EDUCATION 4.0 TO FOSTER DIGITAL CITIZENSHIP

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ABSTRACT: Children and young people are particularly vulnerable to the dangers of the digital world, such as technology addiction, fake news, misinformation, online harassment, data theft, and privacy invasion and exposure. Therefore, the education system needs to focus on equipping students with basic digital skills, such as Digital Literacy, to foster and strengthen Digital Citizenship, which involves the responsible, safe, and ethical use of digital technology and media. To achieve this, the adoption of the Education 4.0 paradigm is necessary, aimed at nurturing the skills required for 21st-century learning and work, in response to the challenges posed by the Fourth Industrial Revolution. In this context, this paper presents the development of an Education 4.0 strategy, through the application of technological, human, organizational, and pedagogical drivers for the digital transformation of education, with the goal of exercising skills, knowledge, and attitudes and values to promote Digital Citizenship competence. The proposed Education 4.0 strategy was tested and evaluated in three elementary and high school classes, involving a total of fifty-three students and three teachers. Based on student feedback regarding the experimentation of the Education 4.0 strategy, the results indicate an improvement in their awareness and maturity as digital citizens.

KEYWORDS: Digital Citizenship; Digital Literacy; Digital Transformation; Skills; Education 4.0.

RESUMO: Crianças e jovens são particularmente vulneráveis aos perigos do mundo digital, como o vício em tecnologia, notícias falsas, desinformação, assédio online, roubo de dados e invasão e exposição da privacidade. Por isso, o sistema educacional precisa focar em capacitar os estudantes com habilidades digitais básicas, como o Letramento Digital, para fomentar e fortalecer a Cidadania Digital, que envolve o uso responsável, seguro e ético da tecnologia e dos meios digitais. Para isso, é necessária a adoção do paradigma da Educação 4.0, voltado para o desenvolvimento das competências exigidas para a aprendizagem e o trabalho no século XXI, em resposta aos desafios impostos pela Quarta Revolução Industrial. Nesse contexto, este trabalho apresenta o desenvolvimento de uma estratégia de Educação 4.0, por meio da aplicação de habilitadores tecnológicos, humanos, organizacionais e

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pedagógicos para a transformação digital da educação, com o objetivo de exercitar competências, conhecimentos, atitudes e valores que promovam a Cidadania Digital. A estratégia de Educação 4.0 proposta foi testada e avaliada em três turmas do ensino fundamental e médio, envolvendo um total de cinquenta e três estudantes e três professores. Com base no feedback dos alunos sobre a experimentação da estratégia de Educação 4.0, os resultados indicam uma melhora em sua consciência e maturidade enquanto cidadãos digitais.

PALAVRAS-CHAVE: Cidadania Digital; Letramento Digital; Transformação Digital; Habilidades; Educação 4.0.

1 INTRODUCTION

The World Economic Forum (WEF) points out that many children and young people don't have the necessary skills to thrive in the Fourth Industrial Revolution (4IR) (WEF, 2022). Moreover, factors like gender, socioeconomic status, location, and ethnicity continue to influence access to quality education (WEF, 2022). UNESCO (2018) highlights the significance of quality education, stating that it's crucial for the future economic prospects of young people. To address the challenges of the 4IR, education systems must evolve. Education is crucial in preparing the workforce for future jobs, many of which do not yet exist and will require a mix of digital and socio-emotional skills (WEF, 2016). The concept of Education 4.0 has emerged, emphasizing inclusive education that focuses on 4IR skills and incorporates both pedagogical and technological innovations to prioritize student-centered learning (WEF, 2020a).

Students in the 21st century need to develop the digital skills essential for Education 4.0 (WEF, 2020a). These skills enable individuals to handle challenges like online addictions, identity theft, online privacy, and the vast amount of digital information (WEF, 2018). Digital citizenship, which involves the safe and responsible use of technology, is a key competency for achieving digital maturity (DQ Institute, 2019). This concept is emphasized in curricula and public policies around the world (CIEB, 2018; COMMONSENSE, n.d.; ISTE, 2016; Council of Europe, 2022; Brasil, 2018). However, concerning statistics highlight the critical need to focus on digital citizenship. Globally, about 60% of 8- to 12-year-olds face cyber risks, including cyberbullying (COSI, 2020). In Brazil, 31% of young people aged 9 to 17 struggle to verify the accuracy of online information, and 44% have encountered strangers online (CGI.BR, 2018). Despite the vast learning and entertainment opportunities the digital world offers (Erickson & Monk, 2018),

children and young people remain vulnerable to cyberbullying, technology addiction, violence, radicalization, scams, and data theft (Sadiku & Musa, 2021).

The COVID-19 pandemic has accelerated the adoption of digital technologies in education, exacerbating educational inequalities (Milenkova & Lendzhova, 2021). To address this challenge, it is crucial to prioritize basic digital competencies, such as digital literacy, as the foundation for fostering digital citizenship among students (Dimopoulos et al., 2021).

Numerous studies in the current literature focus on the digital transformation in education to develop and enhance digital competencies. Milenkova and Lendzhova (2021) underscore the significance of digital media as both a prerequisite for social inclusion and an indicator of professional competence and social skills. Slavković et al. (2023) highlight that digital citizenship acts as a mediator in the relationship between digital capabilities, change management, and risk management. Mukhametzyanov (2022) reveals that digital citizenship encompasses both citizen competencies and government actions to ensure equal access to digital information and protect individuals in digital communication. Baterna et al. (2020) recommended establishing a digital literacy task force to enhance students' digital proficiency and prepare them for future challenges.

The accelerated pace of digital transformation in education underscores the shift towards Education 4.0 and the growing demand for digital competencies among 21st-century citizens. At the same time, there is a significant gap in basic digital competencies among students. Therefore, this study aimed to answer the research question: "How might we promote digital transformation in education to foster and enhance digital citizenship?". In addressing this question, this work presents the development and evaluation of an Education 4.0 strategy that promotes digital citizenship competency among elementary and high school students.

2 THEORETICAL FOUNDATIONS

This work is based on the competency-based education paradigm to foster and develop students' skills and knowledge related to digital citizenship, a fundamental requirement for professional, social, and educational interactions in today's world.

2.1 EDUCATION 4.0

Schwab (2016) defines the 4IR as a period characterized by rapid technological advancements in AI, IoT, nanotechnology, and biotechnology. The 4IR is driven by the widespread adoption of smart mobile devices, which provide unprecedented access to information. However, it also raises concerns regarding privacy, consumption, and work-life balance. Social inequality is a significant issue in the 4IR, with digitally skilled workers enjoying greater opportunities while others face declining prospects. Education 4.0 addresses these challenges by focusing on developing competencies such as teamwork, critical thinking, creativity, and problem-solving (WEF, 2020a; Hong & Ma, 2020).

Education 4.0 placing a strong emphasis on nurturing 21st-century skills (WEF, 2020b). To adequately prepare students for the 4IR, schools must prioritize cultivating digital proficiency and promoting inclusivity (WEF, 2020a). Both teachers and students should possess digital skills to facilitate a human-centered approach to learning (OECD, 2018b). Employing innovative pedagogies becomes crucial in empowering students to develop the competencies essential for their educational journey (Peterson et al., 2018). As outlined in the Education 2030 framework (OECD, 2018a), competency involves mobilizing knowledge, skills, and attitudes and values to address complex demands.

