

Original Article



Investigating 21st-century skills of Cambodian university students: Insights from a survey study

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Abstract

This study aims to examine the levels of 21st-century skills among Cambodian university students. Adopting a quantitative approach, the study employed a cross-sectional survey design and collected data through an online questionnaire using a five-point Likert scale. A simple random sampling technique was utilized to recruit the participants. Based on responses from 232 Cambodian university students (female = 67.67%) enrolled in Years 1–4 at a private university in Siem Reap, the study showed high levels of collaboration skills ($M = 4.32$, $SD = 0.76$) and critical thinking skills ($M = 4.02$, $SD = 0.79$). The participants also reported moderately high levels of creativity skills ($M = 3.74$, $SD = 0.81$) and communication skills ($M = 3.69$, $SD = 0.81$). Further analysis showed no significant gender differences in critical thinking, collaboration, communication, or creativity skills among the participants. An ANOVA analysis revealed statistically significant differences among students across year levels in critical thinking, $F(3, 228) = 7.62$, $p < 0.05$; communication skills, $F(3, 228) = 4.77$, $p < 0.05$; and collaboration skills, $F(3, 228) = 3.01$, $p < 0.05$, with fourth-year students having higher mean scores, particularly in critical thinking, collaboration, and communication. However, no significant differences were found in students' creativity skills across the different years of study. The study concludes with a discussion of its limitations and suggestions for future research.

Keywords: 21st-century skills, 4Cs skills, critical thinking, communication, collaboration, creativity, Cambodian university students

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Introduction

Higher education plays a crucial role in shaping students' career prospects, providing them with the knowledge and skills essential for the workplace (Ek & Muth, 2023). Over the past twenty years, higher education in Cambodia has experienced rapid growth in the number of institutions and student enrollment (Bou, 2025; Chea, 2019; Heng & Sol, 2023; Williams et al., 2016). Higher education institutions in Cambodia are classified into vocational and academic institutions (Chuon, 2023). Currently, Cambodia has 194 higher education institutions, comprising 79 public and 115 private universities, which are overseen by 17 different ministries. However, only 94 institutions fall under the supervision of the Ministry of Education, Youth, and Sport (MoEYS, 2025). In the 2023-2024 academic year, there were 316,105 students (52.51% female) studying in higher education, including 12.6% enrolled in an associate's degree, 82.2% in a bachelor's degree, 47.2% in a master's degree, and 4.4% in a doctoral degree (MoEYS, 2025).

Despite the significant growth of Cambodian higher education institutions, unemployment remains a critical challenge, with an overall youth unemployment rate of 2.5% (National Institute of Statistics, 2019). This became a major concern among students who attended college and post-graduate school in Cambodia (Thea, 2022). The unemployment of graduates is caused by skills gaps and skills mismatches (Chuon, 2023; Heng & Sol, 2023). Skills gaps and skill mismatches between the skills produced by Cambodian universities and those required by the emerging labor market are a critical problem concerning the current human capital prospects (Peou, 2017). As Chuon (2023) noted, in light of skills gaps and skills mismatches, approximately 30% of Cambodian students obtained high school diplomas, 2.9% completed bachelor's degrees, and only 0.6% completed master's degrees. Heng and Sol (2023) noted that this skills mismatch can be described as a situation where graduates are either unemployed or employed in careers that do not utilize their skills. The National Employment Survey 2020 showed that employers rated communication, teamwork, problem-solving, and learning skills as highly demanding skills, yet they were usually found to be lacking or missing among graduates (Kuocho et al., 2021). Kuocho et al. (2021) added that academic institutions must provide students with skills and knowledge during their college lives, although these skill sets can be gained through working experiences.

As 21st-century skills are increasingly essential in the global job market, students must be well-equipped with such essentials to stay relevant in educational, technological, and economic trends (Kumbhakar & Kumar, 2025). University graduates need to develop 21st-century skills, such as communication, teamwork, problem-solving, critical thinking, and leadership skills, which are essential for their career success and employability (Tes & Khen, 2025). In light of its importance, the Cambodian government has set the promotion of 21st-century skills for youth as a priority program in the Education Strategic Plan 2024-2028 (MoEYS, 2024). For example, 21st-century skills training programs, such as digital technology, innovation, business awareness, entrepreneurship, financial literacy, and soft skills (e.g., leadership, teamwork), were provided to 8,302 young Cambodians (MoEYS, 2025). However, according to Chuon (2023), the knowledge and skills that graduates obtained were not well aligned with market needs due to a lack of effective mechanisms for the private sector to raise concerns to higher education institutions. As a result, university graduates faced skills gaps, including teamwork and collaboration, problem-solving, communication, practical skills, and foreign language skills (Chuon, 2023).

Against this background, this research aims to examine the current levels of 21st-century skills among Cambodian university students. Although much research has explored topics related to 21st-century skills learning among Cambodian children (Ke & Neak, 2025), the role of soft skills for enhancing graduates' employability (Tes & Khen, 2025), the 21st-century skills development model for Cambodian undergraduate students (Boun et al., 2020), employability challenges for Cambodian tertiary graduates (Hak, 2016), and employability skills development in English language education (Chea & Lo, 2022), there remains a gap about 21st-century skills levels among Cambodian university students. Therefore, this study seeks to fill this knowledge gap by examining current levels of 21st-century skills among Cambodian university students. This study is guided by two research questions:

1. What are the levels of 21st-century skills among Cambodian university students?
2. Do the levels of 21st-century skills differ among Cambodian university students by gender and year of study?

Literature review

Conceptualizing the 21st-century skills

The concept of 21st-century skills is understood in many different ways, ranging from individual skills to workplace and social skills that involve skills in life, career, media literacy, and technology (Kelley et al., 2019). Larson and Miller (2012) defined 21st-century skills as “skills that increasingly demand creativity, perseverance, and problem solving combined with performing well as part of a team” (p. 121). The current era requires different sets of skills and competencies from people for them to perform efficiently and associate effectively with their colleagues at the workplace and in daily lives (Ananiadou & Claro, 2009).

