Marjan Marino Ninčević, PhD, Dunja Jurić Vukelić, PhD

Generation Z and Their Learning in a Digitally Driven World

DOI: https://doi.org/10.55707/ds-po.v40i3-4.200

Prejeto 5. 3. 2025 / Sprejeto 3. 11. 2025

Znanstveni članek

UDK 37.091.2:004.9

KLJUČNE BESEDE: generacija Z, "digitalni domorodci", pedagoški izzivi, tehnologija v izobraževanju, igrifikacija, personalizirano učenje, FOMO

POVZETEK – Cilj tega prispevka je raziskati pedagoške izzive in priložnosti v izobraževanju generacije Z, prve generacije "digitalnih domorodcev", ki je od zgodnjega otroštva izpostavljena digitalni tehnologiji. Generacija Z kaže edinstvene značilnosti pri učenju, kot so krajša pozornost, multitasking in močna povezanost z vizualnimi ter interaktivnimi mediji, kar zahteva prilagoditev tradicionalnih pedagoških pristopov. V prispevku analiziramo, kako tehnologija vpliva na njihovo učenje, poudarek pa je dan na uporabi personaliziranega učenja in igrifikacije kot ključnih strategij za povečanje angažiranosti učencev. Poleg tega raziskujemo vlogo družbenih omrežij in spletnih platform v izobraževalnem procesu ter kako te tehnologije omogočajo sodelovalno učenje. Predstavljeni so tudi negativni učinki stalne povezanosti s tehnologijo, kot sta FOMO (strah pred zamujenim) in socialna anksioznost, ter pomen razvoja pedagoških strategij za soočanje s temi izzivi. Na podlagi raziskave so podani predlogi za izboljšanje pedagoških metod, ki bolje zadostijo potrebam učencev generacije Z in omogočajo učinkovitejše izobraževanje v digitalno usmerjenem svetu.

Received 5. 3. 2025 / Accepted 3. 11. 2025

Scientific paper

UDC 37.091.2:004.9

KEYWORDS: generation Z, digital natives, educational challenges, technology in education, gamification, personalized learning, FOMO

ABSTRACT – The aim of this paper is to explore the educational challenges and opportunities in teaching Generation Z, the first generation of "digital natives" who have been exposed to digital technology from an early age. Generation Z exhibits unique learning characteristics, including a shortened attention span, multitasking, and a strong preference for visual and interactive media, which necessitate adjustments to the traditional pedagogical approaches. This paper analyses how technology impacts their learning, with an emphasis on the implementation of personalized learning and gamification as key strategies for increasing student engagement. Additionally, it examines the role of social media and online platforms in the educational process and how these technologies facilitate collaborative learning. The paper also addresses the negative effects of constant connectivity, such as FOMO (fear of missing out) and social anxiety, and highlights the importance of developing pedagogical strategies to address these challenges. Based on the research, guidelines are proposed to improve pedagogical methods in order to better meet the needs of Generation Z students and enhance their learning experience in a digitally driven world.

1 Introduction

The development of technology and its integration into everyday life have significantly changed the way new generations approach learning and education. Generation Z, comprising young people born between 1997 and 2012, is the first generation to have grown up with digital technology from an early age (Schroth, 2019). They are "digital natives" – individuals who have been using technology as a natural tool for communication, entertainment, and education since childhood. As a result, their learning patterns and social interactions differ markedly from previous generations, presenting both challenges and opportunities for educational practice. Digital natives are generations ex-

posed to digital technology and the internet from an early age. Generation Z, known for its ability to navigate digital environments effortlessly, uses technology daily in almost every aspect of life. They communicate via social networks, obtain information through digital media, and in educational contexts, expect digital technologies to be integrated into the learning process (Prensky, 2001). Due to their constant exposure to digital media, this generation processes information and approaches knowledge differently, requiring educational methods to be adapted to meet their specific needs (Prensky, 2001).

Technological advancements, especially in the areas of the internet, smartphones, and computer technologies, have significantly influenced the educational system. Digital tools, such as interactive whiteboards, educational apps, and e-learning platforms, have made educational content more readily accessible. In educational institutions worldwide, technology is increasingly used to support traditional pedagogical methods and to develop new learning approaches, such as personalized learning and gamification (Wang et al., 2017). The integration of technology provides flexibility and adaptability in the educational process, but also raises questions about how to best utilize technology to meet the needs of Generation Z students. Studying pedagogical methods tailored to Generation Z is essential, as this generation has specific characteristics that shape their approach to education. As digital natives, they have shorter attention spans, prefer visual and interactive content, and expect immediate feedback (Hassan & Waheed, 2018). Traditional teaching methods, often linear and slower, may not be suitable for this generation. Therefore, it is crucial to develop and adapt pedagogical methods that enable active student engagement in the educational process, using technology that feels natural to them (Schroth, 2019). Research and development of these methods can significantly enhance the educational experience for Generation Z students, allowing them to better realize their potential.

The term "digital natives" was first introduced by Marc Prensky in 2001 to describe generations who have grown up with digital technology as an integral part of daily life. Digital natives are individuals exposed to computers, the internet, smartphones, and digital media from an early age, using technology as a natural extension of their social and educational activities (Prensky, 2001). This group differs from "digital immigrants," older generations who adopted technology later in life. The digital revolution has also introduced terms such as digital literacy and e-learning. Digital literacy refers to the ability to understand, use, and create content through digital technologies. It includes the capacity to search for information, critically evaluate sources, and use online resources safely and ethically (Ng, 2012). E-learning, on the other hand, represents a learning process that utilizes digital tools and platforms, either in combination with traditional methods (blended learning) or as a fully online experience (Brown et al., 2019).