The competencies required by Education 4.0 can be nurtured and honed through novel teaching and learning strategies devised by drivers of digital transformation in education (Oliveira & Souza, 2022):

- Technological drivers encompass both infrastructure and tools such as Cloud computing, fostering collaborative work; Social networks, enabling interactions for the exchange of information and knowledge; and Educational software, aiding tasks development.
- Organizational drivers focus on enhancing the educational experience by promoting the utilization of digital technologies and innovative pedagogies within and beyond the classroom; and the promotion of teaching autonomy, which aims to encourage and support teachers in innovating their teaching activities.
- Drivers for enhancing teacher digital competence include: Provide constant feedback, offering students opportunities to ask questions, make observations, and engage in discussions during the teaching process; Use appropriate technology according to need, evaluating and comparing the usefulness of different technologies

and resources based on criteria such as content reliability, security, and interactivity; Use digital technologies for personal and collective teaching and learning, supporting the transformation of student thinking into tangible outcomes, and creating spaces for communication and cooperation; and Use innovative assessment methods, implementing open assessments, which may include incorporating peer assessment and self-assessment.

- Drivers for fostering student soft skills include communication, effectively linking thoughts and ideas through oral, written, and non-verbal skills; social and cultural awareness, encouraging interaction with others in a social, cultural, and ethical manner, recognizing and respecting differences; creativity, fostering the ability to produce or discover something new, transform scenarios, and innovate in actions; empathy, developing the capacity to see the world through the experiences of others; responsibility, guiding ethical behavior; and teamwork, promoting collaboration with people from diverse social and cultural backgrounds.
- Drivers for developing student hard skills include management of technological resources, helping them select and utilize technological resources as needed, and effectively use tools required for a job; time management, allowing them to manage their own time and that of a work team, demonstrating increased autonomy and flexibility in schedules; and creative problem-solving, encouraging them to adopt different perspectives, develop and evaluate various alternatives in problem-solving, using divergent and convergent thinking, as well as inventiveness when formulating solutions.
- Pedagogical drivers encompass innovative approaches such as human-centered design (HCD) and design thinking, which enable students to acclimate to self-managed learning focused on real-world problems; Problem-based learning enhances everyday problem-solving skills by immersing students in real-world problems; and Blended learning emphasizes learning by doing and maximizes the benefits of technology to enhance understanding based on individual needs.

2.2 DIGITAL CITIZENSHIP

The journey toward developing digital skills for Education 4.0 can be guided by students' digital maturity levels. According to the Digital Intelligence framework (DQ Institute, 2019), these levels range from basic to advanced: Digital citizenship, which

involves using digital media and technology in a safe, responsible, and ethical manner; Digital creativity, enabling engagement in the digital ecosystem to create new knowledge, technologies, and content from ideas; and Digital competitiveness, the capacity to address global challenges, innovate, and generate new opportunities in the digital economy through entrepreneurship, jobs, and impact.

According to the Digital Intelligence framework, digital citizenship encompasses the following digital competences: build a comprehensive online and offline identity; use technology in a balanced and healthy manner; understand, mitigate, and manage cyber risks through safe, responsible, and ethical use of technology; detect, prevent, and manage various levels of cyber threats to protect data, devices, networks, and systems; recognize, navigate, and express emotions in intra and interpersonal digital interactions; communicate and collaborate with others using technology; find, read, evaluate, synthee, adapt, and share information, media, and technology; and understand and advocate for legal and human rights when using technology.

According to the OECD report on educating 21st-century children (Burns & Gottschalk, 2019), empowering children to be active and ethical digital citizens involves equipping them to engage positively and responsibly both online and offline. Digital citizenship encompasses competent and positive engagement with technology, active participation, and lifelong learning across formal, non-formal, and informal settings. The International Society for Technology in Education (ISTE, 2016) emphasizes that digital citizens understand their rights, responsibilities, and opportunities in an interconnected digital world and act in a safe, legal, and ethical manner.

Digital citizenship and digital literacy are deeply interconnected, much like the relationship between traditional citizenship and literacy (Knox & Bayne, 2013). Digital citizenship involves the skills to navigate and succeed in the digital world (Hargittai, 2007) and is closely tied to the development of digital literacy (Knox & Bayne, 2013). According to the European Commission (2003), digital literacy is the ability to use digital technologies and the internet, essential for skills like creativity, innovation, and entrepreneurship. Without this competence, people cannot fully participate in 21st-century society. Carvalho et al., (2020) emphasize the need for digital literacy to be developed in both teachers and students to enhance educational quality. The DQ Institute (2019) defines digital literacy as the ability to find, read, evaluate, synthesize, create, adapt, and share information, media, and

technology, with respect for knowledge as a fundamental principle. Digital literacy is viewed as an essential skill for Education 4.0 (Peredrienko et al., 2020).

2.3 RELATED WORKS

Several studies in the specialized literature emphasize the need for young people and adults, both students and professionals, to develop skills, awareness, and knowledge related to digital citizenship and digital literacy as essential requirements for education, employment, and social life in today's world.

Costa et al. (2015) conducted an exploratory study that identified everyday situations in which adults are prevented from exercising full citizenship due to a lack of knowledge and proficiency in digital technologies. Based on the results, it was possible to determine that digital citizenship can be strengthened through activities, mediated by digital technologies, aimed at purposes such as information, communication, production, leisure, daily tasks, and digital security. Xu et al. (2018) recommend that strategies to enhance students' digital citizenship include: educational systems should promote the development of digital citizenship principles from kindergarten through higher education; and activities related to digital citizenship should be integrated into the school curriculum to emphasize and develop students' awareness of digital citizenship principles.

Amaro, Oliveira, and Veloso (2016) identified digital literacy skills as crucial for thriving in the knowledge society. These include the ability to manage information by identifying, organizing, and analyzing digital content while evaluating its relevance; communication skills to engage in digital environments, collaborate through online tools, and participate in networks with intercultural awareness; content creation, involving the ability to create, edit, and integrate new and existing content creatively; safety, which emphasizes personal and data protection, secure and sustainable technology use; and problem-solving skills to identify digital needs, select appropriate tools, and continuously update one’s competencies to adapt to evolving technologies.

Young and Ronquillo (2021) demonstrated how students can acquire the digital skills necessary for their future professional practice through a participatory learning environment. Milenkova and Lendzhova (2021) highlighted the importance of digital media and digital literacy as prerequisites for social inclusion and as enablers of interpersonal and professional competencies.

3 METHOD

Figure 1 depicts the Conceptual Model that serves as the foundation for developing an Education 4.0 strategy. This strategy is informed by the drivers of digital transformation in education (Oliveira & Souza, 2022), leading to the formulation of a teaching and learning plan focused on fostering digital literacy skills.