The Partnership for 21st-Century Learning Framework ([P21], 2019) constructed a framework that outlines four skill packages, being seen as essential for students’ academic and career lives in today’s society. According to P21’s (2019) framework, learners must be equipped with the necessary 21st-century skills for success in today’s world, including (1) critical thinking, (2) communication, (3) creativity, and (4) collaboration. Bellanca (2017) noted that the P21 framework provides a conceptual model by emphasizing how the development of these skill sets extends beyond conventional content areas to emerging arenas, such as new media, college and career pathways, and global communication. These 21st-century skills are also known as the 4Cs skills (Ayoub et al., 2024; Salybekova et al., 2023), and to some extent, they are called basic soft skills (Mazzola-Randles, 2020; Thornhill-Miller et al., 2023). Soft skills are a broader category that often includes emotional intelligence and work ethics, whereas the 4Cs specifically target cognitive and interpersonal competencies (Tes & Khen, 2025; Thornhill-Miller et al., 2023). Figure 1 depicts the 4Cs and the other types of knowledge and competencies that are elements of the P21 framework for 21st-century learning.



Figure 1. P21 Framework for 21st-Century Skills (P21, 2019)

Critical thinking skills refer to the ability that allows individuals to retrieve information, analyze evidence, and make informed decisions in complicated situations (Kumbhakar & Kumar, 2025). Critical thinking skill is the capacity to evaluate the credibility of a claim or piece of information and make a judgment regarding what to believe or do (Kousloglou et al., 2023). Students with critical thinking skills can identify problems, collect and evaluate related information, suggest possible solutions, and choose the most effective methods for solving problems (Kousloglou et al., 2023).

Communication skills are the capability to disseminate ideas, information, and opinions precisely and effectively, both in verbal and written forms (Succi & Canovi, 2019). The ability to communicate effectively becomes an integral skill for graduates (Tes & Khen, 2025). Effective communication skills encompass certain characteristics, including demonstrating clear opinions and thoughts, encouraging efforts, communicating to obtain clear goals, developing empathy or respect for differences, and enhancing active listening abilities (Kousloglou et al., 2023).

Creativity is generally defined as the ability to create new and original work and ideas, think differently, and approach challenges with originality (Kubátová et al., 2025; Thornhill-Miller et al., 2023). Creativity skills are a driving force in the knowledge economy, as they empower individuals to generate innovative ideas and create new things (Kumbhakar & Kumar, 2025).

It encompasses “imagination, curiosity, and the capacity to connect ideas in unique ways” (Kubátová et al., 2025, p. 36). As noted by Saimon et al. (2022), creativity can be taught. Developing creativity involves a sense of risk-taking among students, as they need to continually try new ways of creating things (Saimon et al., 2022).

Collaboration is the capacity to work as a team to achieve common goals (Saimon et al., 2022). It encompasses “active participation, shared ideation, attentive listening, and contributing to collective decision-making and problem-solving process” (Kubátová et al., 2025, p. 34). Collaboration skills are needed for students to participate and succeed in the 21st century (Kousloglou et al., 2023). They enable them to interact with their colleagues and contribute their ideas and thoughts to accomplish learning objectives and promote team responsibility (Kousloglou et al., 2023). The ability to work collaboratively in teams assists the organization in coping with problems and challenges resulting from industrial changes (Pol’akov’ et al., 2023). Figure 2 provides a summary of the 4Cs of 21st-century skills that university students need to acquire.

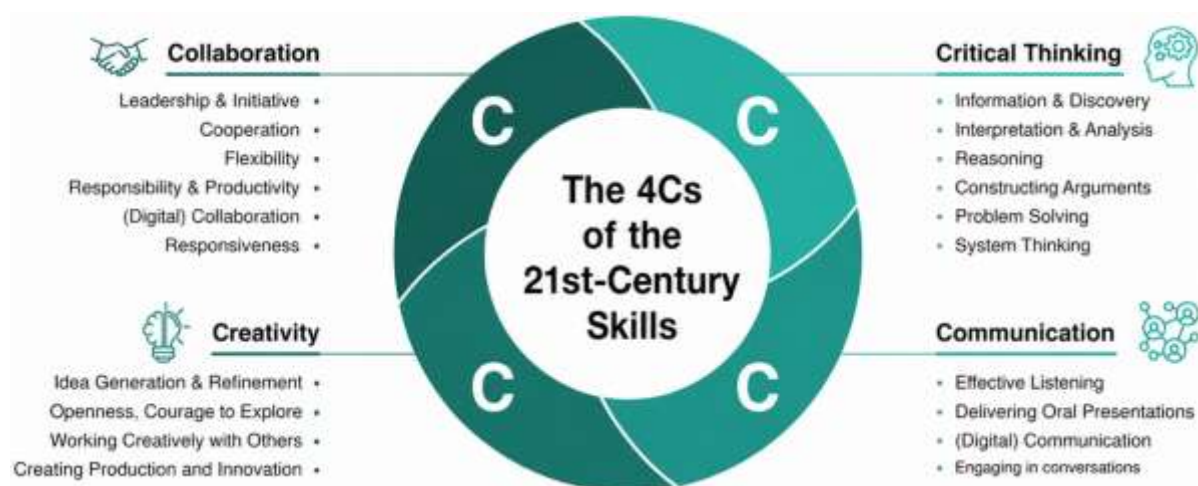


Figure 2. The 4Cs of 21st-century skills

Source: Salybekova et al. (2023)