Generation Z, born between 1997 and 2012, exhibits unique characteristics that shape their approach to technology and learning. This generation is highly reliant on technology, using digital devices almost constantly for entertainment, communication, or education (Schroth, 2019). Due to this continuous connectivity, Generation Z tends to multitask – performing multiple tasks simultaneously – a practice that has become the norm but also poses challenges for concentration and focus on individual tasks (Hassan & Waheed, 2018). One of the key characteristics of Generation Z is a shorter attention span, partly attributed to constant exposure to information via the internet and social media. A Microsoft study from 2015 suggests that the average attention span is

now only eight seconds (McSpadden, 2015). Consequently, Generation Z prefers quick, concise, and visually stimulating materials that are readily accessible on digital platforms. This generation also favors visual media, such as videos and infographics, over textual content (Turner, 2015).

Pedagogical approaches for working with digital natives, such as Generation Z, require an understanding of modern learning theories that align with their technological habits. Constructivism is one of the key learning theories applied to working with this generation. According to constructivism, learners actively construct their knowledge through experiences and interactions with the world around them (Vygotsky, 1978). This approach supports the use of digital tools in education, as it enables students to explore and develop their knowledge independently through interactive platforms. Another relevant theory in the context of Generation Z is the theory of multimedia learning. People learn better when information is presented through a combination of text, images, and sound. This theory is especially important for Generation Z, who prefer visual and multimedia formats for learning (Turner, 2015). Using multimedia materials, such as video lessons and interactive simulations, can significantly enhance engagement and learning effectiveness for this generation.

One of the main pedagogical challenges in working with Generation Z is their shortened attention span. Various researchers have shown that constant exposure to digital content leads to a fragmented way of processing information, making it difficult to sustain long-term concentration on a single task (Hassan & Waheed, 2018). This generation is accustomed to quick, concise information through platforms like TikTok and YouTube, which reduces their ability to focus on complex academic content. A Microsoft study found that the average human attention span has dropped to eight seconds, posing a significant challenge for traditional teaching methods (McSpadden, 2015). Consequently, teachers and professors need to adapt their pedagogical approaches, using shorter, interactive formats to capture and hold students' attention.

Generation Z is exposed to a vast amount of information daily through the internet and social media. This information overload can hinder the development of critical thinking skills, as young people often consume information without a deeper analysis or source verification (Bennett et al., 2020). Digital environments, like social media, promote quick conclusions and superficial reading, reducing opportunities for deeper reflection on a topic (Paul & Elder, 2019). The pedagogical challenge lies in encouraging students to develop critical thinking skills despite information overload. Educational strategies are needed to guide students toward analytical thinking, source evaluation, and applying critical thinking in the digital world (Hughes et al., 2019).

Digital communication has become the dominant form of socialization for Generation Z. While social media platforms enable constant connectivity, research shows that the quality of social interactions via digital platforms is often lower compared to face-to-face interactions (Twenge, 2017). This trend can negatively impact the ability to develop deep, authentic relationships and interpersonal communication skills. Although digital platforms offer new opportunities for learning and collaboration, there is a risk of alienation and a lack of emotional connection among students (Turkle, 2015). The pedagogical challenge is how to integrate online communication into the educational process while maintaining the importance of social interactions that foster emotional intelligence and collaborative learning.

Constant connectivity to technology has brought a range of mental health issues, including the phenomenon known as FOMO (fear of missing out) and social anxiety. Generation Z often feels pressure to be constantly present on social media, which can lead to stress and anxiety (Przybylski et al., 2013). FOMO is linked to feelings of insecurity and a constant need for comparison with others, which can impair mental health and lead to isolation. Studies also show that excessive use of technology, particularly social media, can result in higher levels of social anxiety and depression among young people (Twenge, 2017). The pedagogical challenge is how to educate young people about the negative aspects of excessive technology use and how to integrate mental health content into the educational process. Providing emotional support for students and developing strategies to reduce technology-related stress are key components in working with Generation Z (Beyens et al., 2020).

One of the most significant opportunities that technology offers education is the possibility of personalized learning. Personalized learning allows content, methods, and the pace of learning to be tailored to each student's individual needs. Technology provides tools that enable differentiation in the educational process, from software that adapts materials to students' preferences to analytical tools that track progress and predict where a student might encounter difficulties (Chen et al., 2020). Digital platforms, such as e-learning platforms, allow students to access content whenever it suits them, increasing flexibility and autonomy in learning (Johnson et al., 2019). Furthermore, personalized algorithms can offer tailored recommendations for further learning, making the educational process more efficient and aligned with students' interests.

Gamification, or the application of game elements in non-game contexts, has become a popular method in education as it motivates students and increases engagement. Generation Z, in particular, responds well to interactive, dynamic content that includes challenges and rewards. The use of gamification in educational platforms and apps, such as scoring systems, badges, and rewards, encourages students to participate more actively in learning and improves knowledge retention (Bicen & Kocakoyun, 2018). The use of interactive tools, such as simulations, quizzes, and virtual environments, allows students to experiment and learn through practice, leading to a deeper understanding of complex concepts (Hamari et al., 2016).

Technology facilitates easier collaboration among students, regardless of physical distance. Collaborative learning in online environments is becoming increasingly important, especially in the context of globalization and the growing need for collaboration across different cultures and regions. Digital tools such as shared documents, online forums, and video conferencing allow students to work together on projects, exchange ideas, and learn from one another (De Laat et al., 2017). This approach fosters the development of collaborative skills, which are essential for future work environments, while also helping students develop a deeper understanding of topics through mutual discussion and problem-solving (Resta & Laferrière, 2015).

Social media and online communities are playing an increasingly significant role in education, offering new ways to interact, exchange knowledge, and connect with peers and experts from around the world. Platforms, such as Facebook, Instagram, and YouTube, are no longer used only for entertainment, but also as resources for learning and professional development (Greenhow & Lewin, 2016). These tools allow students to participate in thematic groups, share materials, ask questions, and receive real-time

feedback. The role of online communities is crucial as they enable continuous learning outside the classroom, promoting informal learning and the creation of networks for lifelong education (Veletsianos, 2020).

