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The Mediating Role of Informatics Ethics in 21st Century Skills and Smartphone Addiction Among Young Adults

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The aim of this study is to examine the mediating role of attitudes towards information ethics in the relationship between 21st-century skills and smartphone addiction in young adults. This study utilized a correlational research design, a quantitative research method. The sample consisted of 763 young adults studying in various high schools and different educational levels. The "Smartphone Addiction Scale," the "Attitudes Towards Information Ethics Values Scale," and the "Multidimensional 21st-Century Skills Scale" were used to collect data. Path analysis was used to examine the mediating role of attitudes towards information ethics values in the relationship between 21st-century skills and smartphone addiction in young adults. Path analysis is used to examine the relational nature of the current situation. The empirical findings showed that attitudes towards information ethics values significantly mediate the relationship between 21st-century skills and smartphone addiction in young adults. These findings suggest that educational interventions focusing on information ethics values in young adults should be expanded to encompass different areas, including smartphone addiction and the development of 21st-century skills, and that research in this area should be increased. Furthermore, further research is needed to examine participants with diverse demographic profiles, investigate the dynamics of alternative variables according to different sample sizes, and present their findings.

Introduction

21st-century skills encompass socially valued abilities, learning dispositions, literacy, and competencies. Educators, business leaders, academics, and government institutions widely recognize these skills as essential for success in both the workforce and society. The rapid development of technology and information in the 21st century has brought about new competencies for educators and managers (Aslan & Alcı, 2023). These competencies are the consistent growth of countries, a skilled workforce, and individual characteristics such as perseverance, teamwork, flexibility, critical thinking, adaptability, and learning to learn (Binkley et al., 2012; Donovan & GGreen,2013; Kelley et al., 2019). These skills, previously required only by certain segments, have now become essential for all individuals to adapt to the times and work in new lines of work (Gencer et al., 2019; Kaptan & Cakir, 2025). In today's world, 21st-century skills have become essential for individuals to actively and effectively participate in the information society, enabling them to develop academic

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thinking, critical thinking, and other key areas (Voogt & Roblin, 2012; Fletcher & Tan, 2021). The increasing importance of these skills, the widespread use of mobile devices for skill development, and the proliferation of communication devices have led to the frequent use of smartphones (Gürültü et al. 2019; Devrani, 2021). However, recent studies suggest that advanced digital literacy, technical competence, and digital competence, core elements of 21st-century skills, do not fully protect individuals from problematic behaviours. Under certain conditions, they can instead become a risk factor for smartphone addiction (Aslan & Alcı, 2023; Rombout et al., 2024).

Nowadays, smartphones can perform many tasks that computers do, such as sending and receiving data, accessing the Internet, delivering e-mails and messages, viewing digital applications, and sending and receiving data through company-related systems (Akın, 2018; Balcı & Bal, 2022). Several factors contribute to smartphone use, including satisfaction, increased security and control, communication, indicator of status or identity, freedom, expression of emotions, permanent accessibility, entertainment/games that attract users and distract them from the main purpose of using smartphones (Carbonell et al., 2013; Devrani, 2021). Psychological and physiological problems can occur especially because of excessive and problematic use of smartphones. The most common physiological problems are hand and wrist pain, back and muscle pain, eye diseases, neck stiffness, and sleep problems (Beaunoyer & Guitton, 2021; Choi et al., 2015; Mustafaoglu et al., 2021; Thomée et al.,2011; Tamura et al., 2017). These problems reduce the productivity of individuals in their work lives and cause them to fail to meet the characteristics expected from employees within the scope of 21st-century skills. It has been observed that individuals who frequently use smartphones also exhibit unethical behaviors, such as failing to pay attention to the personal information of others and engaging in cyberbullying (Gürkan et al., 2022; Dakakni & Safa, 2023). Furthermore, findings suggest that technical competence alone is insufficient without an ethical framework. When the technical processes offered by smartphones and digital systems are used without such a framework, they can become a primary driver of pathological addiction (Balcı & Bal, 2022; Nayak, 2018).

