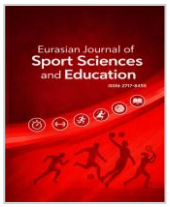
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Research Article

A Comparative Examination of 21st-Century Skills and Academic Achievement Levels among Sports Sciences Students

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Abstract

This study aims to comparatively examine the 21st-century skills and academic achievement levels of students enrolled in sports sciences programs. Within the framework of a quantitative research approach, a descriptive survey design was employed. The study sample consisted of 448 voluntary students selected through convenience sampling from Istanbul Gelisim University School of Physical Education and Sports, including the departments of Coaching Education, Exercise and Sport Sciences for Individuals with Disabilities, Exercise and Sport Sciences, Recreation, and Sport Management. Data were collected using a Personal Information Form and the Comprehensive 21st-Century Skills Scale. In addition, students' cumulative grade point averages (CGPA) were obtained to determine their academic achievement levels, and all collected data were included in the statistical analysis process. The findings revealed that 21st-century skill levels of sports sciences students did not differ significantly according to gender, department, or purpose of social media use. However, significant differences were identified in the sub-dimensions of collaboration, creativity and innovation with respect to age; collaboration, critical thinking and problem solving, creativity and innovation, information and communication technologies, and leadership skills with respect to grade level; and critical thinking and problem solving, social responsibility and adaptability, and entrepreneurship and self-management with respect to time spent on social media. Overall, the results indicate that certain sub-dimensions of 21st-century skills are sensitive to variables such as age, grade level, and time spent in digital environments.

Keywords: Physical education and sports, 21st-century skills, academic achievement, competency

INTRODUCTION

Twenty-first-century skills are conceptualized in the literature as higher-order learning competencies that individuals must acquire in order to advance in their respective fields, particularly in light of rapid developments in information and communication technologies. In an era characterized by intensifying cross-sectoral competition, equipping individuals with competencies that contribute to societal development while simultaneously supporting academic and professional success has become a strategic priority for nations.

The expansion of globalization worldwide, diversification of labor and employment structures, increased economic mobility, and the rapid escalation of competition have collectively generated a demand for individuals who possess competencies beyond conventional standards. The skills expected by employers are commonly articulated through concepts such as 21st-century skills, competencies, or proficiencies (Voogt & Roblin, 2012).

From the perspective of sports sciences education, the significance of 21st-century skills becomes even more pronounced. The field of sports sciences encompasses a dynamic structure that integrates performance analytics, sports technologies, data-driven training design, multidisciplinary teamwork, and ethical governance. In particular, performance analysis software, wearable technologies, and big data applications have rendered digital literacy a critical competency for sport professionals (Baca et al., 2009). Moreover, in domains such as coaching, sport management, and recreation, effective communication, leadership, and problem-solving skills constitute fundamental determinants of professional success. Sport environments inherently involve teamwork, strategic thinking, and rapid decision-making processes. Consequently, students of sports sciences are expected not only to possess theoretical knowledge but also to demonstrate competencies such as collaboration, adaptability, and analytical thinking. Contemporary sport education literature further indicates that interdisciplinary working

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skills and digital competencies are significantly associated with professional performance among sport practitioners (Lara Bercial & McKenna, 2018).

The ease of rapid access to existing sources requires individuals to demonstrate creativity and integrate it into productive processes in order to generate awareness in both their professional and social lives (Dede, 2009). As rapid global change continues, it has become increasingly evident that individuals must possess specific competencies to make informed career choices, develop professional qualifications, and progress in their careers. In developing its next strategic plan, the Global Partnership for Education (GPE) emphasizes serving as a starting point for qualified engagement by evaluating how education systems can equip children and young people with the diverse set of skills necessary to become effective, participatory, and productive members of their communities, countries, and the globalized world (Global Partnership for Education, 2020).

By integrating competencies such as creativity, collaboration, effective communication, and critical thinking into curricula, educational institutions can foster interdisciplinary perspectives on human experience. These competencies are also essential for preparing students to confront future challenges and to navigate complex social and technological environments with confidence and adaptability (Radha & Kareem, 2025).

By incorporating competencies such as creativity, collaboration, effective communication, and critical thinking into curricula, educational institutions can foster an interdisciplinary perspective on human experience. These competencies are also essential for preparing students to navigate future challenges and to operate confidently within complex social and technological environments (Radha & Kareem, 2025). Considering the growing impact of digitalization on the sports sector, the use of data analytics, performance monitoring systems, and online interaction platforms has made it imperative for sports sciences students to develop such skills.

Extensive research has been conducted on 21st-century competencies, and several updated conceptual models have emerged in the literature (Hamarat, 2019; Koçak & Çakmak, 2021):

- The Partnership for 21st Century Skills (P21) Model, developed in the United States, was designed to position 21st-century competencies at the core of K–12 education.
- The EnGauge Model, developed by Metiri Group and Learning Point Associates, aims to enhance and advance 21st-century competencies among teachers, students, and administrators.
- The Assessment and Teaching of 21st Century Skills (ATCS) Model, established as part of a global initiative supported by Cisco, Intel, and Microsoft, seeks to provide clear and operational conceptual definitions of 21st-century skills.
- The International Society for Technology in Education (ISTE) brings together educators contributing to the transformative power of technology integration in education.
- The Organisation for Economic Co-operation and Development (OECD), based on its research and reports, characterizes individuals equipped with 21st-century skills as those who can adapt to transformations in cultural and social norms, demonstrate diverse cognitive attributes, and meet evolving expectations regarding teaching and learning processes.