The role of higher education institutions in developing 21st-century skills

Higher education institutions, particularly universities, play a crucial role in equipping students with the essential skills necessary to thrive in the 21st-century workplace (Khan et al., 2022; Kienzler et al., 2023). Higher education has special responsibilities to prepare students with the competencies needed for career success and in daily life (Khan et al., 2022). Now, students are active learners, as they perceive themselves as participants in creating new ideas or

information (Scott, 2015). Accordingly, universities need to adjust teaching pedagogy beyond traditional skills of numeracy and literacy to incorporate additional 21st-century skills, including critical thinking, creativity, collaboration, and digital literacy (Kivunja, 2015). The attainment of 21st-century skills is well informed by specific pedagogic techniques, including problem-based learning, cooperative learning, experiential learning, gamification (games for learning), and formative assessment (Chu et al., 2017; Voogt & Roblin, 2012). Khan et al. (2022) and Voogt and Roblin (2012) also added that the comprehensive use of information and communication technology (ICT) is needed to increase student learning and promote the attainment of 21st-century skills. Sansone et al.'s (2018) study showed that collaborative learning, project-based learning, technology-enhanced instruction, and exposure to diverse disciplines and practices were essential to cultivating crucial skills for students' future careers.

Furthermore, the implementation of 21st-century skills lies in the role of teachers and their professional development (Chu et al., 2017; Voogt & Roblin, 2012). Teachers and educators must have the pedagogical expertise required to distribute 21st-century skills to their students (Al-Ainati, 2024). The 21st-century pedagogy requires innovative and research-supported teaching strategies, learning technologies, and real-world applications (Scott, 2015). Chu et al. (2017) argued that teacher professional development is crucial to ensure the acquisition of 21st-century teaching competencies. Teachers can engage in professional development through lifelong learning practices, professional learning communities, and mentorship programs (Scott, 2015). Chu et al. (2017) suggested three strategies for developing teachers' 21st-century teaching competencies: 1) participating in collaborative inquiry to gain first-hand experience of this pedagogy, 2) partnering with universities to benefit from the expertise of university academics, and 3) engaging in teacher communities for peer support.

Research into students' 21st-century skills

Research conducted across diverse socioeconomic and geographical contexts has generally shown that students demonstrate high levels of competencies in critical thinking, communication, creativity, and collaboration (Kousloglou et al., 2023; Mahmood & Saleem, 2024; Yao & Tuliao, 2018; Zhong et al., 2025). In European contexts, Crespí et al. (2025) conducted a large-scale survey in two European countries, Spain (n = 675) and Mexico (n = 678), to examine the

effectiveness of soft skills curricular subjects among university students. It was shown that students gained competencies in effective communication and intrapersonal skills. It was also found that collaboration skills among students were lacking, such as working in a team or working cooperatively (Crespí et al., 2025). In Greece, Kousloglou et al. (2023) assessed high school students' 21st-century skills after they participated in mobile-technology-supported inquiry-based learning. It was revealed that students improved their collaboration, communication, critical thinking/problem solving, and creativity (Kousloglou et al., 2023).

In the Middle East, Ilhan and Unal's (2021) study on 21st-century skills of university students (n = 244) found that Turkish students had high levels of collaboration and innovation/creativity. It was also found that there were no significant differences in collaboration and innovation/creativity by gender (Ilhan & Unal, 2021). Cantas et al.'s (2024) correlational study found significant differences in multidimensional 21st-century skills and lifelong learning among Turkish undergraduate students, with students in 3rd and 4th years demonstrating higher scores. Almulla's (2023) study, informed by constructivist learning theory as a model for Saudi Arabian university students' critical thinking, creativity, and problem-solving skills, showed that learning motivation, cooperativity, peer contact, peer engagement, and a smart classroom environment were positively associated with students' critical thinking and creativity. It was also shown that students' critical thinking and creativity were positively associated with problem-solving skills and academic success (Almulla, 2023).

In Pakistan, Mahmood and Saleem (2024) examined 21st-century skills among university students in blended learning programs using pre- and post-test scores. It was revealed that students had improvement in critical and innovative thinking skills (like drawing conclusions, making decisions, and implementing new ideas), as well as interpersonal skills, such as communication and collaboration skills (Mahmood & Saleem, 2024). Likewise, Khan et al. (2019) found that the implementation of 21st-century skills programs and practices in universities helped develop students' 4Cs skills, including critical thinking and problem-solving, communication, collaboration, and creativity. Mahmud et al. (2023) employed a quasi-experimental study to explore the impact of a web-based learning platform, Padlet, on improving the

21st-century skills of undergraduate students, and it was found that the 21st-century skills, such as communication and collaboration, were significantly improved.

In China, [Zhong et al. \(2025\)](#) employed data from interviews (n = 46) and a questionnaire survey (n = 628), revealing that esports-based learning cultivated university students' acquisition of 4Cs skills—critical thinking, creativity, communication, and collaboration. It was also shown that there was no significant difference in 4Cs skills by gender; however, significant differences in students' 4Cs skills acquisition by years of esports experience ([Zhong et al., 2025](#)). [Cai et al.'s \(2017\)](#) study found no significant difference in 21st-century competencies between male and female high school students. However, students' 21st-century competencies were significantly different across different grades from grades 6 to 10, with the 6th-grade students outperforming those in grades 8 and 10, including problem-solving, ICT, critical thinking, and communication and collaboration competencies ([Cai et al., 2017](#)).

[Mahmud and Wong's \(2022\)](#) study on the importance of 21st-century skills for career readiness of Malaysian undergraduate students found that problem-solving skills help develop critical thinking skills, which contribute to the development of creative thinking skills. It was also found that incorporating problem-solving skills into the curriculum or the learning process helps students enhance their academic achievement, creativity, and critical thinking skills, thereby preparing them to solve problems and issues in their future careers ([Mahmud and Wong, 2022](#)). [Fong et al. \(2014\)](#) found that Malaysian postgraduate students had high levels of 21st-century skills, such as ICT skills, collaboration, and lifelong learning skills, but critical thinking and communication skills were lacking.

