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Building Digital Skills through Digitalisation of Education

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Abstract

Under the impact of today's digitally driven world, digital skills integration into education becomes essential for equipping learners with the competencies mandatory for success in the 21st century. This paper investigates the transformative capability of digitalisation in education and intends to explain its impact on the development of digital literacy and digital skills among Gen Z. The current scientific literature highlights the crucial role of digital skills in fostering employability, promoting innovation, and driving social progress. However, there remains a significant gap in understanding how digitalisation proposals within education affect skill acquisition, educational equity, and broader societal implications. This research paper applies a powerful mixed-method research technique and blends qualitative analysis - through study and analysis of field literature and European-level reports - with quantitative analysis of statistical data. The research question that governs this investigation aims at examining discrepancies in access and use of digital resources across various demographic groups. The main results of this investigation uncover a complicated relationship between digitalisation and skills development across EU-27. While cyber technologies provide many opportunities for customised learning and collaboration, gaps still persist and exacerbate already existing inequalities. Additionally, this paper identifies the need for extensive educational methodologies that ensure a harmonious incorporation of digital tools into educational curricula. Consequently, this paper is instrumental to the field of knowledge because it provides a broad analysis of the digitalisation of education and links theoretical judgements with empirical evidence. Finally, this research is disclosing the challenges and opportunities inherent in the development of digital skills, which present eloquent insights for policymakers, professors, and researchers determined to channel the full potential of digital technologies in education.

Keywords: digitalisation, education, digital skills, digital literacy, Gen Z.

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1. Introduction

In order to adapt the public education sector to the growing demands of the labour market, structured and coherent digital competencies acquisition becomes mandatory no matter the age or the demographic area. Moreover, the progressive shift of the majority of economic activities to virtual platforms mainly integrating artificial intelligence solutions has become fundamental for increasing productivity, which only highlights the growing emphasis on developing skills fundamental to human nature, abilities that autonomous systems cannot fully replicate (Kolade & Owoseni, 2022).

Recent findings in the field of educational sciences (Cropley, 2019; Sipică & Toma, 2022; Akimov et al., 2023) have led to a better understanding of critical elements of the foundational skills necessary for students to become adequately equipped for Industry 5.0. These elements include critical thinking, the ability to generate pertinent and original content, collaborative teamwork, effective communication, innovation, and flexibility in integrating web-based tools into educational practices.

Furthermore, the global closure of educational institutions forced public education systems all over the world to suddenly embrace and make use of e-learning platforms (Michigan, 2020; Tam & El-Azar, 2020), while students, despite being digital natives, have had to adapt to utilising digital tools for learning instead of just socialising (Botnariuc et al., 2020). Consequently, the recent pandemic generated the main objective to quickly transition all learning activities to online environments, with digital technologies having accelerated a fundamental restructuring of the traditional educational landscape, forcing educators to adopt individualised methodologies and strategies (Ceobanu et al., 2022).

Taking into consideration all recent technological advancements, it becomes obvious that the incorporation of Internet-based technologies into education is not simply advantageous but also imperative for guaranteeing the relevance and effectiveness of educational practices in the digital era. Failure to adopt digitalisation might leave both educators and learners poorly prepared for the rising demands of Industry 5.0, thus compromising the education's ability to facilitate meaningful labour force integration and societal evolution.

2. Problem Statement

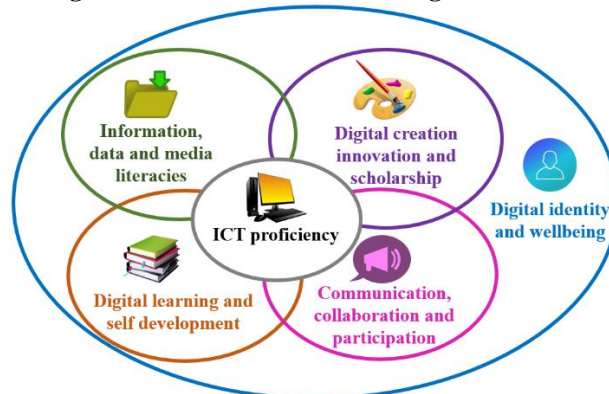
Literature review shows that most research on digital education has focused on the effects of online learning on both teachers and students. Early findings of Prensky (2001) led to the classification of students born after 1994 as digital natives, mainly because these persons are surrounded from a very early age by a plethora of electronic devices such as computers, tablets, video game consoles, and mobile phones. According to this definition, on the opposite end are those individuals who

have acquired the competencies necessary to use electronic devices later in their lives, referred to as digital immigrants.