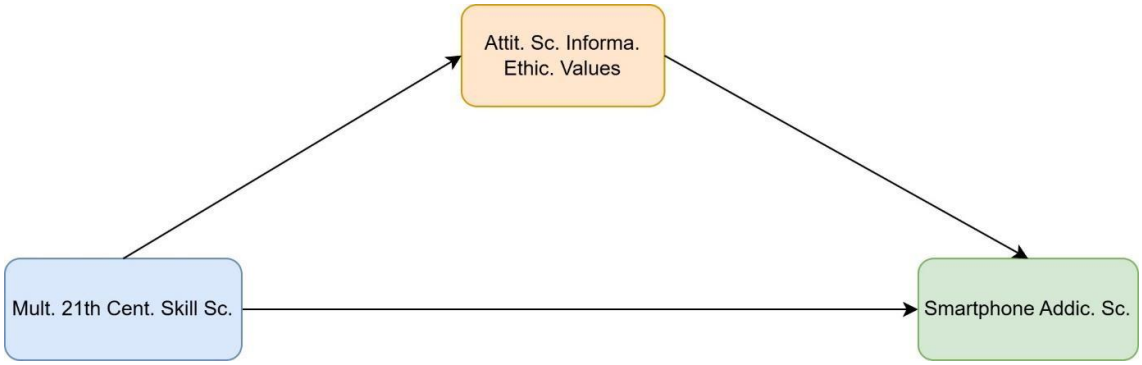
Today, it is essential for a developed society to learn how to resolve ethical dilemmas and engage in thoughtful discussions, as one's thoughts and actions must be grounded in a moral framework (OECD, 2019). Ethical argumentation involves considering facts, feelings, and values, considering the consequences of right and wrong based on the values of individuals and communities (Biber & Biber, 2020). It also supports critical and creative thinking, which are also 21st-century skills to argue openly, use evidence, and generate new perspectives and solutions (Greene, 2025). Because ethics and logic are part of the curriculum, educators and students are academically trained in these areas, and classroom communication is a widely used pedagogy, ethical behavior is expected of students and teachers in their lives (Gürültü et al. 2019; Rombout et al., 2024).

Information technology ethics is a discipline within its own structure that provides principles for evaluating science, technology, and ethics together, conceptualizing them for a unified understanding, and utilizing computer technology (Biber & Biber, 2020; Greene, 2025). The increasing integration of technology into everyday life, has created gaps in relevant policies and laws, making information technology ethics one of the most pressing issues for today's society (Türker & Çoklar, 2024). It is seen that information technology ethics is grouped in different ways in literature. Mason (1986) classified the dimensions of information technology ethics as privacy, accuracy, property, and accessibility. The Computer Ethics Institute (CEI) and organizations such as the IEEE have established a framework for the

concept of ethics (Elçiçek, 2022). To ensure a peaceful environment in the workplace and social life, ethical awareness should be strengthened and extended to other domains, especially IT ethics (Biber & Biber, 2020).

In this context, the purpose of the study was to examine the effects of 21st-century skills and attitudes toward information ethics on smartphone addiction among young adults. For this purpose, a hypothesized model was constructed from the identified domains, and the interaction between variables was examined. The model for the study is shown in Figure 1. The research question is as follows:

RQ. Do 21st century skills and attitudes towards IT ethics have an impact on smartphone addiction?



Note: Multidimensional 21st century skills scale (Mult. 21th Cent. Skill Sc.), Attitude Scale towards Informatics Ethical Values (Attit. Sc. Informa. Ethic. Values), Smartphone Addiction Scale (Smartphone Addic. Sc.)

Figure 1. Research Model

Review

Although there are many definitions of 21st-century skills, the common feature of these definitions is that they emphasize creative and critical thinking skills, problem-solving, and collaboration skills (Tekin, 2023). In the 21st century, individuals are expected to question information rather than memorize it, combine and transform new knowledge with previous knowledge, and become well-equipped individuals (Çevik & Şentürk, 2019). These competencies can be defined as a collection of abilities that are needed and must be continuously developed for individuals to become more effective and productive (Donovan & Green, 2013). These skills are expressed as Life and Professional Skills, Learning and Renewal Skills, Information, Media, and Technology Skills (P21, 2015). With the update made in 2019, innovations were included in the fields of education programs, professional development, learning environments, standards and assessment. These themes are listed as global awareness, financial, economic, commercial and entrepreneurial literacy, civic literacy, health literacy and environmental literacy and are similarly included in educational curricula (Beers, 2011; P21, 2015). Varghese and Musthafa (2021) examined young people's skills such as communication, critical thinking, creativity, and collaboration within the framework of demographic variables and found effects in many areas, especially problem solving. They examined the effects of socioeconomic values, age, and different factors on both skill awareness and behaviour. They particularly drew attention to practices targeting disadvantaged groups.