Within this framework, 21st-century skills may be regarded not merely as general educational outcomes for students of sports sciences, but as strategic competencies directly related to professional qualification, academic sustainability, and sectoral competitiveness. Accordingly, sports sciences curricula should be designed to integrate domain-specific knowledge with critical thinking, digital literacy, and collaborative competencies.

Teaching and learning models developed under the Framework for 21st Century Learning were formulated by educators, instructional experts, and industry leaders to ensure the achievement of learning outcomes and to enable individuals to acquire the knowledge and competencies necessary for success in career, life, and civic engagement (Framework for 21st Century Learning, 2017; Suarta et al., 2017). According to the classification proposed by the Partnership for 21st Century Skills, 21st-century skills are examined under three primary categories.

The first category, learning and innovation skills, encompasses subcomponents such as critical and creative thinking, problem solving, communication, collaboration, and information literacy. The second category includes information, media, and technology skills, covering media literacy, information and communication technology literacy, flexibility and adaptability, and entrepreneurship. The third category, defined as life and career skills, includes dimensions such as social and intercultural competence, productivity, accountability, leadership, and responsibility (Gelen, 2017; Framework for 21st Century Learning, 2017; Masek & Suhadi, 2018). In the context of sports sciences education, these competencies are regarded not only as elements of individual development but also as indicators of professional qualification. Professionals working in subfields such as coaching, sport management, recreation, and performance analytics gain a competitive advantage through their capacity to engage in effective teamwork, make strategic decisions, and utilize digital tools efficiently. Therefore, integrating 21st-century skills into sports sciences curricula may be considered a critical factor in supporting both students' academic achievement and the sustainability of their post-graduation careers.

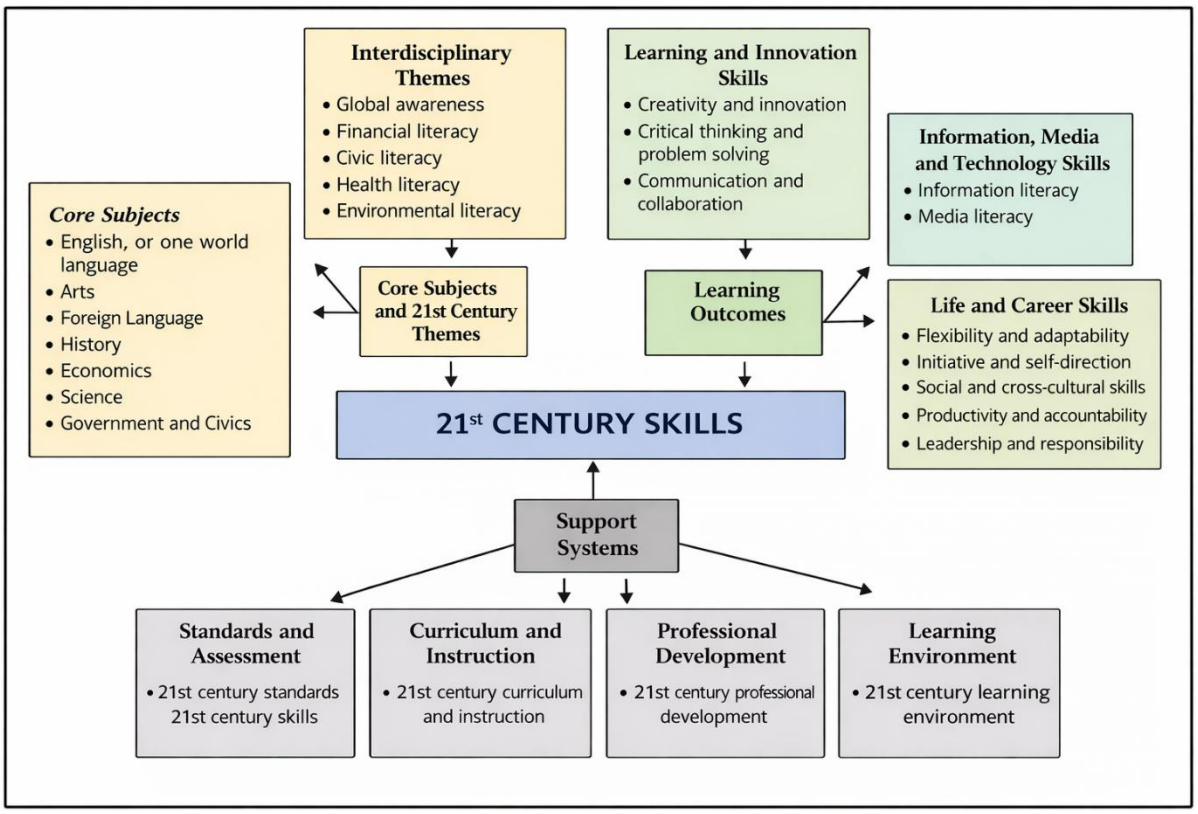


Figure 1. 21st Century skills (Doğuş, 2024)

The overarching aim of 21st-century skills is to ensure that individuals become aware of the competencies and capabilities expected of them in the future and engage in a structured developmental process aligned with these expectations. Core skills are organized under three primary domains and further structured into sub-dimensions. This framework encompasses foundational literacies, interdisciplinary themes, learning and innovation skills, information, media and technology skills, life and career skills, and support systems.