In Vietnam, [Yao and Tuliao \(2018\)](#) explored graduate students' soft skills and found that through classroom-based practices, students had opportunities to develop soft skills, such as independent work, interpersonal relationships, and the ability to work in global contexts, which in turn contribute to their employability. [Lu and Nguyen's \(2022\)](#) recent study found that university students possessed high degrees of critical thinking skills in terms of interpreting, analyzing, inferring, evaluating, and self-regulating. [Yao and Tuliao \(2018\)](#) also found that interacting with international faculty members

could provide students with opportunities to enhance their independent skills, critical thinking, communication, and cultural competence. [Nguyen and Jongkonklang \(2018\)](#) found that high school students had high levels of 21st-century learning skills, such as creative thinking and problem-solving. Further analysis also showed that there were no significant differences in 21st-century skills among students by gender ([Nguyen & Jongkonklang, 2018](#)).

Research into 21st-century skills and employability in Cambodia

The development of 21st-century skills among students has received growing attention in Cambodia, including from policymakers, employers, and academics ([Boun et al., 2020](#); [Ke & Neak, 2025](#); [Kuocho et al., 2024](#); [MoEYS, 2024](#)). [Smekalova et al. \(2024\)](#) noted that employers need college graduates with well-equipped knowledge and competencies to overcome complex situations and solve problems effectively in this fast-changing world. [Boun et al. \(2020\)](#) noted that critical thinking, communication, creativity, and collaboration are essential 21st-century skills that enable Cambodian graduates to survive in the market competition. [Tes and Khen \(2025\)](#) noted that basic soft skills, such as communication, teamwork, critical thinking, and problem-solving, are vital in enhancing graduates' employability prospects. These skills help graduates to meet employers' priorities, enhance self-confidence, and support career development ([Tes & Khen, 2025](#)).

A few empirical studies have examined topics related to 21st-century skills and employability ([Chan, 2023](#); [Ke & Neak, 2024](#)), with some studies showing that Cambodian undergraduate students had modest competencies in communication, digital technologies, and initiative and entrepreneurship ([Smekalova et al., 2024](#)). [Smekalova et al. \(2024\)](#) also found significant differences in communication and critical thinking/problem-solving skills among the students by year of study, with 4th-year students outperforming. [Ke and Neak \(2025\)](#), who examined the 21st-century learning skills of Cambodian children, found that Cambodian children had low levels of collaboration, communication, creativity, critical thinking, and problem-solving. The study also showed that teachers who master high levels of 21st-century teaching skills could help students improve these skills ([Ke & Neak, 2025](#)).

In a tracer study, [Chet et al. \(2021\)](#) found that Cambodian graduate students considered critical thinking, creativity, and the ability to utilize technology as key factors contributing to career success. In essence, it is critical for universities

to build students' employability skills through comprehensive curriculum reform and the integration of 21st-century teaching and learning practices (Chea & Lo, 2022). Specifically, Chea and Lo (2022) showed that student-centered and active learning approaches were effective pedagogical strategies for fostering 21st-century skills. Similarly, Chan (2023) found that the main employability skills demanded in the market were professionalism, work commitment, and technological competence. However, the study also showed that many students were deficient in adaptability to change, communication skills, work commitment, and advanced digital skills (Chan, 2023). Therefore, providing comprehensive teaching and learning opportunities that promote 4Cs skills is imperative to prepare students for career success.

Despite these studies, research exploring Cambodian university students' 21st-century skills, particularly critical thinking, collaboration, communication, and creativity skills, leaves a relatively huge knowledge gap concerning this important topic. Therefore, this study aims to bridge the gap by examining the 21st-century skills of Cambodian university students.

Research methodology

Research design

This study employed a cross-sectional design to examine the levels of 21st-century skills among Cambodian university students. This study used an online questionnaire survey (Creswell, 2014) and a simple random strategy for data collection (Kumar, 2011). A cross-sectional design is employed by researchers to collect data at a single point in time to describe the characteristics and interests of the population, including age, gender, and geographical contexts (Cummings, 2017). Creswell (2014) noted that a survey can provide a quantitative assessment of the tendencies, behaviors, and perceptions of the population, which is considered appropriate for this study. According to Denscombe (2010), an internet-based survey offers a less costly and convenient alternative to other forms of surveys, including postal and telephone surveys. Thus, this research design and data collection method were deemed suitable for the present study.

Research setting

This study took place at one private university located in Siem Reap province, Cambodia. The researchers chose to conduct the study at this private university

for two main reasons. First, it is based on ease of accessibility for data collection, as three of the researchers are lecturers and staff at the university. Institutional familiarity allows the researchers to gain access and obtain a high response rate from the target population (Marshall & Rossman, 2010). Another reason is that higher education institutions, especially universities, are responsible for developing not only students' technical skills and knowledge but also their 21st-century skills needed for the job market. Han et al. (2021) noted that 21st-century skills, such as communication, collaboration, critical thinking, and creativity, are essential skills for the future. Like other countries, higher education institutions in Cambodia play a key role in developing human capital through providing students with the necessary knowledge and skills (Chuon, 2023). According to Kuoch et al. (2021), communication, problem-solving, and teamwork are among the most important skills required in the workplace, yet they are often found to be lacking among graduates. Therefore, the targeted university offered an ideal setting to examine current levels of Cambodian university students' 21st-century skills.