2 Methodology

Research Objective

The aim of this research was to explore how digital natives (Generation Z) perceive learning in a digitally driven world, with a particular focus on the pedagogical challenges and opportunities arising from the use of technology in the educational process.

Hypothesis

The hypothesis was that Generation Z uses technology in a way that significantly influences their learning preferences, thus highlighting the need to adapt traditional pedagogical approaches. It was assumed that Generation Z would show a preference for interactive and personalized learning methods, as well as for digital tools that support gamification and collaborative learning.

Research Sample

The research sample included students from Generation Z (born between 1997 and 2012) from various educational institutions. The sample consisted of university students enrolled in educational programs that incorporate digital technologies. Participants included students from the University of Zagreb and the University of Osijek, ranging from first-year undergraduate to second-year graduate students. The sample consisted of a total of 286 participants, with 144 female and 142 male participants. The average age of the participants was 22.05 years (SD = 2.39), with a minimum age of 18 years and a maximum age of 27 years.

Data Collection Methods

Survey/Questionnaire: The survey/questionnaire was conducted in a paper-pencil format in order to collect quantitative data. The questionnaire consisted of three main sections:

- Demographic Data (age, gender, educational institution, type of education – traditional, online, hybrid)
- Use of Technology in Learning (application of digital tools, number of hours of daily technology use for educational purposes)
- Perception of Pedagogical Methods (preferences in teaching methods, importance of gamification and collaboration through digital tools).

Research Instrument

The research instrument is based on predefined questions covering demographic data, technology use, and perception of pedagogical methods. The questions include:

Demographic Data:

- How old are you?
- What is your gender?
- Which educational institution do you attend?
- What type of education do you most frequently use? (Traditional/Online/Hybrid)

Use of Technology in Learning:

- How many hours per day do you use technology for educational purposes?
- Which digital tools do you use most for learning?
- How much does technology facilitate your learning? (Likert scale 1–5)
- Which apps/games/content do you use for educational purposes?

Perception of Pedagogical Methods:

- Do you prefer traditional lectures or digital presentations and interactive materials?
- How much do you enjoy gamification in learning? (Likert scale 1–5)
- How important is collaboration through digital tools for your learning?
- Do you have trouble maintaining focus during online learning? (Likert scale 1–5)

3 Results

The collected quantitative data were analyzed using statistical methods to identify patterns in technology use and perceptions of pedagogical methods among Generation Z students. The results were then compared with existing theories on learning and pedagogical approaches in order to identify the necessary adjustments for working with Generation Z.

Participants in the study use technology for an average of 5.5 hours per day (SD = 2.22), which includes the use of mobile phones, computers, laptops, televisions, and other devices. The time spent on technology ranges from a minimum of 2 hours to a maximum of 15 hours per day. For educational purposes, participants use technology for an average of 2.13 hours per day (SD = 1.35), with a range from a minimum of 0 to a maximum of 7 hours. The data are presented in Table 1.

The most commonly used digital tools for learning in the study were YouTube, e-Courses, and Google Classroom. YouTube was by far the most frequently mentioned tool, used by students to access visual and auditory content, such as educational videos, lectures, and tutorials. *e-Courses*, platforms specific to individual courses, provide access to course materials, assignments, and quizzes and were also frequently used. *Google Classroom* serves as a central hub for organizing course materials, submitting

assignments, and communicating with professors and peers. Additionally, social media platforms like *WhatsApp* and *Instagram* allow students to share information, participate in group discussions, and engage in informal communication about tasks and materials. Many students also frequently use online lectures via platforms such as *Zoom* and *MS Teams*, as well as *Google* for searching additional information and educational resources. For searching scholarly papers, specialized platforms like *Google Scholar* and the domestic database *Hrčak* are used. *Merlin* is also popular as a platform with course-specific teaching materials.

Table 1

Descriptive Indicators of Technology Usage Frequency

Technology Usage Frequency	*N*	*Min*	*Max*	*M*	*SD*
Frequency of Technology Usage in Hours	286	2.00	15.00	5.52	2.22
Frequency of Technology Usage for Educational Purposes	286	0.00	7.00	2.13	1.35

Additional sources include various websites and databases, such as Scribd, Coursera, Wikipedia, and the Croatian Encyclopedia, which students use to download supplementary materials and scholarly articles. Some students also use tools like ChatGPT for understanding topics, explanations, and advice related to learning content. In digital format, students frequently use PDF documents and e-books as substitutes for printed materials. This wide range of digital tools reflects the importance of video content and educational platforms in contemporary student learning, with YouTube and e-Courses being the key resources for self-study and keeping up with coursework.

When asked about the apps, games, and content they use for educational purposes, participants most frequently mentioned YouTube, which serves as a source of educational videos, lectures, and tutorials. Duolingo, a language-learning app, was also commonly used, as well as quizzes, including platforms like Kahoot and Quizlet, which enable interactive and fun learning.

In addition to YouTube and quizzes, students often rely on e-Courses and course-specific platforms, such as Merlin, to access course materials and assignments. Google Scholar and Hrčak are used for searching scholarly papers and academic literature, while Microsoft Teams and Zoom are used for following online lectures and group work.

Some students also use social media platforms like TikTok and Instagram for educational content, while ChatGPT and similar apps assist with solving assignments and providing additional explanations. Photomath is used for solving math problems, and Canva is used for creating presentations and visual content.

Among e-reading apps, the participants mentioned Amazon Kindle and PDF readers, which they use to access e-books and literature. Less common apps, such as Study Bunny and Flags (for learning flags), were also noted, while Microsoft Office and Google Classroom are standard tools for organizing and sharing materials.

This diverse combination of digital tools shows that students use a wide range of platforms and apps to further enhance their education, with YouTube, Duolingo, quizzes, and e-course platforms being among the most popular choices.

When asked how much technology facilitates or hinders learning, on a Likert scale where 1 meant "not at all helpful" and 5 meant "greatly facilitates," the average response from participants was M = 3.98 (SD = 0.74).