The Education 4.0 strategy to enhance digital citizenship is in line with both international and specific Brazilian public policies. The national curriculum base (Brasil, 2017) advocates for integrating digital culture practices in classrooms, covering aspects of digital citizenship such as digital literacy and new communication methods. The national foundation for the initial training of basic education teachers (Brasil, 2019) places importance on incorporating digital technologies in teaching practices and fostering teachers' digital competencies. The national foundation for the continuing training of basic education teachers (Brasil, 2020) concentrates on establishing conducive learning environments, incorporating digital languages, and employing active learning methodologies, including the integration of information and communication technologies.

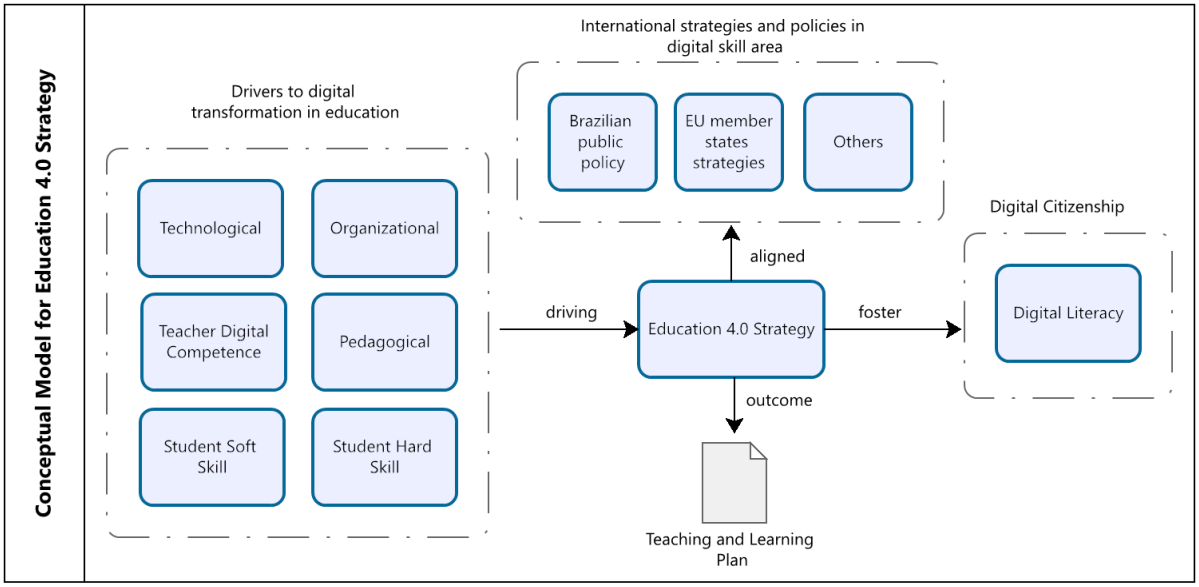

Figure 1 - Conceptual Model for Education 4.0 strategy.

In the European Union (European Commission, n.d.), several member states have implemented strategies to promote digital skills. Portugal has INCoDe.2030 (INCode.2030, 2017), an integrated public policy aimed at enhancing digital skills. Malta has the National eSkills Strategy (Malta Foundation, 2019), which outlines targets for the development of

digital skills. Ireland has the Third ICT Skills Action Plan (Government of Ireland, 2021), which prioritizes digital skills within the education sector and emphasizes the training of ICT specialists. Italy has the National Strategy for Digital Skills (Repubblica Digitale, 2020), which focuses on enhancing digital skills, promoting responsible technological development, and encouraging lifelong learning for future job opportunities.

A teaching and learning strategy aimed at enhancing digital skills is also in harmony with other initiatives that promote and provide guidance on the significance of incorporating digital technologies as tools for teaching and learning. These initiatives aim to enhance educators' capacity to expand and enhance pedagogical skills in the learning and teaching process, including:

- The Open University has put forth the Digital and Information Literacy Framework (Reedy & Goodfellow, 2016), which establishes a connection between digital literacy and students' abilities, competencies, and attitudes when employing digital technologies to attain personal, academic, and professional objectives.
- The Organization for Economic Co-operation and Development (OECD) set up the Center for Educational Research and Innovation, which releases various educational studies. Among these is the report by Burns and Gottschalk (2019) that evaluates the intersection of children's emotional well-being and digital technologies, exploring ways to equip them for digital citizenship.
- The International Society for Technology in Education (ISTE) in 2016 set forth specific objectives for students to attain digital citizenship. These include the ability to shape and manage their digital identity and reputation, understanding the lasting impact of their actions in the digital realm. Moreover, students are encouraged to engage in positive, safe, legal, and ethical behavior when using technology, whether in online social interactions or with networked devices. Additionally, students should be adept at managing their data to uphold privacy and digital security standards and be aware of the technology-driven methods used to track online browsing activities.
- The ACM Informatics for All strategy (Caspersen et al., 2018) advocates for the early integration of digital literacy education, ensuring that students acquire proficiency in the fundamentals by the time they reach high school.

A Education 4.0 strategy crafted and directed through the integrated use of drivers for digital transformation in education, should be translated into a plan that provides guidance

for implementing the strategy in the classroom. Figure 2 illustrates the workflow employed to structure the Education 4.0 strategy, involving educators, students, and the author of the work. The study employed convenience sampling to select educators and students, which is a technique based on the availability and accessibility of participants when a comprehensive list of the target population is unavailable (Malhotra, 2006).

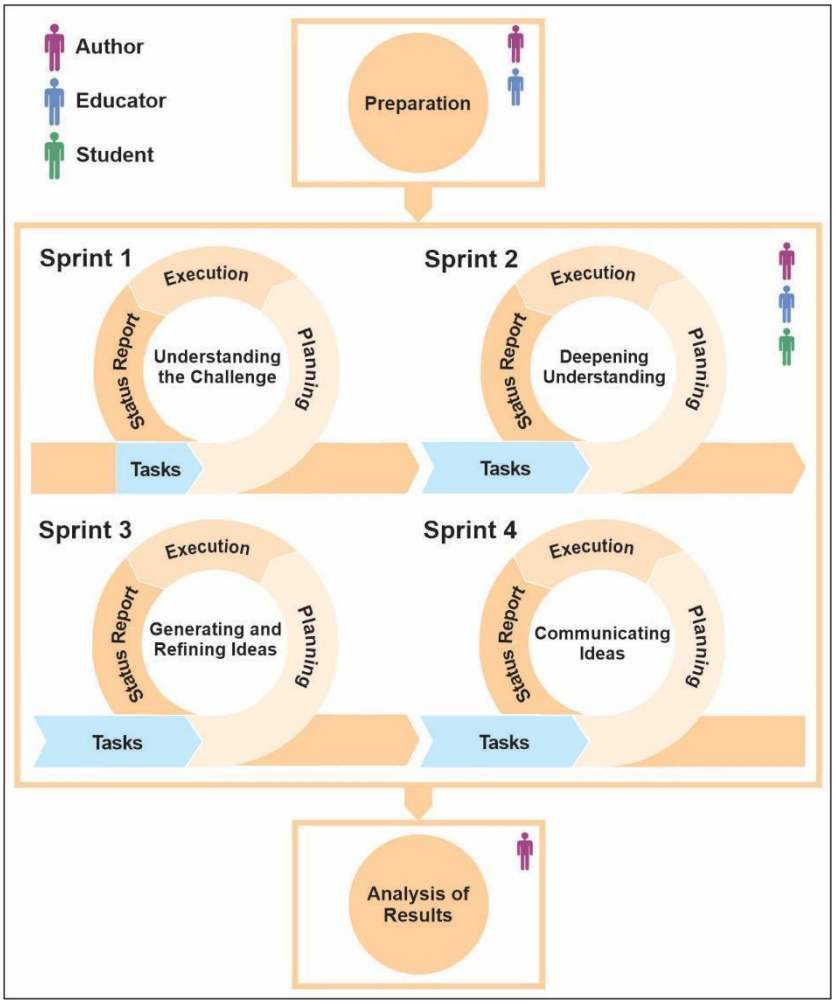

Figure 2 - Workflow of Education 4.0 Strategy.