The work of several authors (Taylor & Ferrari, 2012; Schwab, 2016; Werfhorst et al., 2022) focused on conceptualising digital competencies, and they all agreed on a three-dimensional profile of these abilities that encompass ICT, information, and media literacy. The rapid advancement of digital education led to a more comprehensive perspective on the concept of digital skills, characterised by other scholars (Cropley, 2019; Sipică & Toma, 2022; Akimov et al., 2023) as having five dimensions more clearly defined: analytical reasoning, cooperative teamwork, proficient communication, inventive thinking, and adaptability with online tools.

According to the European Commission's Digital Education Action Plan 2021-2027, the digital skills are characterised by six dimensions: ICT proficiency; information, data, and media literacies; digital learning and self-development; communication, collaboration, and participation; digital creation, innovation, and scholarship; and digital identity and well-being (Figure 1).

Figure 1. The six dimensions of digital skills



Source: adapted from European Commission's Digital Education Action Plan 2021-2027 (2020).

The focus of the European Commission's attention is on two strategic priorities: fostering the development of a high-performing digital education ecosystem and enhancing digital skills and competencies for digital transformation (European Commission, 2020).

Moreover, increased efficiency in teaching all disciplines through incorporating technology has already been highlighted in previous studies within the field of educational sciences (Drăgan, 2019; Țițan et al., 2020). Other authors (Gui et al., 2023) emphasise the importance of integrating digital skills into instructional activities, which have the potential to positively influence students' behaviour by fostering healthy digital content consumption habits.

Furthermore, other recent studies on the integration of artificial intelligence (AI) systems into the instructional process note the significant contribution of these artificial language models to the enhancement of deep cognitive processes,

metacognitive processes, and collaborative learning skills (Gennari et al., 2023; Iku-Silan et al., 2023).

Although numerous previous studies determined the positive correlation between digital technologies use and the level of digital skills acquired, the findings of Sailer et al. (2021) and Fütterer et al. (2023) conclude that the main factor that determines the use of electronic equipment in the classroom is the level of digital competencies manifested by the educators. Therefore, the integration of digital resources into teaching can only be achieved by providing teachers with training courses and formal instruction in order to acquire both digital skills and practical solutions for implementing digital applications under optimal conditions (Botnariuc et al., 2020; Zhang et al., 2023).

3. Research Questions / Aims of the Research

The main aim of this paper is to thoroughly investigate the associated disparities in the access and use of digital technologies among diverse demographic groups, with an accent on Gen Z. The methodology involves a complex mixed-method approach with the purpose of accomplishing its primary objective. Consequently, this research aims to identify and analyse the extent of inequalities in access and use of digital resources among different European countries. In order to operationalise the research problem, the following research question govern the present endeavour:

RQ 1: What are the disparities in accessing and using digital resources across various demographic groups?

The answer to this research question will shed light on the disparities in digital skills development and offer the opportunity for personalised strategies to be implemented in order to address not only the lack of access to digital resource accessibility but also the absence of digital skill acquisition by vulnerable demographic segments.

4. Research Methods

The methodological approach used by this research encompasses both qualitative and quantitative methods in order to provide a comprehensive understanding of the phenomena of the digitalisation of education. From a qualitative point of view, this paper scrutinises the scientific literature in the field of digitalisation of education and examines scholarly articles and books, but also the legislative framework, having the goal of gaining a clear picture of the complexities of digitalisation strategies and their impact on digital skill acquisition. Additionally, the qualitative dimension of this study is based on the analysis of documents and reports published at the European level, offering key insights on digitalisation trends and policies across the EU member states.