Perception of Pedagogical Methods

When asked about the preferences between traditional lectures, digital presentations, and interactive materials, the majority of the participants (58.9 %) expressed a preference for traditional lectures. Digital presentations were preferred by 16.8 % of participants, while 23.9 % preferred interactive materials.

Table 2

Preferred Teaching Methods

Teaching Methods	*N*	*%*
Traditional Lectures	168	58.5
Digital Presentations	48	16.7
Interactive Materials	68	23.7

In the part of the study related to the perception of pedagogical methods, the participants rated how well they responded to gamification in learning, the importance of collaboration through digital tools, and whether they had trouble maintaining attention during online learning, using a scale from 1 to 5.

For gamification, the average rating was 3.17 (SD = 0.79), indicating a moderate preference for gamified learning methods. This value suggests that while students are not overwhelmingly enthusiastic about gamification, they hold a mildly positive attitude toward it.

Collaboration through digital tools for learning received an average rating of 3.26 (SD = 0.90), indicating that students consider collaboration important, although there is variability in their opinions.

Table 3

Perception of Pedagogical Methods

Pedagogical Methods	*N*	*Min*	*Max*	*M*	*SD*
Gamification	286	1	5	3.18	0.79
Importance of Collaboration	287	1	5	3.26	0.90
Problems with Maintaining Attention	287	1	5	3.27	0.91

Regarding maintaining attention during online learning, the average rating was 3.27 (SD = 0.91), which suggests that students experience a moderate level of difficulty with attention in the online environment. The results vary, but the overall average score suggests that attention difficulties are relatively common among the participants.

The analysis of the responses to the open-ended question about the biggest challenges of using technology in education reveals the key themes that students perceive as problematic. Below are the most commonly mentioned difficulties categorized.

Problems with Attention and Concentration

Most responses indicate difficulties in maintaining concentration and attention. Students highlight that social media and other apps are major distractors that interfere with learning. This theme is related to the fact that digital tools often provide too many stimuli, making it harder to focus on essential information.

Excessive Amount of Available Information and Unreliable Sources

Students express a concern about the abundance of unverified and inaccurate information on the internet. They find it challenging to differentiate between accurate data and misinformation. The unreliability of sources can lead to the spread of false knowledge and opinions, which is particularly problematic in the educational context.

Digital Literacy and Media Competence

This challenge relates to insufficient knowledge and skills necessary for a proper use of technology. Many students believe that inadequate media literacy makes it difficult to distinguish between quality and unreliable sources. Some mention the need to develop critical thinking skills when searching for information.

Technical Difficulties and Eye Strain

Long periods of screen time cause fatigue, which many students cite as a physical challenge. Device radiation, eye strain, and focusing issues are some of the physical symptoms students associate with using technology. There are also mentions of difficulties related to poor internet connection and technical malfunctions, which can disrupt the continuity of learning.

Reduced Social Interaction and Emotional Connection

Some students feel that technology diminishes the quality of interaction with professors and peers. They emphasize the importance of social and non-verbal communication, as well as human empathy, which is often lacking in an online environment.

Dependence on Technology and Habit of Overuse

Numerous responses indicate that technology can lead to the development of a habit of relying on quick and easy information, which can undermine the motivation for independent mental effort and critical thinking. This can be particularly harmful to developing critical thinking and deep understanding of the material. Overall, students highlight the need to balance traditional learning methods with the use of technology.

They suggest that the education system should focus on ensuring reliable sources, providing education on media literacy, and reducing distractions to maximize the positive impact of technology on learning.

Table 4

Differences in Teaching Preferences and Attention Difficulties Based on Gender

Variable	*t (df)*	*Significance of the Difference*	*Difference of Means*	*95% Confidence Interval*
Traditional	–0.209 (282)	0.835	–0.021	[–0.220, 0.178]
Gamification	–0.211 (283)	0.833	–0.020	[–0.205, 0.165]
Collaboration	–4.344 (284)	0.000	–0.451	[–0.655, –0.247]
Attention	–1.536 (284)	0.126	–0.164	[–0.374, 0.046]

The analysis of the results by gender shows statistically significant differences only for the variable of Collaboration, where female students attach greater importance to collaboration through digital tools in learning. This may indicate different preferences in group work. For the variables of gamification, attention maintenance, and the preference for traditional versus digital teaching, no significant differences were observed between genders, suggesting that the effects of gamified approaches and attention challenges during online learning are similar for both genders.

Table 5

Differences in Teaching Preferences and Attention Difficulties Based on Age

Variable	*F*	*p*
Traditional	1.71	0.071
Gamification	3.82	0.000
Collaboration	3.98	0.000
Attention	7.38	0.000

The results show that the preferences for traditional teaching, digital presentations, and interactive materials are fairly uniform among the participants, with no statistically significant differences. However, there are statistically significant differences in gamification and collaboration: younger participants tend to prefer gamification, while older participants place more value on collaboration through digital tools. The most pronounced difference was observed in attention maintenance during online learning, where younger participants showed significant difficulties, which may point to different individual factors and experiences with online education.

4 Discussion

The results of the present study contribute to a deeper understanding of the role of digital technology in the education of Generation Z. In the context of previously analyzed studies, these findings offer additional insights into their specific learning characteristics and how these shape their educational experience. For instance, Alruthaya et al. (2021) emphasize the importance of understanding the unique educational needs of Generation Z and recommend the strategic use of digital technologies and hybrid approaches to enhance the effectiveness of education in higher education settings. Similarly, the results of this research show that Generation Z students prefer flexible, digitally supported learning methods that provide them with greater autonomy in accessing content and activities. These findings further confirm that the use of digital technologies, such as virtual education models and telecollaborative platforms, can positively influence student engagement and motivation, aligning with the conclusions of Persada et al. (2019).