21st-century skills play a decisive role in the global workforce (Suarta & Suwintana, 2017).

For a 21st-century individual to be successful, they are expected to be creative and inquisitive thinkers who know how to obtain and use technology to acquire the information they need. They are also expected to be aware of their responsibilities, make responsible decisions, and act independently while collaborating effectively with others. Furthermore, they should possess social awareness, cultural and social skills, and openness to different perspectives. Finally, they are expected to be flexible, productive, self-confident, determined, and to demonstrate a high level of self-actualization (Kaufman, 2023). The present study is grounded in of these competencies, which includes learning and innovation, digital literacy, and career competencies (Partnership, 2019; Dakakni & Safa, 2023).

Ethics holds a significant place among 21st-century skills and behaviours. Previous studies indicate that the concept of ethics is as important as acquiring digital media and technology literacy skills and creative thinking skills, which are among the 21st- century skills in educational environments (Dilekçi & Karatay, 2023). Biber and Biber (2020) stated that currently, where developing technology is widely used, high school students' ethical knowledge regarding privacy, freedom of expression, and intellectual property is low, while their ethical knowledge regarding integrity is moderate. They also suggest that digitally presented content does not sufficiently benefit students in the field of information ethics, and that improvements are needed in the content of these courses to address the important topic of information ethics.

Similarly, Greene (2025) examined undergraduate students' adherence to critical discussion rules to foster respect for diverse opinions and collaboration in their classrooms and living environments. Drawing on theoretical models of ethical compliance, this study used data analysis to identify and evaluate the structure and content of attitudes and behaviours at different quality levels. The content varied between acceptable and unacceptable depending on the nature and complexity of the content and the level of participation in the discussion. Students' misconceptions and weak arguments were reported to have decreased significantly after the awareness intervention. However, students' engagement with certain behaviours in virtual environments and their use of mobile devices can lead to smartphone addiction.

While individuals who excessively use smartphones as part of smartphone addiction believe they are socializing, they may become increasingly isolated from real life, they are alienated from real life and become lonelier (Şata et al., 2016). Furthermore, individuals with smartphone addiction have been observed to experience loneliness and social anxiety (Alikaşifoğlu, 2012), and young people with smartphone addiction are observed to have difficulty concentrating in class and to experience declines in academic achievement (Gezgin et al., 2018; Samaha & Hawi, 2016). Smartphone addiction has been found to lead to problems such as depression, hyperactivity, attention deficit, social phobia, and anxiety (Al-Barashdi et al., 2015; Qudah et al., 2019). Research on smartphone addiction has increased considerably in recent years (Gezgin, 2018; Daysal & Yılmazel, 2020; Gezgin & Mihci, 2020; Ting & Chen, 2020; Gezgin et al., 2021). Similarly, excessive smartphone use causes individuals to lose concentration at work or school, social anxiety and communication disorders, and subsequently psychological problems (Choi et al., 2015). Furthermore, it can lead to problems such as depression and anxiety (Aktan & Kutlay, 2021). Griffiths (1996) classifies technological addictions as a similar category to chemical products in the treatment field, and the negative effects they have on people have been observed in research results. These addictions, which people cannot control and engage in to obtain pleasure while avoiding stress, can lead to severe negative consequences. According to Qudah et al. (2019), smartphone addiction differs from chemical dependencies such as alcohol addiction, cigarette

addiction, and substance addiction. The use of digital devices and the performance of many daily tasks through digital devices like phones has also led to smartphone addiction.

Research shows that teachers' self-efficacy in 21st-century skills impacts teaching quality and students' ethical behavior (Aktan & Kutlay, 2021). Similarly, school administrators' leadership in promoting innovation and digital literacy impacts institutional effectiveness (Yılmaz, 2021). Studies by Sergeeva et al. (2023) and Marzuki et al. (2015) reveal that administrators' adaptability and communication skills are critical for teacher motivation and student outcomes. While studies have examined students' 21st-century skills (Engin & Korucuk, 2021) and adult education (Arslan et al., 2024), few have addressed the impact of 21st-century skills and ethical behavior on smartphone addiction.