In Türkiye, ongoing efforts focus on the conceptualization and implementation of the The Turkish Century Education Model. In modeling and conceptualizing skill development, it is considered essential that competencies be interpreted in conjunction with knowledge. The designated domain-specific skills have been structured to include inclusive competencies tailored to each field. Within the scope of the The Turkish Century Education Model, the competencies defined under "Physical Education, Games, and Sport Field Skills" conceptualize sport not merely as a means of enhancing physical performance, but as a multidimensional developmental framework aimed at strengthening cognitive processes, social interaction capacity, and emotional resilience. This framework incorporates higher-order competencies such as strategic thinking, collaboration, and leadership, reflecting a holistic approach to individual development.

The 2023 report issued by the Turkish Ministry of National Education and the Board of Education (MEB) provides a detailed explanation of the fundamental competency domains targeted for development in individuals. In this context, mother-tongue literacy, physical education and sport competencies, information literacy, and information and communication technology competencies are emphasized. Additionally, scientific literacy, sensitivity to human rights and democratic values, mathematical literacy, learning skills, self-awareness, and artistic competencies are categorized as foundational skills. Core life skills, foreign language proficiency, and civic consciousness are also identified as integral components of this classification (Ministry of National Education [MEB] & Presidency of the Council of Education [TTKB], 2023).

In alignment with 21st-century skills objectives, educational stakeholders have introduced specific practices to realize this vision and to accelerate transformation and development processes (Hamarat, 2019):

- Establishing a clear and strategic vision
- Planning, analyzing data, managing processes, and ensuring systematic organization
- Standardization of curricula
- Integration of technology into education
- Administrative contribution and leadership support
- Adequate physical infrastructure
- Ease of access
- Content development and management

- Social sharing and collaboration
- Professional development and training of educators

There are national and international bodies that define competencies and establish qualification frameworks. The Council of Europe adopted the European Qualifications Framework (EQF) in 2008 as a meta-policy instrument and overarching framework in the field of lifelong learning. The EQF was developed to enable clearer interpretation and comparability of qualification standards across countries (European Parliament & Council of the European Union. 20008).

Within this broader structure, National Qualifications Frameworks (NQF) consist of a set of principles organized across multiple levels to define and classify qualifications commonly used by national education authorities (National Qualifications Frameworks, 2022). The Turkish Qualifications Framework (TQF) was designed in coordination with the EQF as a supra-policy implementation instrument. The TQF serves as a comprehensive national qualifications framework encompassing all qualification standards acquired through learning at every level of education in Türkiye (Turkish Qualifications Framework, 2024).

In Türkiye, various competencies are being developed across all levels—from primary education to higher education—to enhance quality within vocational, general, and academic education programs and to ensure equal opportunity in sustaining lifelong learning. These key competencies have been articulated as communication in the mother tongue and in foreign languages, numerical and technological competencies, digital competence, learning to learn, and social competencies (Gelen, 2017). There is a substantial convergence between national qualifications frameworks and international 21st-century skills models. Within this context, sports sciences education emerges as a strategic domain in which these competencies are operationalized in applied and multidimensional ways. This alignment underscores the necessity of structuring sports sciences programs according to an educational paradigm that integrates cognitive, social, and digital competencies.

The contemporary technological era has evolved into an information age; consequently, enhancing and reconstructing societal benefits through education has become imperative. In a period characterized by rapid global transformation, it is essential to update educational programs and reassess emerging needs in order to avoid lagging behind ongoing advancements (Çiftçi et al., 2020). The primary point of departure for this study is to empirically examine the effect of 21st-century skill levels on the academic achievement of sports sciences students and, based on the findings obtained, to provide evidence-based recommendations for educational program development. Within this framework, the study is structured in three stages.

The first stage establishes the theoretical and conceptual foundations underlying the relationship between 21st-century skill levels and academic achievement among sports sciences students. The second stage involves the administration of data collection instruments to the designated sample, followed by statistical analyses of the collected data. In the third stage, conclusions and recommendations are presented with the aim of enhancing 21st-century skills within sports sciences education, drawing upon the empirical findings.

Accordingly, the specific objective of the research is to determine the statistical relationships between sports sciences students' 21st-century skill levels and their academic achievement indicators, and to examine whether these variables differ according to demographic characteristics.

Hypotheses

H_{1a}: There is a statistically significant difference in scale scores according to participants' gender.

H_{1b}: There is a statistically significant difference in scale scores according to participants' age.

H_{1c}: There is a statistically significant difference in scale scores according to participants' grade level.

H_{1d}: There is a statistically significant difference in scale scores according to participants' department.

H_{1e}: There is a statistically significant difference in scale scores according to participants' average daily time spent on social media.