The Education 4.0 strategy workflow initiated with the Preparation stage, during which the author of the work and the educator collaboratively designed the teaching and learning plan using a specific combination of drivers for digital transformation in education. The Execution comprising four time-box iterations (sprints) with specific objectives: Understanding the Challenge, framing an educational challenge; Deepening Understanding, uncovering insights; Generating and Refining Ideas, unlocking creative power to build and combine ideas for exploration and fulfillment of insights; and Communicating Ideas, constructing a solution prototype. A sprint, a term derived from agility (Schwaber, 2004;

Parsons & Maccallum, 2019), involves mini-cycles (iterations) encompassing planning, execution, and reporting on the tasks performed. Sprints facilitate structuring the learning process through short and continuous deliveries with a limited scope, allowing for risk mitigation. The Education 4.0 strategy workflow concluded with the Analysis of the Results, conducted by the author of the work, from feedback received from the students, which was analyzed and organized into comparative graphs.

4 RESULTS

In each application of the Education 4.0 strategy (Figure 2), four sprints were conducted, each serving a distinct purpose. The sequence commenced with understanding the challenge, followed by delving deeper into the context related to the challenge to discover insights. Subsequently, the focus shifted to generating and prototyping ideas derived from these insights to address the challenge effectively. At the conclusion of each sprint, each team was anticipated to achieve progress milestones and present a comprehensive status report detailing the tasks undertaken.

4.1 PREPARATION STAGE

The Preparation involved selecting suitable drivers for digital transformation in education, considering the students' level of education, specificities, and realities. Tasks for each sprint were defined, and a schedule for sprint execution was agreed upon by the author and educators. This stage culminated in the development of a teaching and learning plan (Table 1) to consolidate the agreements.

Table 1 - Teaching and Learning Plan.

Purpose	Development of digital citizenship			
Target public	Elementary and high school classes			
Drivers to Digital Transformation in Education				
Technological	Social Networks; and Cloud Computing			
Organizational	Develop, update and adapt curriculum; and Using hybrid teaching methods			
Teacher Digital Competence	Provide constant feedback; Use of Digital Technologies for personal and collective teaching and learning; and Use innovative assessment methods			
Student Soft Skill	Communication; Creativity; Critical and Analytical Thinking; and Responsibility			
Student Hard Skill	Management of Technological Resources; Quality Management; and Time Management			
Pedagogical	Innovation Approaches - Human Centered Design (HCD); and Problem-based learning			
Sprints Schedule				
Sprint (what)	#1 Understanding the challenge	#2 Deepening Understanding	#3 Generating and Refining Ideas	#4 Communicating Ideas
Tasks (how)	Desk research Conversation starters	Brainstorm Prototype	Storyboard	Pitch

Timeboxing (when)	21 days	21 days	21 days	21 days

4.2 EXECUTION STAGE

The Execution involves four sprints, each serving a specific purpose: (1) Understanding the challenge, aimed at comprehending the key question guiding the progress of the work; (2) Deepening Understanding, involving immersion in the context to unearth insights; (3) Generating and Refining Ideas, facilitating the co-creation of student proposals derived from the exploration of insights; and (4) Communicating Ideas, enabling the presentation of ideas prototyped by students during the learning process. The application of the Education 4.0 strategy aimed at fostering digital citizenship competencies took place in three school classes located in cities within the state of Pernambuco in the northeastern region of Brazil:

- Class 1 took place at the State Technical School Jurandir Bezerra Lins in Igarassu city, involving 12 students from the 1st year of high school. The educator leading the class held a postgraduate degree and specialized in teaching Portuguese subjects, with over a decade of teaching experience.
- Class 2 was conducted at the José Joaquim da Silva State Technical School in Vitória de Santo Antão city, with the participation of 19 students from the 2nd year of high school. The educator leading the class held an undergraduate degree and specialized in teaching Literature and Portuguese subjects, with 8 years of teaching experience.
- Class 3 took place at the Luciene Maria de Jesus Oliveira Municipal School in Orocó city, with 22 students from the 7th year of Elementary School participating. The educator leading the class held an undergraduate degree and specialized in teaching Arts subjects, with 3 years of teaching experience.

At the outset, educators introduced students to the dynamics, explaining the structure involving sprints with task development and delivery. Students were then grouped into teams, with members chosen by the students themselves. Educators outlined the expectations for each sprint, providing a comprehensive overview of the teaching and learning plan (Table 1). Basic explanations of the essential drivers were provided to ensure all students had the necessary proficiency. The drivers for digital transformation in education used in the sprints are detailed in Table 2.

Table 2 - Drivers used in Education 4.0 strategy.

Category	Driver	Description
Technological	Social Networks	Virtual meetings among teachers, students, and the author of the work were facilitated using Google Meet (https://meet.google.com). For the "Brainstorm" task, WhatsApp (https://www.whatsapp.com) was used to enhance communication, allowing students to exchange information such as images, texts, and audio.
	Cloud Computing	Google Drive (https://www.google.com/intl/pt/drive) was used for storing and sharing the activities completed by student teams during each sprint. It also facilitated the creation and formatting of status reports through Google Docs and Google Slides. The "Storyboard" task was carried out using the Storyboard That tool (https://www.storyboardthat.com).
Organizational	Develop, Update, and Adapt Curriculum	Updates in educational practices were analyzed and suggested to fit the institution's schedule. Rather than adding an extracurricular course on digital literacy, the curriculum was adapted to incorporate relevant issues into the subjects each teacher typically teaches.
	Using Hybrid Teaching Methods	This approach provided students and teachers with the flexibility to conduct activities without being limited by space and time constraints. It combined online and traditional teaching, facilitated by digital technologies.
Teacher Digital Competence	Providing Constant Feedback	Constructive discussions, including comments, suggestions, and questions, enhanced the depth of the teaching experience. This approach allowed for the adjustment of learning paths based on evidence and student needs.
	Using Digital Technologies for Personal and Collective Teaching and Learning	Integrating various digital tools into the teaching process requires teachers to continuously seek knowledge and stay updated on technology use. Teachers used social networks, YouTube, and the Internet to facilitate their learning process, offering opportunities to enhance their personal and professional development.
	Using innovative assessment methods	student learning assessments were carried out using assessment of deliveries by sprint.
Student Soft Skill	Communication	The “Desk Research” task guided students to seek content and knowledge from reliable information sources. The “Conversation Starters” and “Brainstorm” tasks encouraged internal communication among students, fostering their creative potential and allowing them to freely express their ideas. The “Prototype” and “Storyboard” tasks promoted the production of audiovisual communication. These tasks gave students autonomy in searching for information, clearly presenting their ideas, and creating acceptable content in the digital world. They also emphasized responsible and empathetic communication.
	Creativity	Throughout the execution of all tasks, the chain of ideas and imagination of the students became evident. Students exercised their creativity by exploring Digital Citizenship themes through storytelling and drawings.
	Empathy	The “Conversation Starters” task encouraged students to consider social, political, environmental, and economic issues, prompting them