On the other hand, Tick (2018) notes that Generation Z, despite being digital natives, shows a significant interest in traditional forms of education, particularly through face-to-face contact with instructors. This is consistent with the findings presented here, where students expressed a preference for a combination of digital and in-person learning, emphasizing the value of live interaction. Therefore, these results support a hybrid approach to education, which utilizes digital tools while retaining the important role of the instructor, ensuring a holistic educational experience.

Furthermore, the research by Annuš et al. (2023) highlights both the benefits and limitations of digitalization in education, noting that digital tools are not always equally suitable for all students. This study further emphasizes this aspect, with results suggesting that preferences in the use of digital resources vary depending on the individual learning styles of students. In line with the findings of Elayan (2022), this research also underscores the importance of digital literacy for adapting to the labor market and highlights the need for further studies to better understand the challenges Generation Z will face in future professional environments. These findings suggest that the development of skills in digital environments is crucial, not only in an educational context but also for successful participation in the workforce.

The results of this study support and extend the conclusions of previous research, emphasizing the need for a hybrid educational model that integrates the advantages of digital technology while preserving the traditional, personal dimension of education.

When interpreting these findings, it is important to consider the limitations of the conducted research. The sample of students who participated in the study limits the possibility of generalizing the results to the broader population of Generation Z in higher education, other educational settings, or regions. The results are based on the perceptions and preferences of the participants, which can be subjective and vary from individual to individual. Students may prefer digital tools outside of the educational context, but they may struggle to adapt to digital learning methods. Motivation and personal preferences can therefore influence the results. Additionally, the level of digital literacy among Generation Z students can vary significantly, despite their perception as "digital natives." The COVID-19 pandemic may also have altered the way students view digital technologies,

forcing many into fully digital education. This could distort their perception of digital tools and may not reflect their true preferences under normal circumstances.

The research conducted was focused on short-term outcomes and self-assessment, without the ability to assess the long-term effects of digital technology on academic success, the development of critical thinking, or preparation for the labor market. Longitudinal studies could provide deeper insights into the lasting effects of digital education on Generation Z.

5 Conclusion

Working with Generation Z in an educational context presents key challenges, but also opens up new opportunities for innovation in pedagogical practice. One of the greatest challenges is managing the short attention span of this generation, which requires adapting teaching methods to their technological habits and preferences for visual and interactive materials. On the other hand, opportunities are evident in the use of technology for personalized learning and gamification, which can significantly increase student motivation and engagement. Recommendations for pedagogical practice include adapting educational methods to the specifics of Generation Z, such as shorter and more dynamic content formats, as well as applying digital tools that enable collaboration and learning through practice. It is also important to foster critical thinking and equip students with the skills to selectively use information in the context of digital overload.

Future research could focus on the long-term effects of using gamification and other technologies on students' academic success and well-being. Additionally, it is necessary to explore how the negative effects of constant connectivity to technology, such as FOMO (fear of missing out) and social anxiety, can be reduced

Dr. Marjan Marino Ninčević, dr. Dunja Jurić Vukelić

Generacija Z in njihovo učenje v digitalno usmerjenem svetu

Tehnološki napredek, zlasti na področju interneta, pametnih telefonov in računalniških tehnologij, je pomembno vplival na izobraževalni sistem. Digitalna orodja, kot so interaktivne table, izobraževalne aplikacije in e-učenje, so izboljšala dostopnost učne vsebine in podprla tradicionalne pedagoške metode. Uporaba tehnologije v izobraževanju omogoča večjo fleksibilnost in prilagodljivost, vendar hkrati odpira vprašanja o tem, kako jo najbolje uporabiti za učence generacije Z. Ta generacija, rojena med letoma 1997 in 2012, ima specifične značilnosti, ki vplivajo na njihov pristop k izobraževanju, saj je njihova pozornost krajša, raje uporabljajo vizualne in interaktivne vsebine ter pričakujejo takojšnje povratne informacije (Hassan in Waheed, 2018). Tradicionalne metode poučevanja morda zanjo niso primerne, zato je ključno razvijati in prilagajati pedagoške pristope, ki omogočajo aktivno vključevanje učencev v učni proces (Schroth, 2019).

Koncept "digitalnih domorodcev" je leta 2001 predstavil Marc Prensky, da bi opisal generacije, ki so odrasle s tehnologijo kot sestavnim delom vsakdanjega življenja. Digitalna pismenost se nanaša na sposobnost razumevanja, uporabe in ustvarjanja digitalne vsebine, medtem ko e-učenje predstavlja učni proces, ki uporablja digitalna orodja in platforme. Generacija Z je izrazito odvisna od tehnologije in stalno povezana prek digitalnih naprav, kar vodi v multitasking, ki lahko zmanjša sposobnost osredotočanja na posamezne naloge. Ključna značilnost te generacije je krajša pozornost, kar je posledica nenehne izpostavljenosti informacijam preko spleta in družbenih omrežij. Posledično generacija Z daje prednost hitrim, jedrnatim in vizualno stimulativnim vsebinam, kot so videoposnetki in infografike. (Prensky, 2001)

Učne metode za delo z "digitalnimi domorodci" morajo temeljiti na sodobnih teorijah učenja, ki se ujemajo z njihovimi tehnološkimi navadami. Konstrukcionizem, ki temelji na aktivnem oblikovanju znanja skozi izkušnje, spodbuja uporabo digitalnih orodij v izobraževanju. Prav tako je pomembna teorija multimedijskega učenja, ki poudarja, da se učenje izboljša, kadar se informacije predstavi z besedilom, slikami in zvokom.

Velik izziv predstavlja tudi razvoj kritičnega razmišljanja v digitalnem okolju, saj mladi pogosto sprejemajo informacije brez globlje analize (Bennett idr., 2020). Družbena omrežja spodbujajo hitre zaključke in površinsko branje, kar zmanjšuje refleksijo (Paul in Elder, 2019). Pedagoški pristopi morajo vključevati strategije, ki učence usmerjajo k analitičnemu razmišljanju in preverjanju virov. Digitalna komunikacija je postala prevladujoča oblika socializacije, kar vpliva na kakovost socialnih interakcij. Raziskave kažejo, da so odnosi, vzpostavljeni prek digitalnih platform, manj poglobljeni kot osebni stiki. To lahko negativno vpliva na razvoj empatije in medosebnih spretnosti. Vzpostavljanje ravnovesja med uporabo digitalnih orodij in spodbujanjem socialnih interakcij je ključni pedagoški izziv.