Sample and sampling strategy

A simple random strategy was employed to select the participants for this study. The participants in this research were Cambodian university students who studied at a private university in Siem Reap, Cambodia. As shown in Table 1, there were 232 Cambodian university students (32.33% female) who participated in this research. Their age distribution ranged from 20 to over 36 years old, with 21-25 years being the most (74.14%). About one-third of them were in year 4 (34.05%), while the rest were in year 1 (24.57%), year 2 (23.28%), and year 3 (18.10%). Majors of study differed significantly: Business Administration (37.07%), TESOL (36.64%), International Relations (16.38%), Finance and Banking (6.90%), Tourism and Hospitality (2.16%), and others (such as computer science and English for business communication) (0.86%). Regarding types of employment, about two-thirds of them were 'students and working' (63.36%) and 'students only' (16.81%), while the rest (19.83%) were government staff, company staff, freelancers, and self-employed or business owners.

Table 1. Participants' demographic information (n = 232)

Demographic	Value	Frequency	Percentage
Gender	Male	75	32.33
	Female	157	67.67
Age	<20 years old	38	16.38
	21-25 years old	172	74.14
	26-30 years old	17	7.33
	31-35 years old	3	1.29
	36-40 years old	2	0.86
Year of study	1st year	57	24.57
	2nd year	54	23.28
	3rd year	42	18.10
	4th year	79	34.05
Majors of studies	TESOL	85	36.64
	Tourism and Hospitality	5	2.16
	International Relations	38	16.38
	Business Administration	86	37.07
	Finance and Banking	16	6.90
	Others (Computer Science and English for Business Communications)	2	0.86
Types of employment	Student only	39	16.81
	Students and working	147	63.36
	Government staff	3	1.29
	Company staff	20	8.62
	NGOs staff	13	5.60
	Freelancer	2	0.86
	Self-employed/owned business	8	3.45

Table 2. Reliability test

Main constructs	Number of items	Cronbach's alpha
Critical thinking skills	6	0.85
Collaboration skills	5	0.84
Communication skills	6	0.83
Creativity skills	5	0.83
Overall	22	0.93

Research instrument

The questionnaire survey was developed using Microsoft Forms and written in both Khmer and English to ensure clarity and prevent language-related misunderstanding, as all participants were native Khmer speakers. The questionnaire had two main sections, consisting of 27 items. Section 1 was the participants' demographic information, with six questions. Section 2 focused on the 21st-century skills of university students with 21 questions, and a five-point Likert scale (from 1 = Strongly disagree to 5 = Strongly agree) was adopted.

The questionnaire was designed by the first author and was subsequently checked and enhanced by other authors. It was developed based on studies in the literature review, such as [Afikah et al. \(2024\)](#), which measured critical thinking skills in science learning, and [Kelley et al. \(2019\)](#), which developed a 21st-century skills survey instrument for high school students. Based on these studies, the questionnaire included items measuring four core dimensions of university students' 21st-century skills: critical thinking, collaboration, communication, and creativity.

Data collection and analysis

The questionnaire link was distributed to Cambodian university students via Telegram groups. Telegram was used as a major means of sharing the survey link because it is the most commonly used platform in Cambodia for communication among teachers and students. The researchers asked permission to go to different classrooms to inform students about the research and sought support from their colleagues to share the survey link with their students through Telegram groups. The questionnaire was also piloted with ten students to ensure clarity, relevance, and comprehensibility before the official data collection. Based on their feedback, refinements were made to enhance wording, structure, and reliability. For instance, "I can understand questions that lead to critical thinking" was revised to "I can answer questions or solve problems that require careful thinking and analysis," "I justify choices based on specific evaluation criteria" was revised to "I can make informed decisions based on specific evaluation criteria," "I am able to complete tasks effectively without having to be reminded" was revised to "I am able to complete tasks effectively and responsibly without having to be reminded by team members," and "I can understand how knowledge or ideas might be transferred to other products" was revised to "I can understand that concepts from one subject area

can be used to solve problems in different contexts.” The survey was open for approximately 11 weeks, from August 11 to October 31, 2025. It took approximately 10 to 15 minutes to complete the survey.

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. To analyze the data, the responses from Microsoft Forms were imported into Microsoft Excel for data cleaning and preparation. They were then imported into SPSS for coding and analysis. An internal reliability test was calculated, yielding a Cronbach’s alpha of 0.93, indicating very good internal consistency across 22 questionnaire items (see Table 2). Both descriptive and inferential statistical methods were utilized, such as percentage, frequency, mean, standard deviation, t-test, and analysis of variance (ANOVA).

Ethical considerations

Throughout the research process, ethical standards were carefully checked. First, a request letter was issued by the first author, submitted to the targeted university for permission to conduct data collection and stating the purpose of the study. Second, respondents’ specific personal information, such as names, phone numbers, and email addresses, was not collected, as it could lead to revealing their identities. Participation in the survey was based on voluntarism and anonymity, and the participants could complete the survey at their convenience. They were also informed that they could withdraw from the survey at any time without having to provide explanations or reasons.

Results

Levels of 21st-century skills of Cambodian university students

Critical thinking skills

Table 3 presents the Cambodian university students’ levels of critical thinking skills. The results showed that the participants held an overall high level of critical thinking skills ($M = 4.02$, $SD = 0.79$). Particularly, the results revealed that the participants reported high levels of agreement regarding their critical thinking skills related to statements, such as ‘I use my knowledge to solve problems in certain situations.’ ($M = 4.25$, $SD = 0.72$), ‘I compare information from different sources before drawing a conclusion.’ ($M = 4.21$, $SD = 0.82$), and ‘I combine different components, perspectives, and data sources to develop well-rounded solutions.’ ($M = 4.05$, $SD = 0.76$). However, the participants appeared to hold moderately high levels of agreement when it comes to

statements: 'I can make informed decisions based on specific evaluation criteria.' ($M = 3.95$, $SD = 0.84$), 'I can evaluate reasoning and evidence that support an argument.' ($M = 3.86$, $SD = 0.80$), and 'I can answer questions or solve problems that require careful thinking and analysis.' ($M = 3.78$, $SD = 0.81$).