		to put themselves in others' shoes and understand different perspectives and motivations. During the “Prototype” and “Storyboard” tasks, students were able to grasp the needs, experiences, behaviors, and objectives of the people involved. This helped them recognize that different people have different needs and expectations.
	Critical and Analytical Thinking	In the “Desk Research" task, students were required to select, analyze, and evaluate information sources. During the “Brainstorm” task, students were encouraged to propose creative solutions and share ideas spontaneously from diverse perspectives. In the “Conversation Starters" task, teachers promoted teams to engage in debates on topics to generate valuable ideas.
	Responsibility	Throughout each task, teams were encouraged to reflect responsibly and analyze the outcomes, focusing on collective rather than personal desires. Each student was expected to exhibit responsibility in their engagement with issues related to digital citizenship, emphasizing collective responsibility over individual behavior.
Student Hard Skill	Management of Technological Resources	For each task, the teacher provided suggestions for some technological tools. However, the teams had the flexibility to choose the tool that best suited their needs for each sprint, taking into account factors like access difficulties, varying levels of proficiency among team members, and availability.
	Quality Management	Through completing tasks, students employed their critical thinking to assess the quality of posts circulating on the network and to select information for sharing. This process encouraged students to grasp the structure of digital media and how media usage influences information search and management. It fostered a mindset of critical evaluation and caution when establishing their digital presence.
	Time Management	Throughout the sprint execution, students effectively managed their time to ensure timely delivery of assignments. Teams autonomously organized themselves to select and develop task deliverables according to deadlines.
Pedagogical	Innovation Approaches	In tackling the digital citizenship challenge, teachers utilized Human-Centered Design (HCD) and Agile management to guide the process and task management, respectively.
	Problem-Based Learning	The learning objective was to address and mitigate threats to digital citizenship, such as the proliferation of fake news and misinformation, cyberbullying, and other online risks. These challenges guided the development of tasks aimed at fostering digital citizenship skills among students.

The Education 4.0 strategy, aimed at enhancing digital citizenship, was implemented in Portuguese, Literature, and Arts classes. As a pedagogical tool, Cordel literature—a unique literary genre native to the Brazilian northeast region—was employed. Cordel literature is a form of textual production deeply rooted in Brazil's northeastern culture, enriched by the vernacular language of the region. Cordel refers to small booklets of poems traditionally hung on strings ("cordas" in Portuguese) and sold at popular fairs in Brazil, hence the name "Cordel" (Silva & Tomácio, 2014). In contemporary times, Cordel literature

contributes to creative communication and visual storytelling, addressing reflective and critical themes.

4.2.1 SPRINT #1 - UNDERSTANDING THE CHALLENGE

During Sprint #1, the teacher tasked students with creating a Cordel literature piece addressing the issue of digital citizenship: "how to handle and prevent threats such as the spread of fake news and misinformation, cyberbullying, and other online risks". The "Desk Research" activity enabled students to gather information from diverse sources beyond their usual scope, focusing on current events and related subjects. In the "Conversation Starters" task, the teacher facilitated a dialogue where each team presented their Desk Research findings. Students were encouraged to take positions and engage in debates on topics related to Digital Citizenship, exploring aspects like the characteristics of the Cordel literary genre and the skills of a digitally literate citizen.

4.2.2 SPRINT #2 - DEEPENING UNDERSTANDING

During Sprint #2, teams participated in the "Brainstorm" and "Prototype" tasks. In the "Brainstorm" activity, teams discussed and deliberated on themes such as Fake News, Ethics in the digital world, Empathy, and the Use of digital technology that would be addressed in their Cordel literature piece. The "Prototype" task involved creating sketches to visualize the Cordel literature piece. Teams could either draw these manually or use graphic tools such as MS Paint and CorelDRAW to digitalize their sketches.

4.2.3 SPRINT #3 - GENERATING AND REFINING IDEAS

During Sprint #3, teams embarked on the "Storyboard" task. This task focused on creating a narrative that helps visualize their ideas. Figure 3 presents one of the Cordel literature pieces developed (in portuguese) as a Storyboard. The text of Cordel's literature is structured in rhymed verses.

4.2.4 SPRINT #4 - COMMUNICATING IDEAS

During Sprint #4, teams participated in the "Pitch" task. This task involved presenting the tasks, tools, and work products they developed throughout the process. Teams showcased their Cordel literature piece addressing the digital citizenship challenge as part of their presentation.

FUJA DE NOTÍCIAS FALSAS

A Divulgação de Notícias Falsas.
Prejudica muita gente
É preciso pesquisar
E informar consciente

Não é de hoje que mentiras
São divulgadas como verdades
Assuntos sérios e importantes
Só que sem veracidade

Não confie em tudo que lê
Preste muita atenção
Porque uma fake News
Gera muita confusão

Qualquer tipo de notícias falsa
Por mais simples, é descabida
Todas elas prejudicam
Alguma coisa de alguém na Vida

Para diminuir as fale News
Cada cidadão deve fazer sua parte
Compartilhando somente as notícias
Que tem certeza que são verdade.

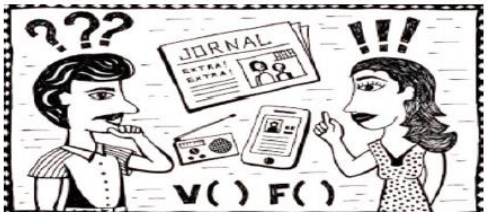

Figure 3 - Cordel literature piece.

4.3 ANALYSIS OF RESULTS STAGE

This stage involved analyzing students' responses to an electronic form (Table 2), which was designed to assess their perception and awareness of Digital Citizenship issues following their experience with Education 4.0. The response options for the questions on the scale were: "never", "rarely", "occasionally", "often", and "always". Figure 4 displays the percentages of student responses to these questions.

Table 2 - Questions answered by students.

ID	Description
Q1	Are you confident in your ability to critically analyze and evaluate information accessed through digital media, ensuring its reliability and credibility? For example, do you scrutinize information content to identify potential fake news?
Q2	When you search on the Internet, do you seek information from trusted sites? For instance, when working on a school project, do you conduct searches on academic Google or directly on sites recognized as authoritative on the topic?
Q3	In collaborative school projects, do you feel empowered to create, store, and share documents using cloud computing platforms? For instance, can you create and edit documents online using Google Docs and share them with classmates and teachers?
Q4	Do you feel confident in searching for, installing, and using software applications to manipulate digital information? For instance, are you able to use apps like Storyboard That to create Cordel literature pieces?
Q5	Do you feel capable of using visual elements, whether static or dynamic, to communicate a subject or an idea? For example, can you narrate a story using images or animations to convey a topic learned in the classroom?
Q6	When encountering a post by an Internet user, do you strive to maintain respectful and empathetic behavior, even if you disagree with the content? For instance, if you come across a post or comment on a social network that you disagree with, do you aim to respond critically while avoiding offense and respecting divergent points of view?
Q7	Do you feel prepared and take necessary precautions to be a responsible "digital" citizen? For example, do you share useful information and knowledge with others on the Internet, whether known or unknown, while being cautious not to share sensitive data (like personal information or compromising photos) that could potentially harm you in the future? Are you also mindful of digital pitfalls such as viruses and fake news?