H_{1f}: There is a statistically significant difference in scale scores according to participants' purpose of social media use.

H_{1g}: There is a statistically significant difference in scale scores according to participants' cumulative grade point averages (CGPA).

METHOD

Research model

This study examined the effect of 21st-century skill levels on the academic achievement of students enrolled in the School of Physical Education and Sports. A descriptive survey design, one of the survey research models, was employed. Descriptive survey research is conducted on large groups and aims to describe phenomena and events by collecting individuals' opinions and attitudes regarding a particular issue (Karakaya, 2012).

Within this framework, the study investigated the 21st-century skill levels of sports sciences students and their academic achievement, and conducted comparative analyses based on various demographic variables.

For the implementation of this research, ethical approval was obtained from the Ethics Committee of Istanbul Gelisim University (Decision No: 2024-12, dated 16 August 2024).

Research groups / Sampling

The target population of this study consisted of students enrolled in the School of Physical Education and Sports at İstanbul Gelişim University. Based on a priori power analysis conducted using G*Power software, the required minimum sample size was calculated as (n = 305). The study sample comprised 448 undergraduate students enrolled during the 2024–2025 academic year in the programs of Coaching Education (Turkish and English tracks), Exercise and Sport Sciences for Individuals with Disabilities, Exercise and Sport Sciences, Recreation, and Sports Management. Participants included first-, second-, third-, and fourth-year students who were actively continuing their education at the time of data collection (n = 448). A power analysis was conducted prior to data collection to determine the minimum required sample size for adequate statistical power (Kılbaş & Cevahir, 2023). Sampling in this study was conducted using a non-probability sampling method, specifically convenience sampling. Participants were included in the study on a voluntary basis. The primary objective of convenience sampling is to ensure the inclusion of individuals who are both accessible and relevant to the research topic (Özmen et al., 2013).

Collection of data

The study utilized the Comprehensive 21st-Century Skills Scale developed by Kalemkuş and Özek (2022). The scale's validity and reliability analyses had previously been conducted. To assess construct validity, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were applied, followed by factor analysis.

Reliability analyses for the scale factors were conducted using Cronbach's alpha coefficients. The coefficients were reported as follows: .921 for Factor 1, .917 for Factor 2, .899 for Factor 3, .865 for Factor 4, .850 for Factor 5, .687 for Factor 6, .674 for Factor 7, .667 for Factor 8, and .614 for Factor 9. The overall Cronbach's alpha coefficient for the entire scale was reported as .973 (Kalemkuş & Özek, 2022).

The instrument consists of two sections. The first section is a personal information form containing seven items, while the second section comprises 62 items. The second section is structured into nine sub-dimensions: critical thinking and problem solving, social responsibility and adaptability, collaboration, media literacy, information and communication technology literacy, creativity and innovation, entrepreneurship and self-direction, communication, and leadership skills. Permission to use the scale was obtained on March 23, 2024.

Ethical approval

For this study, ethical approval was obtained from the Istanbul Gelişim University Ethics Committee Chairmanship (Decision No. 2024–12, dated August 16, 2024).

Data / Statistical analysis

The collected data were analyzed based on arithmetic means and standard deviation values. To determine the distributional characteristics of the data, the Kolmogorov–Smirnov test was applied. In addition, skewness and kurtosis coefficients were examined to assess normality. As the data did not demonstrate a normal distribution, non-parametric tests were employed. Specifically, the Mann–Whitney U test and the Kruskal–Wallis test were conducted for group comparisons. All statistical analyses were performed using SPSS version 25, and the level of statistical significance was set at (p < .05).

FINDINGS

When Table 1 is examined, no statistically significant differences were found between male and female participants across any of the sub-dimensions (p > .05).

When Table 2 is examined, a statistically significant difference was identified in the collaboration skills sub-dimension (p < .05). The observed difference was found to be between students aged 18–21 and those aged 22–24. Similarly, a statistically significant difference was detected in the creativity and innovation sub-dimension (p < .05), with the difference occurring between the 18–21 and 22–24 age groups. No statistically significant differences were observed in the remaining sub-dimensions (p > .05).

When Table 3 is examined, a statistically significant difference was observed in the collaboration skills sub-dimension (p < .05). The identified differences were between second-year and first-year students, as well as between second-year and fourth-year students. A statistically significant difference was also found in the critical thinking and problem-solving sub-dimension (p < .05), with the difference occurring between second-year and fourth-year students. In the creativity and innovation sub-dimension, a statistically significant difference was detected (p < .05), and the difference was identified between first-year and second-year students. Similarly, a statistically significant difference was found in the information and communication technology literacy sub-dimension (p < .05), with differences observed between first-year and second-year students, and between second-year and fourth-year students. In the leadership skills sub-dimension, a statistically significant difference was

identified (p < .05), with differences occurring between first-year and second-year students, second-year and third-year students, and second-year and fourth-year students. No statistically significant differences were observed in the remaining sub-dimensions (p > .05).