Table 3. Participants' critical thinking skills

Statements	Levels of agreement		Mean	SD
	Agree	Strongly agree		
I compare information from different sources before drawing a conclusion.	40.52	41.81	4.21	0.82
I can evaluate reasoning and evidence that support an argument.	46.12	21.55	3.86	0.80
I use my knowledge to solve problems in certain situations.	46.12	40.09	4.25	0.72
I combine different components, perspectives, and data sources to develop well-rounded solutions.	48.71	28.88	4.05	0.76
I can answer questions or solve problems that require careful thinking and analysis.	41.81	19.83	3.78	0.81
I can make informed decisions based on specific evaluation criteria.	44.40	27.59	3.95	0.84
Overall	44.61	29.96	4.02	0.79

Collaboration skills

As shown in Table 4, Cambodian university students reported consistently high levels of collaboration skills ($M = 4.32$, $SD = 0.76$). Specifically, the results showed that participants tended to agree with all statements related to their collaboration skills, such as 'I show kindness and politeness to all team members.' ($M = 4.38$, $SD = 0.75$), 'I appreciate and respect other perspectives.' ($M = 4.38$, $SD = 0.75$), 'I can ensure all team members' ideas are equally valued.' ($M = 4.34$, $SD = 0.80$), and 'I improve my work through the feedback I receive.' ($M = 4.31$, $SD = 0.74$). In addition, the participants also appeared to have a high level of collaboration skills related to the statement: 'I offer assistance to others in their work when needed.' ($M = 4.18$, $SD = 0.76$).

Table 4. Participants' collaboration skills

Statements	Levels of agreement		Mean	SD
	Agree	Strongly agree		
I show kindness and politeness to all team members.	40.09	50.00	4.38	0.73
I appreciate and respect other perspectives.	37.93	50.86	4.38	0.75
I can ensure all team members' ideas are equally valued.	36.64	50.43	4.34	0.80
I offer assistance to others in their work when needed.	46.12	37.07	4.18	0.76
I improve my work through the feedback I receive.	43.53	44.83	4.31	0.74
Overall	40.86	46.64	4.32	0.76

Communication skills

As presented in Table 5, Cambodian university students reported moderately high levels of communication skills ($M = 3.69$, $SD = 0.81$). The results revealed that participants tended to have moderately high levels of agreement regarding their communication skills related to statements, such as 'I am able to complete tasks effectively and responsibly without having to be reminded by team members.' ($M = 3.99$, $SD = 0.87$), 'I use appropriate ways to enhance understanding by creating a clear introduction and conclusion.' ($M = 3.79$, $SD = 0.76$), and 'I can track the team's progress toward goals and deadlines.' ($M = 3.74$, $SD = 0.79$). The results also revealed that the participants tended to hold moderately high levels of agreement related to statements of their communication skills, such as 'I can use time and run meetings/workshops efficiently.' ($M = 3.59$, $SD = 0.77$), 'I can structure data for use in written products or oral presentations, such as creating charts, tables, graphs, or videos.' ($M = 3.56$, $SD = 0.87$), and 'I can organize and convey information or ideas fluently.' ($M = 3.45$, $SD = 0.83$).

Table 5. Participants' communication skills

Statements	Levels of agreement		Mean	SD
	Agree	Strongly agree		
I can use time and run meetings/workshops efficiently.	42.67	11.21	3.59	0.77
I can organize and convey information or ideas fluently.	41.38	7.76	3.45	0.83
I can structure data for use in written products or oral presentations, such as creating charts, tables, graphs, or videos.	39.22	13.36	3.56	0.87
I use appropriate ways to enhance understanding by creating a clear introduction and conclusion.	48.28	17.24	3.79	0.76
I can track the team's progress toward goals and deadlines.	49.57	15.09	3.74	0.79
I am able to complete tasks effectively and responsibly without having to be reminded by team members.	46.12	29.31	3.99	0.87
Overall	44.54	15.66	3.69	0.81

Creativity skills

Table 6 presents the Cambodian university students' levels of creativity skills. The results showed that participants reported moderately high levels of creativity skills in all statements ($M = 3.74$, $SD = 0.81$). Specifically, the results revealed that the participants appeared to have moderately high levels of agreement regarding their creativity skills related to statements, such as 'I can understand that concepts from one subject area can be used to solve problems in different contexts.' ($M = 3.84$, $SD = 0.74$), 'I can adapt communication styles appropriate for different purposes, tasks, or people.' ($M = 3.80$, $SD = 0.88$), 'I am confident in my ability to elaborate and improve ideas.' ($M = 3.77$, $SD = 0.81$), 'I can help the team solve problems and manage conflicts.' ($M = 3.76$, $SD = 0.81$), and 'I have the ability to find sources of information when others do not.' ($M = 3.51$, $SD = 0.82$).

Table 6. Participants' creativity skills

Statements	Levels of agreement		Mean	SD
	Agree	Strongly agree		
I can understand that concepts from one subject area can be used to solve problems in different contexts.	50.86	18.10	3.84	0.74
I have the ability to find sources of information and inspiration when others do not.	40.95	9.91	3.51	0.82
I can help the team solve problems and manage conflicts.	47.41	17.24	3.76	0.81
I can adapt a communication style appropriate for different purposes, tasks, or people.	44.40	21.55	3.80	0.88
I am confident in my ability to elaborate and improve ideas.	46.12	17.67	3.77	0.81
Overall	45.95	16.90	3.74	0.81

Do the levels of 21st-century skills of Cambodian university students differ by gender and year of study?