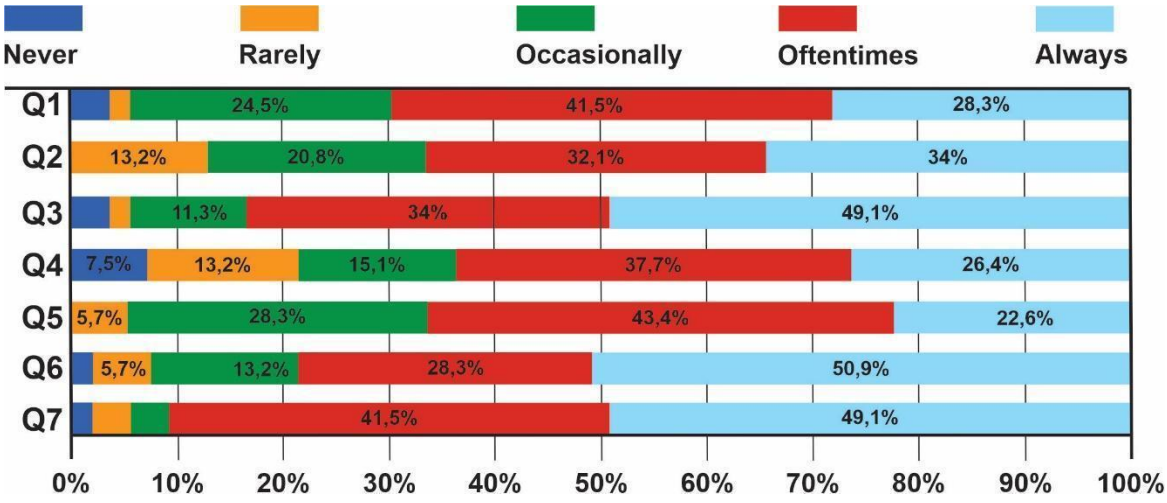

Figure 4 - Students' feedback.

From the analysis of Figure 4, it is possible to observe the maturation of students regarding the perception of knowledge, skills, attitudes and values necessary for the acquisition of digital citizenship competencies. The distribution of responses shows a more balanced distribution between "always" and "oftentimes", indicating a heightened critical awareness. Moreover, the combined percentages of "never," "rarely," and "sometimes" responses, averaging below 25%, highlight a higher level of proficiency among students in digital literacy matters. Notably, questions Q6, Q3, and Q7 received the highest percentage of "always" responses, respectively, as illustrated.

The question Q6 evaluates how individuals behave when encountering posts from other internet users, especially in situations of disagreement. Insights on this topic can be found in the literature. Ramasubramanian & Albrecht (2018) emphasize the importance of social networks as platforms for social engagement, urging citizens to critically reflect, actively participate, and address social and structural inequalities. This perspective aligns with the question's focus on maintaining respectful and empathetic behavior, even when disagreeing with posted content.

Additionally, Blevins et al. (2016) emphasize the significance of creating environments that encourage young individuals to participate in diverse discussions and actions. They argue that active engagement and community involvement are essential for fostering respect toward differing viewpoints. In the context of question Q6, it is noteworthy that the study's findings revealed a significant percentage (79.2%) of respondents indicating that they consistently exhibit respectful and empathetic behavior. This underscores the

importance of promoting constructive online interactions and cultivating a sense of digital citizenship among internet users.

The literature on question Q3 highlights the benefits of using cloud computing platforms for collaborative school work. Sein-Echaluce et al. (2021) emphasize students' familiarity with cloud tools and their alignment with learning theories that promote collaboration and connectivity. García-Peñalvo et al. (2021) underscore the role of cloud computing during the COVID-19 pandemic, particularly in facilitating remote work and online teaching.

According to the question Q3 responses, a significant percentage (83.1%) of respondents feel empowered to use cloud platforms for document creation, storage, and sharing. These findings illustrate the effectiveness of cloud technologies in fostering collaborative work and developing digital skills in education.

The literature on question Q7 emphasizes the critical importance of digital citizenship skills and digital literacy in ensuring online safety and promoting responsible online behavior. Martin et al. (2018) highlight the usage patterns of social networks among children and adolescents, stressing the imperative need for digital citizenship education. Panke & Stephens (2018) underscore the role of digital literacy in effectively navigating the digital landscape and discerning accurate information.

According to the responses to question Q7, a substantial percentage (90.6%) of respondents feel prepared and actively practice the necessary care to be responsible digital citizens. These findings underscore the significance of promoting digital citizenship education and fostering digital literacy skills to navigate the digital world safely and responsibly.

5 CONCLUSIONS

This study significantly enhances educational practices in elementary and high schools, highlighting the pivotal role of digital citizenship as a fundamental competency in today's digital era. The primary audience for this research is educators. By presenting research findings on digital skills and citizenship in education, along with the implementation and assessment of the Education 4.0 strategy, this work offers valuable insights and practical guidance for teachers.

The aim is to equip educators with the necessary knowledge and tools to cultivate digital competencies and promote digital citizenship among their students through effective teaching and learning approaches. By focusing on teachers, this work aims to drive progress in digital education practices, enabling educators to better prepare students for the challenges and opportunities presented by the digital world.

The Education 4.0 strategy was successfully implemented in real classrooms, yielding positive outcomes that highlight enhanced awareness and readiness among students across multiple dimensions. Specifically, students demonstrated improved skills in critically analyzing the credibility of online information, thus mitigating the dissemination of misinformation and fake news. Moreover, they showed increased proficiency in sourcing information from reliable sources and effectively using software applications to support remote, collaborative, and creative learning experiences.

Additionally, students exhibited respectful and empathetic behavior during virtual interactions, whether with acquaintances or strangers, underscoring their adeptness in navigating digital challenges responsibly. These findings underscore the effectiveness of the Education 4.0 approach in equipping students with essential digital competencies and fostering a proactive digital citizenship mindset.

Recognizing the necessity for the educational system to equip students for the challenges posed by the Fourth Industrial Revolution, this study makes a substantial contribution through the introduction of an Education 4.0 strategy. This strategy is crafted to be flexible and relevant across a wide range of contexts and circumstances, drawing upon a blend of key drivers of digital transformation in education.

This study provides valuable insights into integrating digital competencies and promoting digital citizenship in education. However, it is important to acknowledge some limitations.The sample size used might not have been large enough to capture a comprehensive range of perspectives on digital citizenship competencies. Relying on self-assessment by students introduces potential subjectivity and biases in evaluating their performance and awareness. Factors such as socio-economic status, family background, and access to technology, which can influence digital citizenship competencies, were not extensively examined. Future research with larger and more diverse samples, considering contextual variables and the role of teachers, is needed to enhance the generalizability and practical relevance of the findings.