Method

Research Design

This study employed a correlational research design. Correlational research examines the relationship between two or more variables without manipulating the variables (Creswell & Creswell, 2018; Fraenkel et al., 2018). Path analysis was conducted to test the hypothesized mediation model. For this purpose, the study examined the mediating role of attitudes toward IT ethics (M) in the relationship between 21st-century skills (X) and smartphone addiction (Y).

Ethical Considerations and Procedure

All phases of the study strictly adhered to ethical guidelines, in accordance with the standards established by the American Educational Research Association (2011) and the American Psychological Association (2020). All participants provided informed consent, and participation was entirely voluntary. Furthermore, the researchers carefully safeguarded the participants' privacy, rights, and protected participants' privacy and rights. Data were collected through online questionnaires administered by the researcher. The links to these digital forms were distributed to the distributed to the participants, completion of the questionnaires required approximately 20 minutes. The surveys link remained active for one week, during which participants could submit their responses to submit their responses.

Study Group

The study group consisted of 817 high school students of the 817 responses collected, 54 were excluded because they were identified as invalid or careless responses, and data from 763 participants were included in the analysis. Table 1 presents the demographic characteristics of the sample.

Table 1. Study Group

Variables	Group	f	%
Gender	Male	448	58.7
	Woman	315	41.2
School	Anatolian High School	114	14.9
	Science High School	89	11.7
	Vocational and Technical High School	410	53.7
	Religious Vocational High School	150	19.7
Class	9th Grade	239	31.3
	10th Grade	183	24.0
	11th Grade	202	26.5
	12th Grade	139	18.2
Owning a Smartphone	Yes	720	94.4
	No	43	5, 6
Internet availability at home	Yes	652	85.5
	No	111	14.5

As shown in Table 1, 763 students participated in the study. Of the participants, 58.7% were male and 41.2% were female. In terms of school type, more than half (53.7%) attended a vocational and technical high school, while the remaining participants were distributed across Anatolian high schools (14.9%), religious vocational high schools (19.7%), and science high schools (11.8%). 31.3% of the students were in 9th grade, 24.0% in 10th grade, 26.5% in 11th grade, and 18.2% in 12th grade. In addition, 94.4% of the students had a smartphone, whereas 5.6% did not own a smartphone. Furthermore, 85.5% of the students had internet access at home, while 14.5% did not.

Data Collection Tools

Smartphone Addiction Scale (SAS)

The Smartphone Addiction Scale, consisting of 10 items and developed by Kwon et al. (2013) and adapted to Turkish by Noyan et al. (2015), was used in the study. In the original research that was adapted cronbach's alpha for the scale was found to be 0.867. The scale has no sub-factors and consists of a single factor. The SAS is designed with a 6-point Likert scale ranging from strongly disagree to strongly agree. Example item: “I can't get the work I planned done because of my smartphone use”. In addition to test the structural validity of the Turkish form. The results showed that the single-factor model showed acceptable model fit (RMSEA = .05, CFI = 0.96, TLI = .95, SRMR = .06). The current sample internal consistency coefficient of the scale was found to be .84.

Attitude Scale towards Informatics Ethical Values (ASTIEV)

The Attitude Scale towards Informatics Ethical Values (ASTIEV), consisting of 31 items, was developed by Çelik and Gündoğdu (2019) to measure students’ attitudes toward informatics ethical values. In the original study, the internal consistency coefficient was reported as $\alpha = .798$. The sub-dimensions of the scale include factors such as virtual helpfulness, virtual morality, cyber bullying, and respect for copyright. The ASTIEV uses a 4-point Likert scale ranging from strongly disagree to strongly agree between strongly disagree

and strongly agree. Example item: "I read other people's emails without their knowledge". Confirmatory factor analysis was performed to test the structural validity of the Turkish form. The results showed that the single-factor model fit the data well (RMSEA = .04, CFI = 0.94, TLI = .93, SRMR = .06). Current sample the internal consistency coefficient of the scale was found to be .83.