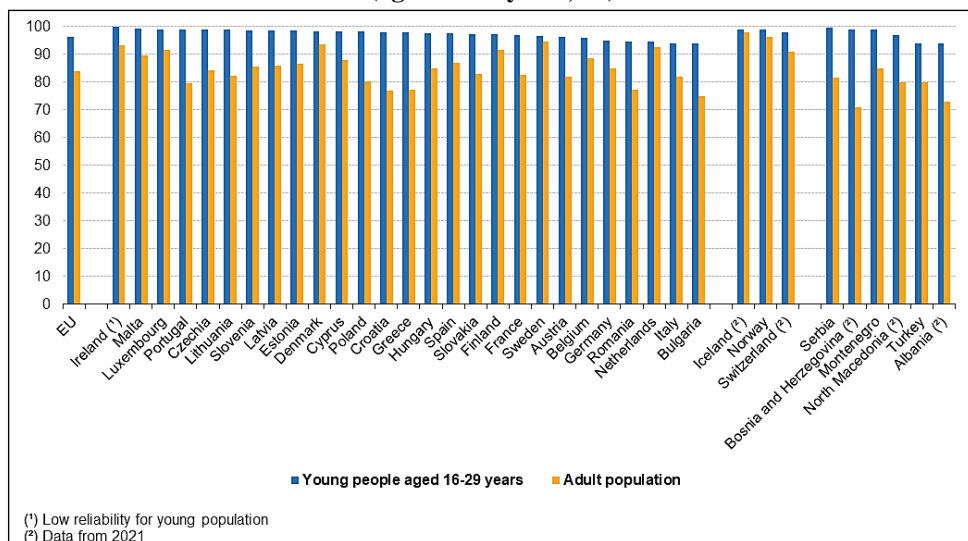
Next, the research methodology uses a quantitative perspective based on rigorous statistical analysis, which helps providing valuable empirical evidence to support its findings. With the means of systematic data collection and processing, this study aims to quantify the effectiveness of digitalisation strategies in promoting digital

skill acquisition across different demographic areas and groups. Furthermore, the use of the quantitative analysis enables the quantification of disparities in the access to and use of online equipment.

5. Findings: How Digitalised are the Digital Natives?

Figure 2 shows that the average percentage of adults who reported using the Internet on a daily basis was 84%, while the share of young people increased to 96%. Furthermore, the percentage of young people (aged 16 to 29 years) from all the EU 27 countries who reported using the Internet every day started at 94% and many countries almost reached 100%.

Figure 2. Young people who used the Internet on a daily basis in 2022 (aged 16-29 years, %)



Source: Eurostat database.

Not surprisingly, the share of adult population that reported using the Internet on a daily basis is lower than the share of young people, but still jumps over 70% (Bosnia and Herzegovina). If the average difference between these two groups is 12% among EU member states, the highest gap (21%) is in Croatia and Greece, followed by Portugal and Bulgaria with a difference of 19 pp., and by Poland and Romania with 18 pp.

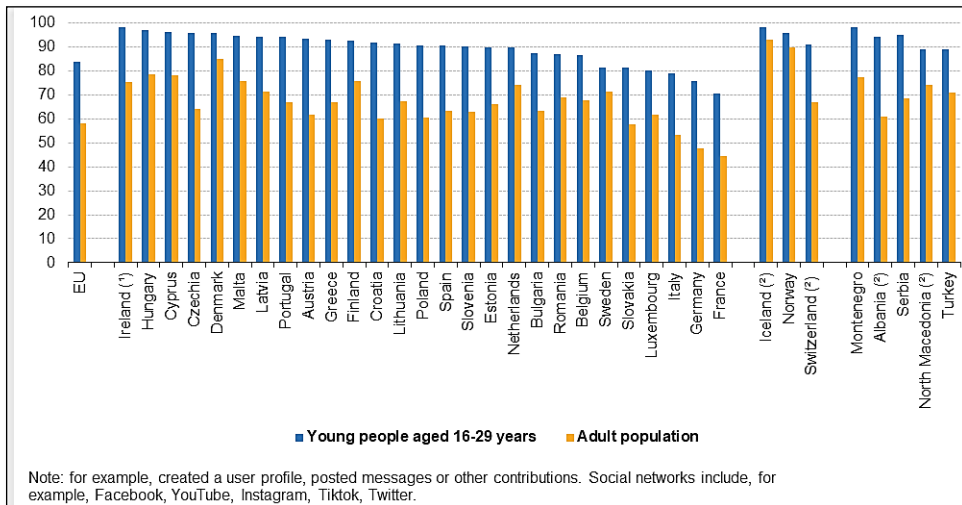
Nonetheless, data from Figure 2 demonstrates that the most digitalised countries with the lowest digital gap are the Netherlands (2pp) and Sweden (2pp), followed by Denmark (5pp) and Finland (5pp).