Table 1. Evaluation of scale scores according to participants' gender

Variables	Gender		N	Mean Rank	Rank Sum	U
Communication Skills	Male	325	220.16	71552.00	18577	.237
	Female	123	235.97	29024.00		
Collaboration Skills	Male	325	224.01	72803.00	19828	.896
	Female	123	225.80	27773.00		
Critical Thinking and Problem Solving	Male	325	227.13	73816.00	19134	.482
	Female	123	217.56	26760.00		
Creativity and Innovation	Male	325	224.23	72874.00	19899	.939
	Female	123	225.22	27702.00		
Media Literacy	Male	325	222.54	72326.50	19351.5	.599
	Female	123	229.67	28249.50		
Information and Communication Technology Literacy	Male	325	222.62	72350.00	19375	.610
	Female	123	229.48	28226.00		
Social Responsibility and Adaptability	Male	325	221.28	71917.00	18942	.388
	Female	123	233.00	28659.00		
Entrepreneurship and Self-Management	Male	325	220.89	71790.00	18815	.321
	Female	123	234.03	28786.00		
Leadership Skills	Male	325	221.39	71950.50	18975.5	.386
	Female	123	232.73	28625.50		

Table 2. Analysis of participants' scale scores according to age variable

Variables	Age Group	N	Mean Rank	sd	x2	p	Difference
Communication Skills	18-211	312	218.56	2	2.269	.322	-
	22-242	111	238.18				
	25 and above[3]	25	237.86				
Collaboration Skills	18-211	312	213.45	2	8.064	.018*	1<2
	22-242	111	246.11				
	25 and above[3]	25	266.40				
Critical Thinking and Problem Solving	18-211	312	215.58	2	5.194	.074	-
	22-242	111	242.35				
	25 and above[3]	25	256.50				
Creativity and Innovation	18-211	312	214.60	2	8.430	.015*	1<3
	22-242	111	240.66				
	25 and above[3]	25	276.24				
Media Literacy	18-211	312	218.15	2	2.996	.224	-
	22-242	111	235.46				
	25 and above[3]	25	255.02				
Information and Communication Technology Literacy	18-211	312	222.38	2	.320	.852	-
	22-242	111	228.37				
	25 and above[3]	25	233.72				
Social Responsibility and Adaptability	18-211	312	216.56	2	4.697	.096	-
	22-242	111	238.17				
	25 and above[3]	25	262.84				
Entrepreneurship and Self-Management	18-211	312	218.80	2	2.714	.257	-
	22-242	111	241.44				
	25 and above[3]	25	220.40				
Leadership Skill	18-211	312	217.18	2	5.385	.068	-
	22-242	111	247.99				
	25 and above[3]	25	211.52				

**p<0.05*

Table 3. Analysis of participants' scale scores according to grade level

Variables	Grade Level	N	Mean Rank	df	χ^2	p	Difference
Communication Skills	1st Year[1]	168	218.99	3	6.078	.108	-
	2nd Year[2]	114	207.25				
	3rd Year[3]	78	234.69				
	4th Year[4]	88	248.34				
Collaboration Skills	1st Year[1]	168	227.22	3	12.236	.007*	2<1 2<4
	2nd Year[2]	114	193.57				
	3rd Year[3]	78	227.33				
	4th Year[4]	88	256.66				
Critical Thinking and Problem Solving	1st Year[1]	168	255.81	3	10.121	.018*	2<4
	2nd Year[2]	114	196.42				
	3rd Year[3]	78	229.85				
	4th Year[4]	88	253.64				
Creativity and Innovation	1st Year[1]	168	222.37	3	8.520	.036*	2<4
	2nd Year[2]	114	200.73				
	3rd Year[3]	78	223.13				
	4th Year[4]	88	251.02				
Media Literacy	1st Year[1]	168	228.52	3	5.163	.160	-
	2nd Year[2]	114	206.80				
	3rd Year[3]	78	217.05				
	4th Year[4]	88	246.35				
Information and Communication Technology Literacy	1st Year[1]	168	231.07	3	9.081	.028	1 > 2 2 < 4
	2nd Year[2]	114	196.84				
	3rd Year[3]	78	223.22				
	4th Year[4]	88	248.93				
Social Responsibility and Adaptability	1st Year[1]	168	227.49	3	6.495	.090	-
	2nd Year[2]	114	200.92				
	3rd Year[3]	78	228.27				
	4th Year[4]	88	246.01				
Entrepreneurship and Self-Management	1st Year[1]	168	216.46	3	4.582	.205	-
	2nd Year[2]	114	214.64				
	3rd Year[3]	78	230.10				
	4th Year[4]	88	247.66				
Leadership Skills	1st Year[1]	168	228.32	3	12.376	.006*	1 > 2 2 < 3 2 > 4
	2nd Year[2]	114	193.32				
	3rd Year[3]	78	229.16				
	4th Year[4]	88	253.47				

*$p<0.05$

When Table 4 is examined, no statistically significant differences were found among students enrolled in the departments of Coaching Education, Exercise and Sport Sciences, Exercise and Sport Sciences for Individuals with Disabilities, Recreation, and Sports Management across any of the sub-dimensions ($p > .05$).

