awareness, perseverance, and focus (Kolmar, 2023). It serves as the bridge between defining goals and accomplishing them (Gleeson, 2020).	Goal-setting activity sheets, time management exercise sheets, time-tracking tools, productivity-monitoring tools, mindfulness activity sheets, self-reflection journals, diaries, reflection papers, etc.
Self-Reliance	It is the skill to perform tasks independently, make informed decisions, and take responsibility for one's needs, encompassing emotional, mental, social, physical, and spiritual aspects (Friesen, 2024; Lunsford, 2021).	Independent projects, problem-based learning activity sheets, leadership opportunity rubrics, realia, self-assessment tools, etc.
Systems Thinking	It is the skill to address complex problems holistically, involving awareness of phenomena such as self-organization and emergence within the system, taking an "inside the system" perspective, and deciding how to act on it (Ben-Zvi-Assaraf & Knippels, 2022; Hipkins, 2021; Mehren et al., 2018).	Futures wheel activity sheets, systems mapping exercise tools, scenario planning rubrics, dioramas, models and mock-ups, simulation rubrics, etc.
Time Management	This is organizing and planning one's time effectively, accomplishing key goals, and advancing personally (Jackson, n.d.; Keiling, 2023).	Time management exercise tools, goal-setting activity sheets, productivity tools, time-tracking apps, prioritization/scheduling matrix, etc.

Table 2 summarizes 21st-century skills deemed essential for today's learners and the instructional materials designed to cultivate these competencies for sustainable education. These skills, as emphasized by educator-respondents, include adaptability, analytical reasoning, collaboration, communication, creativity, critical thinking, cultural literacy, future thinking, interpersonal skills, learning and innovation, life skills, practical skills, reading comprehension, reflective thinking, resiliency, self-discipline, self-reliance, systems thinking, and time management. Each skill is accompanied by a description and specific instructional materials, which may be printed, audio, visual, audio-visual, electronic/digital/online, or

multimedia. Incorporating these skills into developing and utilizing instructional materials is vital for preparing learners to navigate the complexities of modern life and work environments, which require knowledge and integral technical, social, and life skills.

The data illustrate the necessity of integrating a wide array of 21st-century skills into instructional materials, reflecting educators' recognition of the multifaceted competencies required for success in today's world and for sustainable educational practice. The diverse range of suggested materials underscores the importance of varied and engaging resources to cultivate these essential skills. The results resonate with the 21st-century skills classroom, where preparing learners for an uncertain future requires a practical and engaging approach (Leming, 2019). The diverse instructional materials suggested for each skill align with Olayinka's (2016) findings, highlighting the role of such resources in making learning more engaging, realistic, and practical, fostering skill acquisition and self-development.

CONCLUSION

The findings emphasize the importance of integrating a wide array of 21st-century skills as a sustainable educational practice into instructional materials to prepare learners for modern life and work complexities. Therefore, educators must be proficient in selecting, developing, and utilizing instructional materials that effectively support the development of these diverse skills. Drawing on expert educators' insights, this study provides a comprehensive framework for integrating essential 21st-century skills into instructional materials, better preparing learners for contemporary challenges. Future researchers can expand on these findings to investigate the effectiveness of various innovative instructional materials in cultivating these crucial skills.

CONFLICT OF INTEREST

The authors declare no conflicts of interest and conducted this research solely to advance knowledge and for widespread use.

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