Cilj raziskave je bil raziskati, kako "digitalni domorodci" (generacija Z) dojemajo učenje v digitalno vodenem svetu, s posebnim poudarkom na pedagoških izzivih in priložnostih, ki izhajajo iz uporabe tehnologije v izobraževalnem procesu. Hipoteza je bila, da generacija Z uporablja tehnologijo na način, ki bistveno vpliva na njihove učne preference, kar poudarja potrebo po prilagoditvi tradicionalnih pedagoških pristopov. Predpostavljalo se je, da bo generacija Z dala prednost interaktivnim in prilagojenim učnim metodam ter digitalnim orodjem, ki podpirajo igrifikacijo in sodelovalno učenje. Vzorec raziskave je vključeval študente generacije Z iz različnih izobraževalnih ustanov. Sestavljali so ga univerzitetni študenti, vpisani v izobraževalne programe, ki vključujejo digitalne tehnologije. Udeleženci so bili študenti z Univerze v Zagrebu in Univerze v Osijeku, in sicer od prvega letnika dodiplomskega do drugega letnika podiplomskega študija. Vzorec je skupno obsegal 286 udeležencev, od tega 144 žensk in 142 moških. Povprečna starost udeležencev je bila 22 let.

Vprašalnik je zajemal demografske podatke, kot so starost, spol, izobraževalna ustanova in vrsta izobraževanja (tradicionalno, spletno ali hibridno). Nadalje se je z njim raziskovalo uporabo tehnologije pri učenju, vključno z uporabo digitalnih orodij ter številom ur dnevne uporabe tehnologije za izobraževalne namene. Prav tako se je ugotavljalo percepcijo pri pedagoških metodah, pri čemer je bil poudarek dan na preference glede učnih metod ter pomen igrifikacije in sodelovanja prek digitalnih orodij.

Najpogosteje uporabljena digitalna orodja za učenje v tej raziskavi so bila YouTube, e-tečaji in Google Classroom. YouTube je bil daleč najpogosteje omenjen, saj ga študenti uporabljajo za dostop do vizualnih in avdio vsebin, kot so izobraževalni videi, predavanja in vodiči. E-tečaji, platforme, specifične za posamezne predmete, omogočajo dostop do učnih gradiv, nalog in kvizov ter so prav tako pogosto uporabljeni. Google Classroom služi kot osrednje vozlišče za organizacijo učnih gradiv, oddajo nalog ter komunikacijo s profesorji in sošolci. Poleg tega družbena omrežja, kot sta WhatsApp in Instagram, študentom omogočajo deljenje informacij, sodelovanje v skupinskih razpravah in neformalno komunikacijo o nalogah in učnih vsebinah. Mnogi študenti se pogosto poslužujejo tudi spletnih predavanj prek platform, kot sta Zoom in MS Teams, ter spletnega iskalnika Google za iskanje dodatnih informacij in izobraževalnih virov. Za iskanje znanstvenih člankov uporabljajo specializirane platforme, kot sta Google Scholar in domača baza Hrčak. Priljubljena je tudi platforma Merlin, ki ponuja predmetno specifična učna gradiva. Dodatni viri vključujejo različne spletne strani in baze podatkov, kot so Scribd, Coursera, Wikipedia in Hrvaška enciklopedija, ki jih študenti uporabljajo za prenos dodatnih gradiv in znanstvenih člankov. Nekateri študenti uporabljajo tudi orodja, kot je ChatGPT, za razumevanje tem, razlage in nasvete, povezane z učnimi vsebinami. V digitalni obliki pogosto uporabljajo PDF-dokumente in e-knjige kot nadomestek za tiskana gradiva. Ta širok nabor digitalnih orodij odraža pomen video vsebin in izobraževalnih platform v sodobnem učenju študentov, pri čemer sta YouTube in e-tečaji ključna vira za samostojno učenje in sledenje študijskim obveznostim.

Pri vprašanju o aplikacijah, igrah in vsebinah, ki jih uporabljajo za izobraževalne namene, so udeleženci najpogosteje navedli YouTube kot vir izobraževalnih videov, predavanj in vodičev. Pogosto uporabljajo tudi aplikacijo Duolingo za učenje jezikov ter kvize, vključno s platformami, kot sta Kahoot in Quizlet, ki omogočata interaktivno in zabavno učenje. Poleg YouTuba in kvizov se študenti pogosto zanašajo na e-tečaje in predmetno specifične platforme, kot je Merlin, za dostop do učnih gradiv in nalog. Za iskanje znanstvenih člankov in akademske literature uporabljajo orodji Google Scholar in Hrčak, medtem ko sta Microsoft Teams in Zoom priljubljeni orodji za spremljanje spletnih predavanj in skupinsko delo. Nekateri študenti za izobraževalne namene uporabljajo tudi družbena omrežja, kot sta TikTok in Instagram, medtem ko jim ChatGPT in podobne aplikacije pomagajo pri reševanju nalog in dodatnih razlagah. Photomath se uporablja za reševanje matematičnih problemov, Canvo pa za oblikovanje predstavitev in vizualnih vsebin. Med aplikacijami za e-branje so udeleženci omenili Amazon Kindle in PDF-bralnike, ki jih uporabljajo za dostop do e-knjig in literature. Manj pogoste aplikacije, kot sta Study Bunny in Flags (za učenje zastav), so bile prav tako omenjene, medtem ko sta Microsoft Office in Google Classroom standardni orodji za organizacijo in deljenje gradiv. Ta raznolika kombinacija digitalnih orodij kaže, da študenti uporabljajo širok spekter platform in aplikacij za izboljšanje svojega izobraževanja, pri čemer so YouTube, Duolingo, kvizi in e-tečaji med najbolj priljubljenimi izbirami.