Taking into consideration that young people’s favourite online activity was participation in social networking in 2022, it is noteworthy to mention that on average 84% of youngsters from EU-27 preferred to create a social media profile and engage in chatting activities. Figure 3 provides an overview of the data from all

EU-27 countries with regards to the share of young people versus adult population accessing social networking sites in 2022.

On one hand, Figure 3 illustrates that the lowest social media participation among both young people (70%) and the adult population (44%) is scored by France. For this reason, the digital gap from France is slightly higher (26pp) than the European average of 25 percentage points. In Eastern Europe, Romania surpasses the average EU level for both groups, with 88% of the young people using social networking platforms compared to 83%, and 68% of the adult population using social media sites compared to 58%. Consequently, the digital gap in Romania (20pp) was lower than the EU average (25pp), suggesting a decreasing trend in the digital divide from Romania.

Figure 3. Young people who accessed social networking sites in 2022 (aged 16-29 years, %)

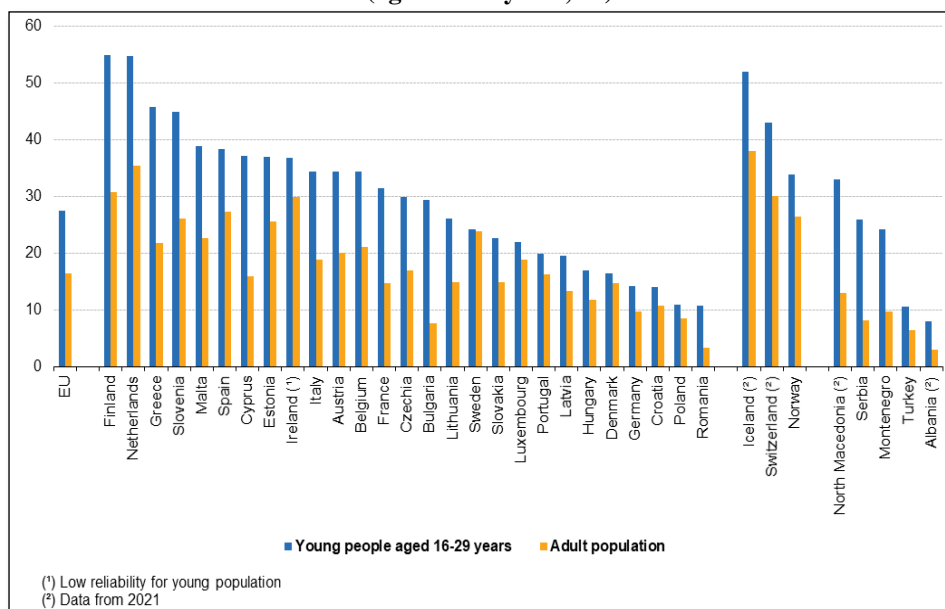


Source: Eurostat database.

On the other hand, Figure 3 shows that Denmark has the lowest level of digital divide (11%) among EU-27, while other Schengen area countries such as Norway and Iceland have almost eradicated their level of digital gap.