Comparison of students' 21st-century skills by gender

An independent sample t-test was conducted to examine the differences in the levels of 21st-century skills between male and female Cambodian university students, specifically in terms of critical thinking, collaboration, communication, and creativity. As shown in Table 7, the results revealed that there were no statistically significant differences in levels of 21st-century skills among male and female Cambodian university students, such as critical thinking, collaboration, communication, and creativity skills ($p > 0.05$). These results indicated that Cambodian university students held consistent levels of 21st-century skills, including critical thinking, collaboration, communication, and creativity skills, regardless of gender.

Table 7. Comparison of students' 21st-century skills by gender

Main constructs	Sex	Mean	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Critical thinking	Male	4.09	1.207	224	0.229	0.10	0.09	-0.07	0.28
	Female	3.99							
Collaboration	Male	4.28	-0.798	224	0.426	-0.07	0.09	-0.24	0.10
	Female	4.34							
Communication	Male	3.78	1.547	224	0.123	0.14	0.09	-0.04	0.31
	Female	3.64							
Creativity	Male	3.84	1.550	224	0.122	0.14	0.09	-0.04	0.32
	Female	3.70							

Comparison of students' 21st-century skills by year of study

A one-way ANOVA was performed to examine differences in Cambodian university students' 21st-century skills, including critical thinking, collaboration, communication, and creativity, based on year of study. As shown in Table 8, there were statistically significant differences in critical thinking, collaboration, and communication skills among the students ($p < 0.05$). However, there was no statistically significant difference in the creativity skills among the students across year levels. Specifically, the analysis showed a statistically significant difference in critical thinking skills across year levels, $F(3, 228) = 7.62, p = 0.000$.

A post-hoc test using Tukey HSD indicated that the students in the 4th year ($M = 4.24, SD = 0.53$) had significantly higher mean scores than 1st-year students ($M = 3.77, SD = 0.61$). For collaboration skills, the results revealed a statistically significant difference across year levels, $F(3, 228) = 3.01, p = 0.031$. Post-hoc analysis using Tukey HSD showed that 4th-year students ($M = 4.45, SD = 0.49$) had significantly higher mean scores than 1st-year students ($M = 4.15, SD = 0.66$). Regarding communication skills, significant differences were also found across year levels, $F(3, 228) = 4.77, p = 0.003$. Post-hoc analysis using Tukey HSD showed that the 4th-year participants ($M = 3.87, SD = 0.56$) scored significantly higher than both 1st-year ($M = 3.53, SD = 0.65$) and 3rd-year students ($M = 3.53, SD = 0.58$). These results indicated that the 21st-century skills, particularly critical thinking, collaboration, and communication, tended to be improved as the students gained more experiences in academic life.

Table 8. Comparison of students' 21st-century skills by year of study

		Mean	SD	Source	SS	df	MS	F	Sig.	Tukey HSD
Critical thinking skills	1st year (1)	3.77	0.61	Between Groups	7.54	3	2.51	7.620	0.000	
	2nd year (2)	3.98	0.68	Within Groups	75.23	228	0.33			
	3rd year (3)	3.96	0.43	Total	82.78	231				4>1
	4th year (4)	4.24	0.53							
Collaboration skills	1st year	4.15	0.66	Between Groups	3.06	3	1.02	3.006	0.031	
	2nd year	4.34	0.67	Within Groups	77.27	228	0.34			
	3rd year	4.28	0.51	Total	80.32	231				4>1
	4th year	4.45	0.49							
Communication skills	1st year	3.53	0.65	Between Groups	4.96	3	1.65	4.772	0.003	
	2nd year	3.70	0.57	Within Groups	78.93	228	0.35			
	3rd year	3.53	0.58	Total	83.88	231				4>1/4>3
	4th year	3.87	0.56							
Creativity skills	1st year	3.59	0.68	Between Groups	2.02	3	0.67	1.738	0.160	
	2nd year	3.78	0.61	Within Groups	88.32	228	0.39			
	3rd year	3.72	0.60	Total	90.34	231				—
	4th year	3.83	0.60							

Note: SS = Sum of Squares; MS = Mean Square; Tukey HSD = Tukey's Honestly Significant Difference

Discussion

This study aimed to examine Cambodian university students' levels of 21st-century skills: critical thinking, collaboration, communication, and creativity. The results showed that Cambodian university students held higher levels of collaboration skills and critical thinking skills, while creativity and communication skills appeared to be moderately high. The results are consistent with previous studies reported by [Chan \(2023\)](#), [Ke and Neak \(2025\)](#), and [Smekalova et al. \(2024\)](#) in the context of Cambodia. [Smekalova et al. \(2024\)](#), for instance, found that Cambodian students had moderate levels of competent acquisition in communication, and they acquired high levels of teamwork and problem-solving skills. However, creativity was found lacking among Cambodian pupils at the primary school level ([Ke and Neak, 2025](#)), highlighting a gap in the education system from an early stage. Moreover, the results of this study are consistent with previous studies of different contexts, such as Greece ([Kousloglou et al., 2023](#)), Malaysia ([Fong et al., 2014](#); [Mahmud & Wong, 2022](#)), Pakistan ([Khan et al., 2019](#); [Mahmood & Saleem, 2024](#); [Mahmud et al., 2023](#)), and Vietnam ([Lu & Nguyen, 2022](#); [Nguyen & Jongkonklang, 2018](#); [Yao & Tuliao, 2018](#)). For instance, students were found to be well equipped with critical thinking skills, such as interpreting or analyzing information ([Kousloglou et al., 2023](#); [Lu & Nguyen, 2022](#)) and communication skills ([Crespí et al., 2025](#)); however, their creativity and collaboration skills were lacking, as they struggled to work well in a team ([Crespí et al., 2025](#); [Fong et al., 2014](#)). Therefore, employing blended learning programs ([Mahmood & Saleem, 2024](#)), implementing 21st-century skills practices ([Khan et al., 2019](#)), integrating web-based learning platforms ([Mahmud et al., 2023](#)), and increasing student-faculty member interactions ([Yao & Tuliao, 2018](#)) could help students develop these essential skills.