Multidimensional 21st-century skills scale (M21CSS)

The Multidimensional 21st Century Skills Scale, developed by Çevik and Şentürk (2019) and consisting of five subfactors, was used to determine students' 21st Century skills in the study. The scale consists of 41 items and comprises five subdimensions: Critical Thinking and Problem-Solving Skills, Information and Technology Literacy Skills, Entrepreneurship and Innovation, Social Responsibility and Leadership Skills, and Career Awareness. he M21CSS uses a 5-point Likert scale ranging from strongly disagree to strongly agree between strongly disagree and strongly agree. Example item: "I enjoy listening to new and different ideas". (RMSEA = .06, CFI = 0.90, TLI = .90, SRMR = .06). Current sample the internal consistency coefficient of the scale was found to be .89.

Data Analysis

The SPSS 25 package program was used to analyse the data obtained in the study. Correlation analyses were conducted to examine the relationships among the variables. Path analysis was applied to examine the mediating role of informatics ethics in the relationship between 21st-century skills and smartphone addiction. In addition, Hayes' (2018) PROCESS Macro Model 4 was used to test the mediation model.

Findings

Correlation Analysis Findings

In order to determine the relationships between the variables, Pearson product-moment correlations were computed. The determined relationships are presented in Table 2. The correlation analysis findings show that 21st century skills are related to smartphone addiction (r = - .13, p < .001; 95% CI [.196, .056]) and attitudes towards IT ethical values (r = - .11, p < .01; 95% CI [-.177, - .036]). In addition, the relationship between attitudes towards IT ethical values and smartphone addiction is significant (r = .25, p < .001; 95% CI [.183, .316]).

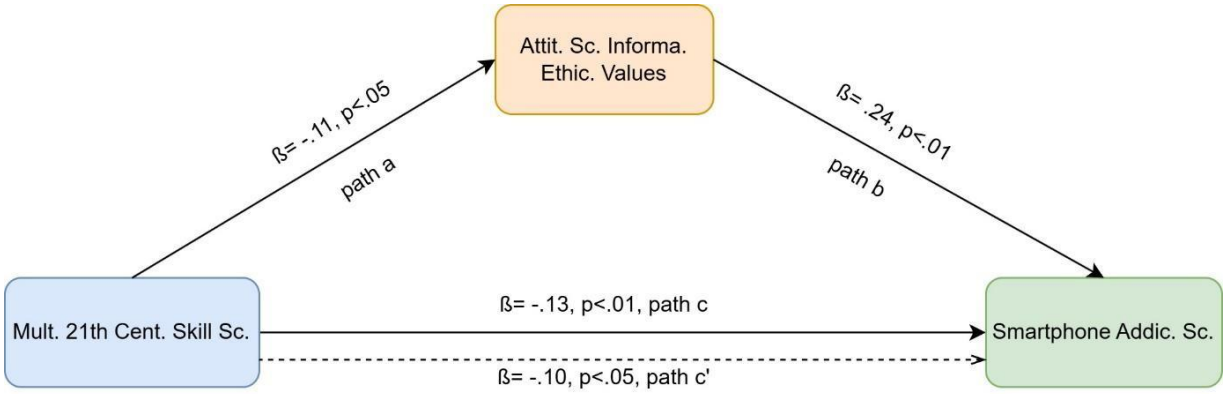
Table 2. Relationships between variables

Variable	Mean	SD	1	2	3
SAS (1)	27.65	9.95	1		
M21CSS (2)	144.25	22.06	-.13**	1	
ASTIEV (3)	62.75	11.53	.25**	-.11*	1

Note. ** p < .001, * p < .01; SAS = Smartphone Addiction Scale, M21CSS = Multidimensional 21st-century skills scale, ASTIEV = Attitude Scale towards Informatics Ethical Values

As shown in Tablo 2, Process Macro Model 4, proposed by Hayes (2018), was applied to determine the mediating role of attitudes toward IT ethics in the relationship between 21st-century skills and smartphone addiction. In this model, 21st-century skills were defined as the independent variable (X), smartphone addiction as the dependent variable (Y), and attitudes

toward IT ethics as the mediating variable (M). The results of the mediation analysis were interpreted using standardized regression coefficients. The results indicate that attitudes toward IT ethics play a mediating role (Figure 2).