Next, Figure 4 illustrates the profound impact of the Internet and associated digital competencies on our daily lives. Hence, the increasing trend of educational activities that have transitioned to online environments in 2022 represents an evident proof of the relevance of digitalisation of education nowadays. Throughout all EU member states, the younger population reveals a higher likelihood for enrolling to online courses compared to the adult age group. This gap is predominantly pronounced with intervals as wide as 24 pp in Finland and Greece, followed by Bulgaria with 22 pp, and Cyprus with 21 pp. In contrast, Sweden shows no discernible gap between age groups, while Denmark and Poland mark a gap of 2 pp.

Figure 4. Young people who used the Internet for doing an online course in 2022 (aged 16-29 years, %)



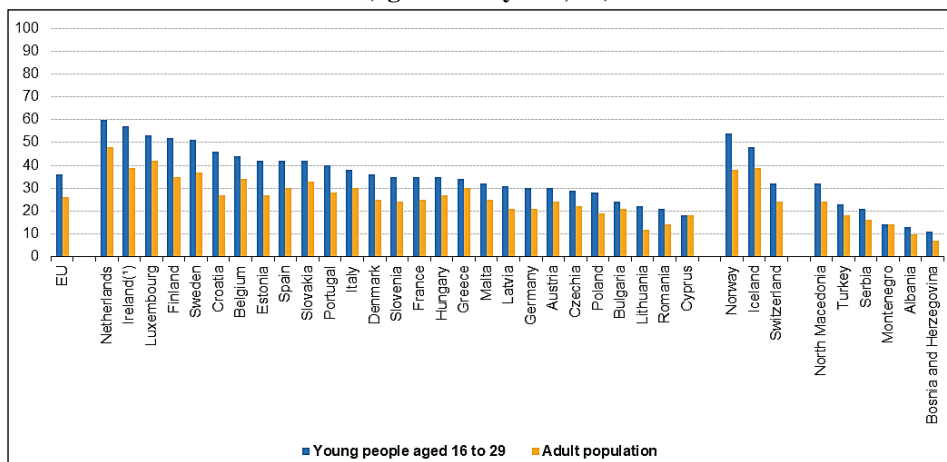
Source: Eurostat database.

As it can be observed in Figure 4, the biggest share of young people who used the Internet for educational purposes in 2022 is scored by Finland and the Netherlands (both 55%). On the other hand, in Romania and Poland only 11% of the individuals aged 16-29 years old made use of the Internet for taking an online course, compared to the EU average of 28%. While benefiting from the online environment advantages, it is extremely important to take into account and address online safety concerns, but also to critically assess the reliability and integrity of sites, information, and content.

Irrespective of the major Internet usage statistics within young persons, Figure 5 proves that just one third (36%) of the European youngest population directly engaged in validating online information in 2021 (latest data availability). Remarkably, Figure 5 demonstrates that only five European countries indicated rates above 50% for young persons aged 16-29 years that engaged in truth verification of digital media content: the Netherlands, Ireland, Luxembourg, Finland, and Sweden.

Conversely, the lowest rates were recorded in Cyprus (18%), followed by Romania (21%), and Lithuania (22%). In addition, Romania (14%) and Lithuania (12%) stated the lowest share of adults who verified online information.

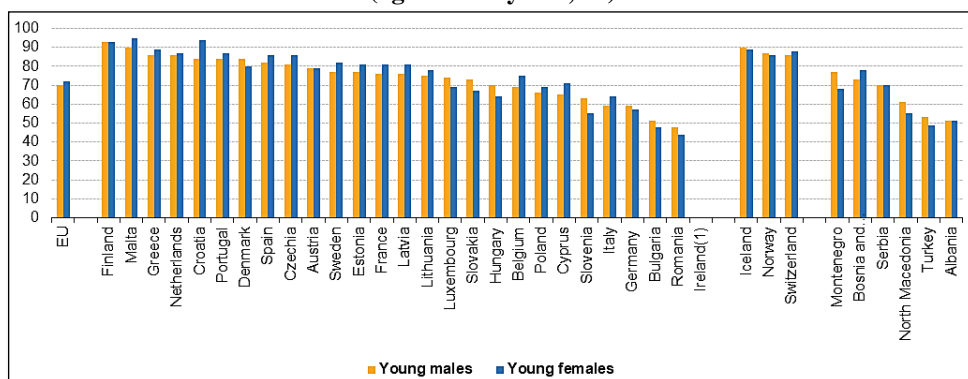
Figure 5. Young people who have verified the information found online in 2021 (aged 16-29 years, %)



Source: Eurostat database.