The study revealed no significant differences in critical thinking, collaboration, communication, and creativity skills among male and female Cambodian university students, indicating that both male and female students developed these four 21st-century skills consistently. These results align with those studies in different contexts, such as China ([Zhong et al., 2025](#); [Cai et al., 2017](#)), Turkey ([Ilhan & Unal, 2021](#)), and Vietnam ([Nguyen & Jongkonklang, 2018](#)). [Ilhan and Unal \(2021\)](#), for example, found that male and female university students did not perform differently in collaboration skills and innovation/creativity skills. [Cai et al. \(2017\)](#) found no significant differences in 21st-century competencies

among high school students. Nevertheless, the results of this study showed statistically significant differences in critical thinking, collaboration, and communication of Cambodian university students by years of study, while no significant differences in creativity skills were found. These results align with those reported by [Smekalova et al. \(2024\)](#) in the context of Cambodia, [Cantas et al. \(2024\)](#) in Turkey, and [Zhong et al. \(2025\)](#) in China. For example, [Smekalova et al. \(2024\)](#) found that communication and critical thinking/problem-solving skills significantly differed among Cambodian students, with 4th-year students acquiring the highest competencies. Similarly, [Cantas et al. \(2024\)](#) found that undergraduate students held significantly different levels of 21st-century skills and lifelong learning skills, indicating that 3rd- and 4th-year students held higher scores than junior students. [Zhong et al. \(2025\)](#) found that there were significant differences in students' 4Cs skills acquisition by year of experience. However, the results of this study are contrary to those of [Cai et al. \(2017\)](#), who found that high school students held different levels of 21st-century competencies across different grades between grades 6 and 10, with the 6th-grade students performing higher scores than those in 8th and 10th grades, including problem-solving, critical thinking, communication, and collaboration skills.

Conclusion and implications

This study has explored Cambodian university students' levels of 21st-century skills in terms of critical thinking, collaboration, communication, and creativity skills. The results revealed that the Cambodian university students acquired high levels of collaboration and critical thinking skills; however, they had moderately high levels of creativity and communication skills. It also revealed no significant differences in critical thinking, collaboration, communication, and creativity skills between male and female Cambodian university students. Further analysis revealed that there were statistically significant differences in critical thinking, collaboration, and communication of Cambodian university students by years of study, indicating that senior university students held higher critical thinking, collaboration, and communication scores than junior ones. However, the results showed that there were no significant differences in creativity skills across the years of study. Since the creativity skills remained consistent throughout the four academic years, the current curriculum development and instructional methods are questionable, necessitating imperative adjustment or refinement.

The study has a few implications. As the communication and creativity skills among university students were moderately high, higher education institutions, university leaders, administrators, and academic lecturers/instructors should modify or update university curricula, academic programs, and pedagogical approaches to cultivate students' communication ability and enhance their collaboration competence. Twenty-first-century pedagogical techniques, such as problem-based learning, project-based learning, inquiry-based learning, cooperative learning, experiential learning, gamification, and authentic and formative assessment, coupled with ICT use and technology-enhanced instruction, are highly potential for enhancing the students' 21st-century skills. In addition, academic instructors and lecturers should also be equipped with 21st-century teaching competencies to align with updated programs or curricula developed by the universities. Academic instructors can participate in any form of continuous professional development programs, such as research conferences, best practice workshops or seminars, and mentorship programs to stay up-to-date, obtain well-rounded knowledge, and absorb the latest teaching practices to effectively deliver lessons and develop 21st-century skills in the students.

This study has shown that there were statistically significant differences in critical thinking, communication, and collaboration, with 3rd- and 4th-year students holding higher scores. Therefore, university leaders, curriculum developers, and academic staff need to integrate 21st-century skills teaching and learning programs or activities that help nurture the critical thinking, communication, and collaboration skills of the students since their freshman year. Group projects, group discussions, role-plays, debates, game-based learning, gallery walks, and technology-integrated learning, such as Padlet and Kahoot, should be introduced frequently to students to promote collaborative learning, boost interactions, and enhance thinking ability. Moreover, students themselves need to be both proactive and active learners in order to identify any deficient skills and seek ways to develop them through joining mentorship programs, taking extra courses, or participating in extracurricular activities besides class times.

This study is not exempt from limitations. First, since it was designed as a cross-sectional survey in which information was gathered only at a single time, the results were unable to capture any change in the development of students

regarding 21st-century skills. Second, the study employed online surveys in which the link was distributed or shared with students mainly through different Telegram groups; it could have missed some potential respondents participating in the study at the time of data collection, leading to a lack of well-rounded insights. Third, another limitation was the use of a self-perceived skills survey, as students subjectively rated themselves on a 1–5 scale rather than on a performance test. Therefore, it may lead to a social desirability bias. Fourth, as the study was conducted at only one private university and with undergraduate students in Siem Reap, the results could not represent the diversity of students' levels of 21st-century skills at other universities or degree levels, such as master's degrees and doctoral degrees. Fifth, only 232 Cambodian university students participated in this study; therefore, the results may not entirely generalize the levels of Cambodian students' 21st-century skills, particularly critical thinking, collaboration, communication, and creativity skills, across Cambodia. To address these limitations, future research should enlarge its scope by including a larger sample size, using a longitudinal research design, or exploring Cambodian university students' 21st-century skills across multiple higher educational institutions for comparative purposes. Future research is also suggested to employ a correlational design to examine relationships among critical thinking, collaboration, communication, and creativity skills. Furthermore, future research is recommended to use qualitative or mixed-methods approaches to obtain more comprehensive understandings of this topic.

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