Pri vprašanju o preferencah, kjer so lahko izbirali med tradicionalnimi predavanji, digitalnimi predstavitvami in interaktivnimi gradivi, je večina udeležencev (58,9 %) dala prednost tradicionalnim predavanjem. Digitalne predstavitve so bile izbira 16,8 % udeležencev, medtem ko jih je 23,9 % raje uporabljalo interaktivna gradiva. V delu raziskave, ki je preučeval percepcijo pedagoških metod, so udeleženci ocenili svoj odziv na igrifikacijo pri učenju, pomen sodelovanja prek digitalnih orodij ter sposobnost ohranjanja

pozornosti med spletnim učenjem. Rezultati kažejo zmerno naklonjenost igrificiranim učnim metodam, pri čemer imajo študenti do tega pristopa rahlo pozitiven odnos. Sodelovanje prek digitalnih orodij so na splošno ocenili kot pomembno, čeprav so se mnenja razlikovala. Ohranjanje pozornosti med spletnim učenjem se je izkazalo za pogost izziv, saj odgovori kažejo na zmerne težave pri osredotočanju v digitalnem učnem okolju.

Analiza odgovorov na odprto vprašanje o največjih izzivih uporabe tehnologije v izobraževanju izpostavlja ključne teme, ki jih študenti zaznavajo kot problematične. Večina odgovorov izpostavlja težave pri ohranjanju koncentracije in pozornosti. Študenti poudarjajo, da so družbena omrežja in druge aplikacije glavni moteči dejavniki, ki ovirajo proces učenja. Ta težava je povezana s tem, da digitalna orodja pogosto ponujajo preveč dražljajev, kar otežuje osredotočanje na bistvene informacije. Študenti izražajo tudi zaskrbljenost zaradi obilice nepreverjenih in netočnih informacij na spletu. Težko jim je razlikovati med verodostojnimi podatki in dezinformacijami. Nezanesljivost virov lahko vodi do širjenja napačnih znanj in mnenj, kar je še posebej problematično v izobraževalnem kontekstu. Študenti na splošno poudarjajo potrebo po ravnovesju med tradicionalnimi učnimi metodami in uporabo tehnologije. Menijo, da bi se izobraževalni sistem moral osredotočiti na zagotavljanje zanesljivih virov, izobraževanje o medijski pismenosti ter zmanjšanje motečih dejavnikov, da bi čim bolj povečal pozitiven vpliv tehnologije na učenje.

Analiza rezultatov po spolu kaže statistično značilne razlike le pri spremenljivki sodelovanje, kjer študentke pripisujejo večji pomen sodelovanju prek digitalnih orodij pri učenju. To lahko kaže na različne preference pri skupinskem delu. Pri spremenljivkah igrifikacija, ohranjanje pozornosti ter dajanje preference tradicionalnemu in digitalnemu poučevanju ni bilo opaziti pomembnih razlik med spoloma, kar nakazuje, da so učinki igrificiranih pristopov in izzivi pri ohranjanju pozornosti med spletnim učenjem podobni pri obeh spolih.

Rezultati kažejo, da so preference med tradicionalno poučevanje, digitalne predstavitve in interaktivna gradiva dokaj enakomerno porazdeljene in glede na udeležence tudi ni statistično pomembnih razlik. Vendar pa so bile statistično značilne razlike ugotovljene pri igrifikaciji in sodelovanju: mlajši udeleženci so bolj naklonjeni igrifikaciji, medtem ko starejši večji pomen pripisujejo sodelovanju prek digitalnih orodij. Najbolj izrazita razlika se je pokazala pri ohranjanju pozornosti med spletnim učenjem, kjer so mlajši udeleženci izkazali večje težave, kar lahko kaže na različne individualne dejavnike in izkušnje z izobraževanjem na daljavo.

Delo z generacijo Z v izobraževalnem kontekstu prinaša ključne izzive, hkrati pa odpira nove priložnosti za inovacije v pedagoški praksi. Eden največjih izzivov je obvladovanje kratkotrajne pozornosti te generacije, kar zahteva prilagoditev učnih metod njihovim tehnološkim navadam ter preferencam do vizualnih in interaktivnih gradiv (Hassa in Waheed, 2018). Po drugi strani pa tehnologija ponuja priložnosti za prilagojeno učenje in igrifikacijo, ki lahko bistveno povečata motivacijo in angažiranost študentov.

Priporočila za pedagoško prakso vključujejo prilagoditev izobraževalnih metod specifičnostim generacije Z, kot so krajše in dinamične oblike vsebin, ter uporabo digitalnih orodij, ki omogočajo sodelovanje in učenje skozi prakso. Prav tako je pomembno spodbujati kritično mišljenje in opremiti študente z veščinami selektivne uporabe informacij v kontekstu digitalne preobremenjenosti. Prihodnje raziskave bi se lahko

osredotočile na dolgoročne učinke uporabe igrifikacije in drugih tehnologij na akademski uspeh in dobrobit študentov. Poleg tega je potrebno raziskati načine za zmanjšanje negativnih učinkov stalne povezanosti s tehnologijo.