Nevertheless, young people exhibit an average 10% higher tendency than adults to verify the accuracy of information or content encountered online (Figure 5). The difference increased to 19% in Croatia and 18% in Ireland. On the other hand, Norwegian and Icelandic young people adult populations exceeded EU averages in evaluating their Internet sources. The essential role of information and communication technology competencies in the prosperity of knowledge-based economies and societies is widely acknowledged, and most young people regularly engage in computer and Internet use when they complete their compulsory education in the EU. As a result, it is necessary for young people to cultivate digital citizens that are self-sufficient and conscientious, but also equipped with basic digital skills.

Figure 6. Young people with at least basic digital skills by gender in 2021 (aged 16-29 years, %)

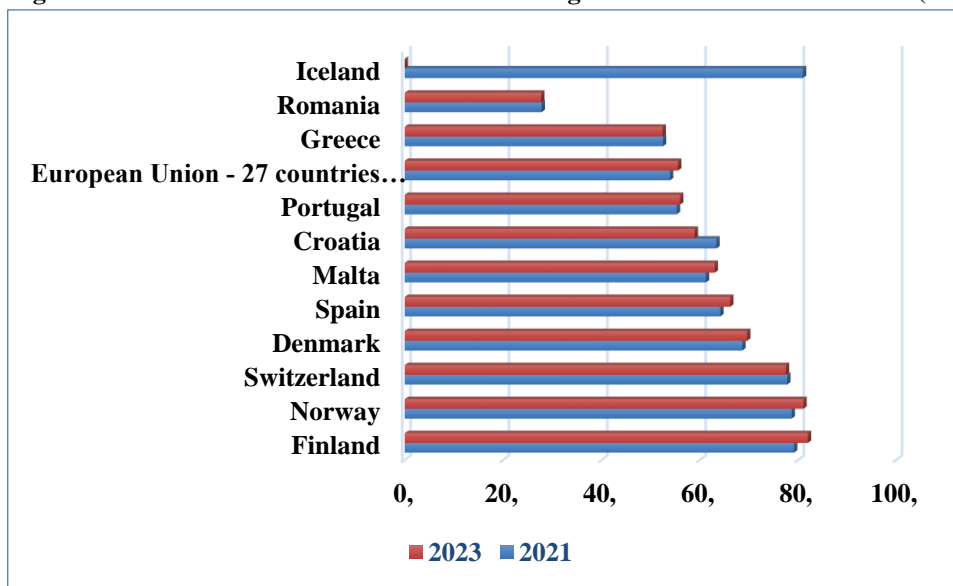


Source: Eurostat database.

Also, the rate of young individuals having basic or above basic overall skills in 2021 ranges from 46% in Bulgaria and Romania, to 92% in Malta and 93% in Finland, while the average EU level was 71%. Figure 6 shows that in 2021 there was no significant gender-based disparity in the reported digital skills manifested by young people at the EU level.

However, the situation varies when examining individual member states with the percentage of young females possessing at least basic digital skills exceeding that of young males by at least 5 percentage points in nine countries (Figure 6). For example, Croatia had the largest difference in favour of young women (94%), while the proportion of young men with at least basic digital skills (84%) was 10 percentage points lower. In Romania, there is a significant gender difference of 4% between young men (48%) and young women (44%) with at least basic digital competencies. Furthermore, the percentage of young men with at least basic digital skills exceeds the percentage of young women in in four other European countries: Slovenia, Hungary, Slovakia, and Luxembourg by more than 5 percentage points. In addition, Figure 6 shows that both young men and women have a significant share of at least 80% of young people with basic digital skills from ten EU-27 countries, including Finland, Malta, Greece, Croatia, Portugal, Denmark, Spain, Iceland, Norway, and Switzerland.