Not: Multidimensional 21st century skills scale (Mult. 21st Cent. Skill Sc.), Attitude Scale towards Informatics Ethical Values (Attit. Sc. Informa. Ethic. Values), Smartphone Addiction Scale (Smartphone Addic. Sc.)

Figure 2. The mediating role of attitudes towards ethical values in predicting 21st century skills and smartphone addiction

Accordingly, 21st century skills are a significant predictor of smartphone addiction (β = - .13, SE = .01, p < .01; 95% CI [-.089, - .025], path c). At the same time, 21st century skills are a significant predictor of attitudes towards IT ethics, which served as the mediator (β = - .11, SE = .01, p < .05; 95% CI [-.093, - .019], path a). Smartphone addiction is also explained by attitudes towards IT ethics (β = .24, SE = .03, p < .01; 95% CI [.147, .266], path b). After this stage, it was investigated whether the effect of the independent variable on the dependent variable changed when the mediator variable was included in the model. According to the results of the mediation analysis, the direct effect of 21st century skills on smartphone addiction was significant in the final model (β = - .10, *SE* = .01, p < .05; 95% CI [-.076, - .0145], path c').

In other words, the mediating role of attitudes towards IT ethics in the relationship between 21st century skills and smartphone addiction is significant (*ab* = - .03, 95% CI [-.045, - .007]). The findings of the mediation analysis are presented in Table 3.

Table 3. Mediation Model

Model	Predictive	SAS	ASTIEV	SAS
M21CSS →ASTIEV →SAS	M21CSS	-.13 **	-.11 *	-.10 *
	ASTIEV			.24 **
	R2	.02	.02	.07
	F	12.44 **	8.83 *	29.85 **

Note. ** p < .01, * p < .05; SAS = Smartphone Addiction Scale, M21CSS = Multidimensional 21st century skills scale, ASTIEV = Attitude Scale towards Informatics Ethical Values

As seen in Table 3, the ASTIEV variable has a partial effect on the relationship between M21CSS and SAS. M21CSS affects SAS both directly and indirectly through ASTIEV. As 21st-century skills (M21CSS) increase, an individual's attitude toward ethical IT values

(ASTIEV) decreases (negative correlation), and lower ethical attitudes were associated with higher levels of smartphone addiction smartphone addiction (SNS). However, the direct reducing effect of M21CSS on SNS continues.

Discussion and Conclusion

This study examined the impact of attitudes toward ethical values on the relationship between 21st-century skills and smartphone addiction. The results indicate that 21st-century skills predict smartphone addiction. Research has determined that adhering to ethical principles in education is crucial in applied education, affecting areas ranging from preschool to adult education, including leadership, communication, and technology use (Buchanan et al., 2022; Santos- Meneses & Drugova, 2023). In short, as individuals' 21st-century skills increase, their values toward information ethics decrease, and this decrease, in turn, impacts smartphone addiction. The rationale behind this is that although conventional wisdom posits competence as a protective factor, when skill development is decoupled from an ethical framework, it can instead become a primary driver that is linked to individuals toward unethical situations and addiction (Olay, 2022).

21st- century skills are a significant predictor of attitudes toward IT ethics, which are treated as a mediator variable in the model. Research has been conducted emphasizing the need for 21st- century skills in education. The 21st-century Skills Partnership has identified core competencies such as critical thinking, creativity, and digital literacy, which are also resonant with Turkey's national education policies (Gürültülü et al., 2019). 21st-century skills have may contribute to increase individuals' awareness of IT ethics and reduce digital addictive behaviours (Trilling & Fadel, 2009; Voogt & Roblin, 2012; Wijnen et al., 2021). Some studies have found that while younger generations have high digital skills, their levels of ethical awareness and responsibility are lower. It is possible that individuals with high levels of 21st-century skills (particularly those with strong digital literacy, innovation, and critical thinking skills) may perceive ethical norms as restrictive or unnecessary. This is associated with a tendency to rate ethical values lower (Dakkani & Safa, 2023). Tek and Özsarı (2025) state that an increase in digital literacy levels supports individuals' digital well-being and reduces problematic behaviours such as phubbing. Similarly, in their study on amateur athletes, Özsaydı et al. (2025) found that digital addiction plays a moderating role in the positive effect of digital literacy on life satisfaction, noting that as literacy increases, the risk of addiction and its associated negative outcomes decrease. Because individuals possessing 21st-century skills are more competent in filtering information in digital environments, managing their time, and using digital tools purposefully, they are able to avoid the problematic use of smartphones.