When Table 5 is examined, a statistically significant difference was observed in the critical thinking and problem-solving sub-dimension ($p < .05$). The identified difference was between participants who reported 0–2 hours of daily social media use and those who reported 5 hours or more. A statistically significant difference was also found in the social responsibility and adaptability sub-dimension ($p < .05$), with the difference occurring between the 0–2 hours and 5 hours or more groups. Similarly, a significant difference was detected in the entrepreneurship and self-management sub-dimension ($p < .05$), and this difference was likewise attributable to the comparison between participants using social media for 0–2 hours and those using it for 5 hours or more per day. No statistically significant differences were identified in the remaining sub-dimensions ($p > .05$).

Table 4. Analysis of participants' scale scores according to department variable

Variables	Department	N	Mean Rank	df	χ^2	p	Difference
Communication Skills	Coaching Education[1]	65	209.76	4	5.304	.258	-
	Exercise and Sport Sciences[2]	80	312.15				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	220.33				
	Recreation[4]	61	255.06				
	Sports Management[5]	135	237.86				
Collaboration Skills	Coaching Education[1]	65	213.46	4	5.426	.0246	-
	Exercise and Sport Sciences[2]	80	198.89				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	235.14				
	Recreation[4]	61	226.05				
	Sports Management[5]	135	235.86				
Critical Thinking and Problem Solving	Coaching Education[1]	65	217.46	4	2.089	.719	-
	Exercise and Sport Sciences[2]	80	208.96				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	228.62				
	Recreation[4]	61	235.70				
	Sports Management[5]	135	228.77				
Creativity and Innovation	Coaching Education[1]	65	222.71	4	4.400	.355	-
	Exercise and Sport Sciences[2]	80	202.90				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	237.13				
	Recreation[4]	61	237.73				
	Sports Management[5]	135	222.17				
Media Literacy	Coaching Education[1]	65	216.69	4	1.867	.760	-
	Exercise and Sport Sciences[2]	80	211.94				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	223.69				
	Recreation[4]	61	235.97				
	Sports Management[5]	135	231.16				
Information and Communication Technology Literacy	Coaching Education[1]	65	216.61	4	1.263	.868	-
	Exercise and Sport Sciences[2]	80	215.02				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	225.36				
	Recreation[4]	61	235.34				
	Sports Management[5]	135	228.33				
Social Responsibility and Adaptability	Coaching Education[1]	65	214.46	4	3.578	.868	-
	Exercise and Sport Sciences[2]	80	210.96				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	217.41				
	Recreation[4]	61	239.42				
	Sports Management[5]	135	236.24				
Entrepreneurship and Self-Management	Coaching Education[1]	65	211.13	4	1.581	.812	-
	Exercise and Sport Sciences[2]	80	225.00				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	219.18				
	Recreation[4]	61	230.73				
	Sports Management[5]	135	232.04				
Leadership Skills	Coaching Education[1]	65	227.06	4	1.840	.765	-
	Exercise and Sport Sciences[2]	80	215.03				
	Exercise and Sport Sciences for Individuals with Disabilities[3]	107	227.36				
	Recreation[4]	61	211.24				
	Sports Management[5]	135	232.60				

Table 5. Evaluation of scale scores according to participants' average daily social media time

Variables	Hour	N	Mean Rank	df	χ^2	p	Difference
Communication Skills	0–2 hours[1]	138	223.62	2	.237	.888	-
	3–5 hours[2]	234	22.94				
	5 hours and above[3]	76	230.89				
Collaboration Skills	0–2 hours[1]	138	240.34	2	5.032	.081	-
	3–5 hours[2]	234	223.37				
	5 hours and above[3]	76	199.22				
Critical Thinking and Problem Solving	0–2 hours[1]	138	248.33	2	10.365	.006*	2>3
	3–5 hours[2]	234	221.68				
	5 hours and above[3]	76	189.91				
Creativity and Innovation	0–2 hours[1]	138	233.76	2	1.615	.446	-
	3–5 hours[2]	234	223.10				
	5 hours and above[3]	76	211.97				
Media Literacy	0–2 hours[1]	138	227.32	2	2.944	.229	-
	3–5 hours[2]	234	230.25				
	5 hours and above[3]	76	201.70				
Information and Communication Technology Literacy	0–2 hours[1]	138	227.57	2	4.131	.127	-
	3–5 hours[2]	234	231.39				
	5 hours and above[3]	76	197.72				
Social Responsibility and Adaptability	0–2 hours[1]	138	242.41	2	6.321	.042*	1>3
	3–5 hours[2]	234	222.99				
	5 hours and above[3]	76	196.64				
Entrepreneurship and Self-Management	0–2 hours[1]	138	240.55	2	6.934	.031*	1>3
	3–5 hours[2]	234	225.08				
	5 hours and above[3]	76	193.57				
Leadership Skills	0–2 hours[1]	138	236.43	2	4.537	.103	-
	3–5 hours[2]	234	225.73				
	5 hours and above[3]	76	199.05				

* $p < 0.05$

When Table 6 is examined, no statistically significant differences were identified across any of the sub-dimensions according to the purpose of social media use ($p > .05$).

When Table 7 is examined, no statistically significant differences were found across any of the sub-dimensions among the GPA categories of 2.00 and below, 2.00–2.99, and 3.00 and above ($p > .05$).