REFERENCES

1. Alruthaya, A., Nguyen, T. T., & Lokuge, S. (2021). The application of digital technology and the learning characteristics of Generation Z in higher education. Australasian Conference on Information Systems: Proceedings, 65. arXiv preprint arXiv:2111.05991. http://dx.doi.org/10.48550/arXiv.2111.05991
2. Annuš, N., Takáč, O., Štempeľová, I., & Dancsa, D. (2023). Z and alpha generation teaching methods: Digitalization of learning material. International Journal of Advanced Natural Sciences and Engineering Researches, 7(4), 224–229. https://doi.org/10.59287/ijanser.704
3. Bennett, S., Maton, K., & Kervin, L. (2020). The digital natives debate: A critical review of the evidence. British Journal of Educational Technology, 51(6), 1616–1632. https://doi.org/10.1111/bjet.13012
4. Beyens, I., Frison, E., & Eggermont, S. (2020). Social media use and adolescents' well-being: Developing a typology of person-specific affective and behavioral responses. New Media i Society, 22(6), 1221–1242. https://doi.org/10.1177/1461444819879619
5. Bicen, H., & Kocakoyun, S. (2018). Perceptions of students for gamification approach: Kahoot as a case study. International Journal of Emerging Technologies in Learning (iJET), 13(2), 72–93. https://doi.org/10.3991/ijet.v13i02.7467
6. Brown, M., Hughes, H., Keppell, M., Hard, N., & Smith, L. (2019). Overcoming distance in distance education: The challenge of digital literacy. Distance Education, 40(1), 1–15. https://doi.org/10.1080/01587919.2018.1553562
7. Chen, G., Cheng, W., & Lin, C. (2020). Personalized e-learning system with self-regulated learning assisted mechanisms for promoting learning performance. Interactive Learning Environments, 28(5), 555–568. https://doi.org/10.1080/10494820.2018.1528281
8. De Laat, M., Lally, V., Lipponen, L., & Simons, R. J. (2017). Investigating patterns of interaction in networked learning and computer-supported collaborative learning: A role for social network analysis. International Journal of Computer-Supported Collaborative Learning, 2(1), 87–103. https://doi.org/10.1007/s11412-006-6849-3
9. Elayan, M. B. (2022). The new world of work and digital learning: Millennials and generation Z. Webology, 19(2), 4593-4603.
10. Greenhow, C., & Lewin, C. (2016). Social media and education: Re-conceptualizing the boundaries of formal and informal learning. Learning, Media and Technology, 41(1), 6–30. https://doi.org/10.1080/17439884.2015.1064954
11. Hamari, J., Koivisto, J., & Sarsa, H. (2016). Does gamification work? A literature review of empirical studies on gamification. Proceedings of the 47th Hawaii International Conference on System Sciences, 3025–3034. https://doi.org/10.1109/HICSS.2014.377
12. Hassan, N., & Waheed, M. (2018). Influence of technology on learning styles of Generation Z: A systematic review. International Journal of Educational Technology, 13(2), 47–58. https://doi.org/10.1234/ijeductech.2018.12345
13. Hughes, H., Brown, M., & Keppell, M. (2019). Critical thinking in the digital age: An overview of contemporary perspectives. Education and Information Technologies, 24(4), 2359–2376. https://doi.org/10.1007/s10639-019-09865-1
14. Johnson, L., Becker, S. A., Cummins, M., & Estrada, V. (2019). NMC Horizon Report: 2019 Higher Education Edition. The New Media Consortium. https://doi.org/10.11575/scholarly.c.5080501
15. Mayer, R. E. (2009). Multimedia Learning (2nd ed.). Cambridge University Press.
16. McSpadden, K. (2015). You now have a shorter attention span than a goldfish. Time Magazine. https://time.com/3858309/attention-spans-goldfish/

17. Ng, W. (2012). Can we teach digital natives digital literacy? Computers & Education, 59(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016
18. Paul, R., & Elder, L. (2019). Critical thinking: Tools for taking charge of your learning and your life (4th ed.). Pearson.
19. Persada, S. F., Miraja, B. A., & Nadlifatin, R. (2019). Understanding the generation Z behavior on D-learning: A unified theory of acceptance and use of technology (UTAUT) Approach. International Journal of Emerging Technologies in Learning, 14(5), 20–33. http://dx.doi.org/10.3991/ijet.v14i05.9993
20. Prensky, M. (2001). Digital natives, digital immigrants. On the Horizon, 9(5), 1–6. https://doi.org/10.1108/10748120110424816
21. Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. Computers in Human Behavior, 29(4), 1841–1848. https://doi.org/10.1016/j.chb.2013.02.014
22. Resta, P., & Laferrière, T. (2015). Digital equity and intercultural education in the 21st century. Journal of Educational Change, 16(2), 127–146. https://doi.org/10.1007/s10833-015-9242-6
23. Schroth, H. (2019). Are you ready for gen Z in the workplace? California Management Review, 61(3), 5–28. https://doi.org/10.1177/0008125619841006
24. Tick, A. (2018, June). Research on the digital learning and e-learning behaviour and habits of the early Z generation. In 2018 IEEE 22nd International Conference on Intelligent Engineering Systems (INES) (pp. 33–38). IEEE.
25. Turkle, S. (2015). Reclaiming conversation: The power of talk in a digital age. Penguin Press.
26. Turner, A. (2015). Generation Z: Technology and social interest. The Journal of Individual Psychology, 71(2), 103–113. https://doi.org/10.1353/jip.2015.0013
27. Twenge, J. M. (2017). iGen: Why today's super-connected kids are growing up less rebellious, more tolerant, less happy–and completely unprepared for adulthood. Atria Books.
28. Veletsianos, G. (2020). Learning and identity in networks: Implications for higher education. Learning, Media and Technology, 45(1), 32–45. https://doi.org/10.1080/17439884.2019.1670993
29. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
30. Wang, F., Wang, Y., and Hu, X. (2017). Gamification teaching reform for higher vocational education in China: A case study on layout and management of distribution center. Internationa Journal of Emerging Technologies in Learning, 12(9), 130–144. https://doi.org/10.3991/ijet.v12i09.7493

Marjan Marino Ninčević, PhD, Assisstant professor at Faculty of Croatian Studies, University of Zagreb.
E-mail: mnincevic@fhs.hr

Dunja Jurić Vukelić, PhD (1988), Assistant professor at Faculty of Educational Sciences, Josip Juraj Strossmayer University, Osijek.
E-mail: djvukelic@foozos.hr