REFERENCES

AMARO, A., OLIVEIRA, L. & VELOSO, A. Let's Build our Family Tree!": Grandparents and Grandchildren Using Tablets Together, **Procedia Computer Science**, v. 100, pp. 619-625, ISSN 1877-0509, 2016. https://doi.org/10.1016/j.procs.2016.09.203

BATERNA, H., MINA, T., & ROGAYAN JR, D. Digital Literacy of STEM Senior High School Students: Basis for Enhancement Program. **International Journal of Technology in Education**, 3(2), 105-117, 2020. https://doi.org/10.46328/ijte.v3i2.28

BLEVINS, B., LECOMPTE, K. & WELLS, S. Innovations in civic education: Developing civic agency through action civics. **Theory & Research in Social Education**, 44(3), 344-384, 2016. https://doi.org/10.1080/00933104.2016.1203853

BRASIL. Resolução CNE/CP nº 2, de 22 de dezembro de 2017: Institui e orienta a implantação da Base Nacional Comum Curricular, 2017. Available in: http://basenacionalcomum.mec.gov.br/images/historico/RESOLUCAOCNE_CP222DEDEZEMBRODE2017.pdf

BRASIL. Base Nacional Comum Curricular: Educação é a Base, 2018. Available in: http://basenacionalcomum.mec.gov.br/images/BNCC_EI_EF_110518_versaofinal_site.pdf

BRASIL. Resolução CNE/CP n º 2, de 20 de dezembro de 2019: Define as Diretrizes Curriculares Nacionais para a Formação Inicial de Professores para a Educação Básica e institui a Base Nacional Comum para a Formação Inicial de Professores da Educação Básica (BNC-Formação), 2019. Available in: http://portal.mec.gov.br/docman/ dezembro-2019-pdf/135951-rcp 002-19/file

BRASIL. Resolução CNE/CP nº 1, de 27 de outubro de 2020: Dispõe sobre as Diretrizes Curriculares Nacionais para a Formação Continuada de Professores da Educação Básica e institui a Base Nacional Comum para a Formação Continuada de Professores da Educação Básica (BNC-Formação Continuada), 2020. Available in: http://portal.mec.gov.br/docman/ outubro-2020-pdf/164841-rcp001-20/file

BURNS, T. & GOTTSCHALK, F. **Educating 21st Century Children: Emotional Well-being in the Digital Age, Educational Research and Innovation**, OECD Publishing, Paris, 2019. https://doi.org/10.1787/b7f33425-en

CARVALHO, J., INMACULADA, S. & DELGADO, S. Conditioning factors in the integration of technology in the teaching of Portuguese non-native language: A post-Covid 19 reflection for the current training of Teachers. **International Journal of Learning, Teaching and Educational Research,** 19(9), 2020. https://doi.org/10.26803/ijlter.19.9.11

CASPERSEN, M. , GAL-EZER, J., MCGETTRICK, A. & NARDELLI, E. **Informatics for all the strategy**. ACM/Informatics Europe, NY, 2018. https://doi.org/10.1145/3185594

CGI.BR. TIC kids online Brasil - Pesquisa Sobre o Uso da Internet por Crianças e Adolescentes no Brasil, 2018. https://www.cetic.br

CIEB. Centro de Inovação para a Educação Básica: Currículo de Referência em Tecnologia e Computação da educação infantil ao ensino fundamental, 2018.

https://curriculo.cieb.net.br/assets/docs/Curriculo_de_Referencia_em_Tecnologia_e_Computacao.pdf

COMMON SENSE EDUCATION. Everything You Need to Teach Digital Citizenship, n.d. https://www.commonsense.org/education/digital-citizenship

COSI. Real-Time Measure for Country's Child Online Safety, 2020. https://www.dqinstitute.org/child-online-safety-index

COSTA, F., VIANA, J., CRUZ, E. & PEREIRA, C. **Digital literacy of adults education needs for the full exercise of citizenship**. International Symposium on Computers in Education, Setubal, Portugal, pp. 92-96, 2015. https://doi.org/10.1109/SIIE.2015.7451655

COUNCIL OF EUROPE. Digital Citizenship Education (DCE). Children and young people spend a lot of time nowadays connected to digital technology, 2022. https://www.coe.int/en/web/digital-citizenship-education/home

DIMOPOULOS, K., KOUTSAMPELAS, C. & TSATSARONI, A. Home schooling through online teaching in the era of COVID-19: Exploring the role of home-related factors that deepen educational inequalities across European societies. **European Educational Research Journal**, 20(4), 479-497, 2021. https://doi.org/10.1177/14749041211023331

DQ INSTITUTE. DQ Global Standards Report 2019. Common Framework for Digital Literacy, Skills and Readiness, 2019. https://www.dqinstitute.org/wp-content/uploads/2019/03/DQGlobalStandardsReport2019.pdf

ERICKSON, D. & MONK, G. Applying narrative therapy with young people who engage in video gaming. **Journal of Systemic Therapies**, 37(1), 1-14, 2018. https://doi.org/10.1521/jsyt.2018.37.1.1

EUROPEAN COMMISSION. eLearning: Better eLearning for Europe. Office for Official Publications of the European Communities, 2003. Available in: https://www.lu.lv/materiali/biblioteka/es/pilnieteksti/izglitiba/eLearning%20-%20Better%20eLearning%20for%20Europe.pdf

EUROPEAN COMMISSION. Digital Skills & Jobs Platform. National Strategies, n.d. https://digital-skills-jobs.europa.eu/en/actions/national-initiatives

GARCÍA-PEÑALVO, F., CORELL, A., ABELLA-GARCÍA, V. & GRANDE-DE-PRADO, M. Recommendations for mandatory online assessment in higher education during the COVID-19 pandemic. In Radical solutions for education in a crisis context (pp. 85-98). Springer, 2021. https://doi.org/10.1007/978-981-15-7869-4_6

GOMES, G. & SOUZA, R. **Transformação Digital na Educação para fomentar Competências Digitais**. In: Concurso Alexandre Direne (CTD-IE) - DISSERTAÇÕES DE MESTRADO, Manaus. Anais Estendidos do XI Congresso Brasileiro de Informática na Educação (CBIE 2022). Porto Alegre: Sociedade Brasileira de Computação, p. 62-73, 2022. DOI: https://doi.org/10.5753/cbie_estendido.2022.226361

GOVERNMENT OF IRELAND. Ireland's Third ICT Skills Action Plan, 2021. Available in: https://assets.gov.ie/24702/90df5645cbac4ed3bf6fa6f832507933.pdf

HARGITTAI, E. **A framework for studying differences in people's digital media uses**. In Grenzenlose Cyberwelt? (pp. 121-136). VS Verlag für Sozialwissenschaften, 2007. https://doi.org/10.1007/978-3-531-90519-8_7

HONG, C., MA, W. **Introduction: Education 4.0: Applied degree education and the future of work**. In Applied degree education and the future of work (pp. 1-13). Springer, Singapore, 2020. https://doi.org/10.1007/978-981-15-3142-2_1 INCODE.2030. INCoDe.2030, 2017. https://www.incode2030.gov.pt/en/incode2030

ISTE. International society for technology in education (ISTE): standards for students, 2016. https://www.iste.org/standards/for-students

KNOX, J. & BAYNE, S. Multimodal profusion in the literacies of the Massive Open Online Course. **Research in Learning Technology**, 21, 2013. https://doi.org/10.3402/rlt.v21.21422

MALHOTRA, N. Questionnaire design. The handbook of marketing research: Uses, misuses, and future advances, 83, 2006.