Table 6. Evaluation of participants' scale scores according to their purpose of social media use

Variables	Social Media Use	N	Mean Rank	df	χ^2	p	Difference
Communication Skills	Socialization	94	236.71	3	2.064	.559	-
	Entertainment	176	226.75				
	Information Seeking	102	220.25				
	Passing Time	76	209.89				
Collaboration Skills	Socialization	94	217.94	3	3.423	.331	-
	Entertainment	176	230.42				
	Information Seeking	102	235.93				
	Passing Time	76	203.58				
Critical Thinking and Problem Solving	Socialization	94	216.65	3	3.210	.360	-
	Entertainment	176	233.62				
	Information Seeking	102	230.52				
	Passing Time	76	205.01				
Creativity and Innovation	Socialization	94	211.22	3	2.861	.414	-
	Entertainment	176	233.49				
	Information Seeking	102	229.56				
	Passing Time	76	213.31				
Media Literacy	Socialization	94	222.99	3	1.228	.746	-
	Entertainment	176	231.01				
	Information Seeking	102	224.19				
	Passing Time	76	211.69				
Information and Communication Technology Literacy	Socialization	94	221.96	3	1.159	.763	-
	Entertainment	176	230.97				
	Information Seeking	102	224.56				
	Passing Time	76	212.58				
Social Responsibility and Adaptability	Socialization	94	214.70	3	2.977	.395	-
	Entertainment	176	234.90				
	Information Seeking	102	227.62				
	Passing Time	76	208.35				
Entrepreneurship and Self-Management	Socialization	94	223.29	3	6.147	.105	-
	Entertainment	176	232.70				
	Information Seeking	102	234.65				
	Passing Time	76	193.39				
Leadership Skills	Socialization	94	219.91	3	1.376	.711	-
	Entertainment	176	229.54				
	Information Seeking	102	229.43				
	Passing Time	76	211.89				

DISCUSSION

This study examined the relationship between 21st-century skill levels and academic achievement among students enrolled in a faculty of sports sciences, within the context of various demographic variables. As globalization increasingly influences all domains of life and technological innovations rapidly disseminate across societies, the competencies individuals are expected to possess continue to evolve. Within the information age, the requirements for students to achieve academic success, develop expertise, build careers, and contribute productively have led to the emergence of 21st-century competencies. This framework, which defines the skills, knowledge, and expertise necessary for success in both professional and everyday life, integrates content knowledge, specialized skills, expertise, and multiple forms of literacy (Arıkan, 2025).

Table 7. Evaluation of participants' scale scores according to their Cumulative Weighted Grade Point Average

Variables	GPA	N	Mean Rank	df	χ^2	p	Difference
Communication Skills	2 and under	105	204.13	2	4.102	.129	-
	2-3	304	228.94				
	3 and above	39	244.76				
Collaboration Skills	2 and under	105	207.11	2	4.929	.085	-
	2-3	304	225.94				
	3 and above	39	260.09				
Critical Thinking and Problem Solving	2 and under	105	216.11	2	1.318	.517	-
	2-3	304	224.94				
	3 and above	39	243.67				
Creativity and Innovation	2 and under	105	217.96	2	7.15	.699	-
	2-3	304	225.15				
	3 and above	39	237.01				
Media Literacy	2 and under	105	224.10	2	1.426	.490	-
	2-3	304	221.67				
	3 and above	39	247.68				
Information and Communication Technology Literacy	2 and under	105	216.70	2	.684	.710	-
	2-3	304	225.88				
	3 and above	39	234.77				
Social Responsibility and Adaptability	2 and under	105	219.26	2	1.462	.481	-
	2-3	304	223.35				
	3 and above	39	247.55				
Entrepreneurship and Self-Management	2 and under	105	219.94	2	6.934	.188	-
	2-3	304	225.72				
	3 and above	39	227.26				
Leadership Skills	2 and under	105	217.74	2	1.531	.465	-
	2-3	304	224.04				
	3 and above	39	246.28				

When the findings were evaluated according to the gender variable, no statistically significant differences were identified between male and female students across the sub-dimensions of 21st-century skills. These results are consistent with previous studies (Gürültü et al., 2020; Çoklar, 2018; Kıyasoğlu & Çeviker Ay, 2020; Kırnık, 2024; Aydoğan et al., 2022; Vebrianto et al., 2020). However, Kocaağalar et al. (2024) reported that male students scored significantly higher than female students in the sub-dimensions of knowledge, skill, character and meta-learning. The absence of gender-based differences in the present study may be explained by the fact that students in sports sciences are exposed to similar curricular content, learning environments, and practice-oriented course experiences. In a field where applied instruction is predominant, skill development may be shaped more by educational experience and level of engagement than by gender differences.

When scale scores were analyzed according to age, a statistically significant difference was found in the collaboration sub-dimension, particularly between students aged 18–21 and those aged 22–24. In a study conducted by Çiftçi and Bakar (2020), a significant difference was observed in the learning and innovation skills sub-dimension between students aged 21–22 and those aged 23 and above, which parallels the findings of the present study regarding the creativity and innovation sub-dimension. Conversely, İder and İpek (2023) reported that, based on mean scores, there was no significant relationship between increasing age and higher scores in the sub-dimensions of 21st-century skills, indicating that perceived possession of these competencies did not systematically differ across age groups.