Figure 7. Individuals with basic or above basic digital skills in 2023 versus 2021 (%)



Source: authors' contribution using Eurostat database.

Given that by 2021 the percentage of young people between the ages of 16 and 29 with at least basic digital skills is the highest in these ten countries, it is easy to assume that their percentage of people with basic or above basic digital skills is also higher than the EU average. As a result, the data analysis of Figure 7 illustrates

a trend towards acquiring basic digital skills or more, with ten countries having the highest proportion of young people with at least basic digital skills (Finland, Malta, Greece, Croatia, Portugal, Denmark, Spain, Iceland, Norway, and Switzerland) in 2023 compared to 2021, while Romania has the lowest proportion.

It is noteworthy that nine of these countries (Iceland, Portugal, Croatia, Malta, Spain, Denmark, Switzerland, Norway, and Finland) have exceeded the EU average of people with basic or advanced digital skills (55% in 2021, 55% in 2023). Still, it must be mentioned that there is no data available for Iceland in 2023 (Figure 7).

On the other hand, the share of individuals from Greece and Romania with basic or above basic digital skills remains slightly below the EU average for both years, with Romania scoring the lowest share among all EU-27 countries.

6. Conclusions

Under the digital age umbrella, digital connectivity represents a global landscape for digital native people born in a world surrounded by technology. However, the scope of their digital competence and its impact on future progress remain the subject of discussion. This study analyses data from the official Eurostat reports on young European digital habits, highlighting their use of the Internet, the involvement and the acquisition of digital skills.

Findings present a very incoherent image of the digital landscape among young Europeans, who all present a daily habit of Internet usage (Figure 2), but seem to lack fact-checking behaviour while consuming online content. On the one hand, social networking activities are the main reason because the majority of young people use the Internet, but they also show higher online course enrolment rates than adults, emphasising the transition of Gen Z to Education 4.0 paradigm. On the other hand, the results indicate that young Europeans lack adequate fact checking behaviour, with only a few countries (such as the Netherlands and Sweden) taking the lead by example and actively checking online information and data sources.

Furthermore, the level of digital competence of young people remains far from the EU 2030 target, with only ten European countries with higher digital skills than the EU average. In addition, Figure 7 shows the gender difference between women and men in attaining digital skills in a number of countries (Malta, Croatia, Portugal, the Czech Republic, Spain, Sweden, France, Estonia, Latvia, Belgium, Poland, and Cyprus). Conversely, countries such as Greece and Romania are confronted with persistent obstacles in bridging the digital divide, and their digital literacy rates are lower than the EU average.

A very curious case is presented by the Romanian education system which is the only European system to assess students' digital skills through national tests for all pupil, but fails to deliver measurable competencies with only 48% of young males and 44% of young females possessing at least basic digital competencies. These rates place Romania in the last position in the hierarchy of minimal digital skills reported by European young individuals from 36 countries, followed closely by Bulgaria (Figure 7).

Overall, this paper explains the complex technological dimension of young Europeans aged 16 to 29, showing promising progress and concerning disparities. Although the use of the Internet and online learning show a transition to Education 4.0, the inadequacy of fact-checking behaviours and the continuing gender difference in digital skills improvement emphasise the need for targeted interventions. The results of this research also highlight the vital role of quality education for digital skills promotion, with countries that give priority to early digital competence acquisition with higher success rates than the other countries.

As a result, this research article provides a detailed picture of the complex digital landscape of European citizens, but it is critical to recognise certain limitations that affect the interpretation and generalisation of these conclusions. First, the study's focus mainly on young Europeans can potentially limit the extrapolation of results to a wider demographic group or geographical region. Secondly, the findings demonstrate the importance of quality education to promote digital competence, but the study does not offer a more detailed image of specific educational interventions or strategies used by different countries. Finally, even if the study identified dissimilarities in the development of digital skills and testing practices, it did not offer detailed recommendations to address these differences or develop assessment strategies. Future research should try to overcome these limitations by applying more diverse and representative research methods that address digital skills differences effectively.

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