Another significant finding of the study is the mitigating effect of information technology (IT) ethics attitudes on smartphone addiction. It is linked to ethical literacy and cyber ethics provide a crucial self-control mechanism for individuals in establishing their boundaries on digital platforms. Research emphasizing the need to integrate ethical literacy into curricula regarding the use of emerging technologies (Ceraovac & Keane, 2025) suggests that ethical attitudes distance individuals from problematic use when resolving technological moral dilemmas. In the boundless world of the internet and digital tools, young adults with high IT ethics can be said to be more resilient against anxiety may contribute to conditions such as the "fear of missing out" (FoMO). Indeed, Wang et all. (2022) demonstrated that FoMO plays a mediating role between digital gaming and internet addiction and anxiety, depression, and stress, whereas ethical and conscious use alleviates this stress.

The results of the path analysis shed light on the relationship between smartphone addiction and sub-skills included in 21st-century skills. It was observed that as the level of addiction increases, the quality of life of young adults decreases. Tülübaş, Karaköse, and Papadakis (2023) examined the relationship between digital addiction and academic achievement with a holistic approach and confirmed that addiction disrupts learning processes. Similarly, a large-scale university youth study conducted by Balcı, Olkun, and Sarıtaş (2025) is associated with intensive and problematic use of smartphones has seriously destructive effects on students' academic performance as well as their physical and mental health. This situation is linked to that developing preventive factors such as 21st-century skills and IT ethics will not only reduce addiction but also indirectly support academic achievement and psychological well-being (e.g., sleep quality, reduced feelings of loneliness).

Smartphone addiction is also explained by attitudes toward IT ethics. Nayak (2018) reported anxiety, work neglect, and loss of self-control in students with smartphone addiction. Attitudes toward ethical values influence smartphone addiction. The mediating role of attitudes toward IT ethics in the relationship between 21st-century skills and smartphone addiction is significant. Individuals with advanced 21st-century skills (e.g., digital literacy, critical thinking, problem-solving, and creativity) may use technology more comfortably and pragmatically. In other words, as skills increase, even if awareness of ethical risks increases, commitment to ethical behavior may decrease (Wijnen et al., 2021). This may contribute to a more flexible approach to ethical boundaries. Similar results are supported by other researchers. Similarly, it has been observed that skills acquired without ethical development are not separated from social life, and that developing competencies devoid of an ethical dimension weakens personality integration. This suggests that knowledge does not always translate into practice (Katane & Katans, 2023; Rayn et al., 2023).

Furthermore, a negatively significant relationship was found between 21st-century skills and IT ethics. This could be interpreted as individuals approaching ethical boundaries more flexibly or prioritizing ethical values less as their digital skills increase. Individuals' heightened awareness of ethical issues is linked to increased cognitive engagement and controlling behaviours with technology. Individuals with heightened sensitivity, particularly regarding issues such as privacy, data security, and digital identity, may tend to check their phones more frequently, constantly monitor notifications, and monitor online activity (Beaunoyer & Guitton, 2021; Diana et all., 2025; Yılmaz & Griffiths, 2021). This awareness may contribute to increased addiction-like behaviors. A study examined students' 21st-century skills and digital literacy and found that digital content had no impact on students' 21st-century skills (Gürültü et al. 2019; Kaptan & Çakır, 2025). Therefore, even if an individual believes they are sensitive to ethical issues, they may fail to limit their smartphone use.

According to the research results;

- Ethical values education may be expanded to cover topics such as digital citizenship, privacy, and responsible technology use. Future research could examine how this broader approach affects students' ethical awareness and 21st-century skill development.
- Similar studies may be conducted with different age groups,
- Training programs integrating 21st-century skills and ethical behaviour may be developed,
- Psychoeducational interventions aimed at reducing smartphone addiction may emphasize cyber ethics and the practical application of 21st-century skills.

Declarations

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Conflict of Interest: The author declares that there is no conflict of interest in the study.
Informed Consent: The author confirm that informed consent was obtained from all individuals included in this study involving human subjects.
Data availability: The data is available in the relevant database.

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