The findings further indicated that no significant differences were observed in 21st-century skill levels among students enrolled in different departments within the faculty of sports sciences. In contrast, Tutal (2023) identified significant differences in interdepartmental scores, and Erdoğan (2024) reported meaningful variations in student scores across departments. The absence of departmental differences in the present study may be attributed to the shared core curriculum structure of sports sciences faculties, similar pedagogical approaches, and interdisciplinary content integration. It may therefore be argued that interdepartmental distinctions do not constitute a primary determinant in the development of 21st-century skills; rather, these competencies appear to be shaped predominantly by individual learning experiences and the holistic impact of the educational process.

When scale scores were examined according to participants' grade levels, a statistically significant difference was identified in the collaboration sub-dimension. The observed differences were specifically between first- and second-year students, as well as between second- and fourth-year students. In contrast, Çiftçi and Bakar (2020) reported no significant differences across grade levels in the sub-dimensions of learning and innovation skills, life and career skills, and information, media, and technology skills. Similarly, Kırnık (2024), as well as Güven and Yalız Solmaz (2023), and Koçak and Çakmak (2021), found no statistically significant differences in 21st-century competencies across grade levels. Thus, the present findings partially align with the existing literature.

When scale scores were analyzed according to participants' average daily time spent on social media, a statistically significant difference emerged in the critical thinking and problem-solving sub-dimension. This difference was observed between students who reported using social media for 0–2 hours per day and those who reported using it for five hours or more. Erdoğan (2024) found no significant differences based on daily internet use duration or social media preferences. Similarly, Kuloğlu and Yıldız (2024) reported findings consistent with the present study when sub-dimensions were evaluated. These results suggest that increased time spent on social media may be associated with variations in competencies requiring cognitive depth and self-regulation. Prolonged social media use may relate to attentional fragmentation, increased cognitive load, and time management difficulties, which could indirectly influence higher-order cognitive skills such as critical thinking and problem solving.

When scale scores were evaluated according to participants' purposes of social media use (socialization, entertainment, information seeking, or passing time), no statistically significant differences were found across any of the sub-dimensions. Kennedy et al. (2008) reported that university students generally demonstrate positive attitudes toward information and communication technologies. Pan and Franklin (2011) found relatively low levels of proficiency in the use of technology-based web tools, showing partial consistency with the present findings. It may therefore be argued that, rather than serving as a distinguishing variable, the purpose of social media use is experienced through overlapping and complementary practices. Since students tend not to use social media for a single, exclusive purpose, this may have limited the emergence of significant differences.

Finally, when scale scores were analyzed according to participants' cumulative grade point averages (CGPA), no statistically significant differences were observed across any sub-dimensions among students with CGPA's of 2.00 and below, between 2.00–3.00, and 3.00 and above. Güler and Tuncel (2022) similarly reported no significant differences between 21st-century competencies and students' academic grade averages. In contrast, Giovanni and Komariah (2019) identified a significant relationship between digital literacy skills and student achievement. The findings of the present study suggest that 21st-century skills may not demonstrate a direct and linear relationship with academic grade point average as an indicator of achievement. Academic performance is largely grounded in cognitive outcomes such as knowledge recall, comprehension, and application, as well as exam performance and course-based assessment criteria. Consequently, possessing high levels of 21st-century competencies may not be directly reflected in academic achievement within the current evaluation system.

Conclusion

In conclusion, the 21st-century skill levels of sports sciences students and their academic achievement indicators were examined comparatively, and the findings demonstrate that competency-based outcomes within the higher education context possess a multidimensional structure. The results suggest that students' 21st-century skills cannot be explained solely by individual demographic characteristics; rather, factors such as program structure, learning environment, and experiential learning processes may play a decisive role in the development of these competencies.

The lack of a consistent parallel distribution between academic achievement indicators and skill levels may be attributed to the prevailing assessment systems, which tend to focus predominantly on cognitive performance. This situation highlights the need for pedagogical and structural adjustments in sports sciences education to render higher-order competencies—such as critical thinking, collaboration, problem solving, and self-regulation—more visible and measurable within academic evaluation frameworks.

Overall, the study provides important implications for the reconsideration of 21st-century skills in the academic context of sports sciences and underscores the necessity of strengthening educational programs in line with competency-based approaches.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

- Diversifying course offerings within sports sciences programs to explicitly foster the development of 21st-century skills.
- Restructuring departmental curricula to comprehensively integrate 21st-century competencies, with particular emphasis on enhancing critical thinking, problem-solving, and collaboration skills beginning from the first year of study.
- Implementing awareness-oriented training initiatives to support the development of competencies that may contribute to academic achievement.

- Designing educational modules that integrate social media and technology usage—both in terms of duration and purpose—with 21st-century skill development, thereby transforming digital engagement into a structured and productive learning resource.

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Authors' Contribution

Conceptualization- T.S.S, **Data curation**- T.S.S, **Formal analysis**- T.S.S, **Funding acquisition**-M.S., **Investigation**- M.S., **Methodology**- M.S., **Resources**- F.K., **Software**- F.K., **Validation**- B.S., **Visualization**- B.S., **Writing – original draft**- B.S., **Writing – review & editing**-T.S.S. All authors read and approved the final manuscript.

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