MALTA FOUNDATION. National eSkills Strategy 2019-2021. Malta Foundation, 2019. https://eskills.org.mt/en/nationaleskillsstrategy/Documents/National_eSkills_strategy.pdf

MARTIN, F., WANG, C., PETTY, T., WANG, W. & WILKINS, P. Middle school students' social media use. **Journal of Educational Technology & Society**, 21(1), 213-224, 2018. https://www.jstor.org/stable/26273881

MILENKOVA, V. & LENDZHOVA, V. Digital citizenship and digital literacy in the conditions of social crisis. **Computers**, 10(4), 40, 2021. https://doi.org/10.3390/computers10040040

MUKHAMETZYANOV, I. **Digital citizenship and the student's digital footprint: Questions of application, promotion and data protection**. In Proceedings of the International Scientific and Practical Conference on Computer and Information Security (INFSEC 2021), 2022. https://doi.org/10.5220/0010616600003170

OECD. Organisation for Economic Co-operation and Development. The future of education and skills: Education 2030. OECD Education 2030. OECD Publishing, Paris, 2018a. http://www.oecd.org/education/2030-project/about/documents/E2030%20Position%20Paper%20(05.04.2018).pdf

OECD. Organisation for Economic Co-operation and Development. PISA 2018 Results (Volume VI): Are Students Ready to Thrive in an Interconnected World?, PISA, OECD Publishing, Paris, 2018b. https://doi.org/10.1787/d5f68679-en

OLIVEIRA, K. & SOUZA, R. Digital transformation towards education 4.0. **Informatics in Education**, 21(2), 283-309, 2022. https://doi.org/10.15388/infedu.2022.13

PANKE, S. & STEPHENS, J. Beyond the echo chamber: Pedagogical tools for civic engagement discourse and reflection. **Journal of Educational Technology & Society**, 21(1), 248-263, 2018. https://www.jstor.org/stable/26273884

PARSONS, D. & MACCALLUM, K. **Agile education, Lean learning**. In Agile and lean concepts for teaching and learning (pp. 3-23). Springer, Singapore, 2019. https://doi.org/10.1007/978-981-13-2751-3_1

PEREDRIENKO, T., BELKINA, O. & YAROSLAVOVA, E. New Language Learning Environment: Employers'-Learners' Expectations and the Role of Teacher 4.0. **International Journal of Instruction**, 13(3), 105-118, 2020. https://doi.org/10.29333/iji.2020.1338a

PETERSON, A., DUMONT, H., LAFUENTE, M. &, LAW, N. **Understanding innovative pedagogies: Key themes to analyse new approaches to teaching and learning**, OECD Education Working Papers, No. 172, OECD Publishing, Paris, 2018. https://doi.org/10.1787/9f843a6e-en

RAMASUBRAMANIAN, L. & ALBRECHT, J. **Civic Engagement. In Essential Methods for Planning Practitioners** (pp. 111-128). Springer, Cham, 2018. https://doi.org/10.1007/978-3-319-68041-5_6

REEDY, K. & GOODFELLOW, R. **Digital and information literacy framework**. Open University, 2016. https://www.open.edu/openlearn/pluginfile.php/801340/mod_resource/content/3/ Session%205%20Open%20University%20Digital%20and%20Information%20Literacy%20Framework.pdf

REPUBBLICA DIGITALE. National Strategy for Digital Skills, 2020. https://repubblicadigitale.innovazione.gov.it/it/le-azioni/#documenti

SADIKU, M. & MUSA, S. Digital Intelligence. In: A Primer on Multiple Intelligences. Springer, Cham. p. 163-174, 2021. https://doi.org/10.1007/978-3-030-77584-1_13

SCHWABER, K. **Agile project management with Scrum**. Microsoft press, 2004.

SCHWAB. K. **The Fourth Industrial Revolution: what it means, how to respond,** 2016. https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

SEIN-ECHALUCE, M., FIDALGO-BLANCO, A., GARCÍA-PEÑALVO, F. & FONSECA, D. Impact of Transparency in the Teamwork Development through Cloud Computing. **Applied Sciences**, 11(9), 3887, 2021. https://doi.org/10.3390/app11093887

SILVA, P. & TOMÁCIO, D. Literatura de cordel no Brasil: um ponto no mar da lusofonia. **Revista Odisseia**, (13), 44-57, 2014. https://periodicos.ufrn.br/odisseia/article/view/10245

SLAVKOVIĆ, M., PAVLOVIĆ, K., NIKOLIĆ, T., VUČENOVIĆ, T. & BUGARČIĆ, M. Impact of Digital Capabilities on Digital Transformation: The Mediating Role of Digital Citizenship. **Systems**, 11(4), 172, 2023. https://doi.org/10.3390/systems11040172

UNESCO. World Inequality Database on Education, 2018. https://www.education-inequalities.org

VAJEN, B., KENNER, S., & REICHERT, F. Digital citizenship education–Teachers' perspectives and practices in Germany and Hong Kong. **Teaching and Teacher Education**, 122, 103972, 2023. https://doi.org/10.1016/j.tate.2022.103972

WEF. The future of jobs: Employment, skills and workforce strategy for the fourth industrial revolution. In Global Challenge Insight Report, World Economic Forum. Cologny/Geneva, Switzerland, 2016. http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf

WEF. The Future of Jobs Report 2018. Centre for the New Economy and Society. Cologny/Geneva, Switzerland, 2018. https://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

WEF. Schools of the Future. Defining New Models of Education for the Fourth Industrial Revolution. In Platform for Shaping the Future of the New Economy and Society. Cologny/Geneva, Switzerland, 2020a. http://www3.weforum.org/docs/WEF_Schools_of_the_Future_Report_2019.pdf

WEF. The Future of Jobs Report 2020. Cologny/Geneva, Switzerland, 2020b. http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

WEF. Catalysing Education 4.0. Investing in the Future of Learning for a Human-Centric Recovery. Cologny/Geneva, Switzerland, 2022. https://www3.weforum.org/docs/WEF_Catalysing_Education_4.0_2022.pdf

XU, S., YANG, H., ZHU, S. & MACLEOD, J. **The Relationship between Computer Experience and College Students' Digital Citizenship**. International Conference of Educational Innovation through Technology (EITT), Osaka, Japan, pp. 65-69, 2017. https://doi.org/10.1109/EITT.2017.24

YOUNG, J., & RONQUILLO, R. Enhancing New Media Literacies of Social Work Students through a Participatory Learning Environment. **Journal of Technology in Human Services**, 40, 58 - 78, 2021. https://doi.org/10.1080/15228835.2021.2004572