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Research Article

Redesign of the Digital Literacy Program for Older Adults, validating Desirable Skills with Generative Artificial Intelligence

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ABSTRACT

The research described in this article aims to evaluate and redesign the digital literacy program for older adults by validating desirable skills with AI. The same redesign is based on the execution of the specific objectives of this research, highlighting among them: 1) identifying the training requirements so that older adults can break the digital gaps in access and use of ICTs; 2) redesign the digital didactic management model of the digital literacy program and 3) validate the redesign proposal by incorporating feedback with artificial intelligence. The applied methodology is based on the analytical observation of three years of experience of the digital literacy program, which takes into account the virtualization factor of the learning experience, to motivate the transformation of the digital culture of older adults, taking into account The validation of the thematic axes includes comparisons made against the results of queries to information search and analysis tools based on generative artificial intelligence. The results have led to maintaining references of the experience worldwide, but also enriched with its own factors and lessons learned that make the digital literacy experience for older adults in Panama innovative.

Keywords: digital didactics, digital literacy, generative artificial intelligence, older adults

I. INTRODUCTION

The current generation of older adults lacks the necessary digital literacy to manage Information and Communication Technologies (ICTs), despite many having access to electronic devices that enable such usage. This issue stems from the digital divide, which is not only due to a lack of knowledge and physical resources but also from the adoption of a new culture of interaction through digital media. In other words, handling digital iconography, new interpretations of concepts such as time (everything happens in 24 hours), and geographical location are no longer barriers to global and continuous communication.

To address this issue, the Specialized University of the Americas (UDELAS) has created the Digital Literacy Program for Older Adults (Digital School 60), based on a model of digital didactic management that is virtual, free, and nationally accessible. This program addresses the communication needs of older adults during the COVID-19

pandemic period and, after three years, has evolved into a university extension project. It aims to bridge the digital divide by promoting access to and use of computer resources among the older adult population in Panama.

The need to manage digital didactics becomes a challenge in the teaching-learning process because each participant operates within their own virtual environment (internet speed, cell phone model, arrangement of applications). This includes the an instructional-facilitator (teacher), the student (older adult), and the digital tutor (undergraduate university student).

Another important element in changing the teaching method is shifting from the idea that the teacher is the source of wisdom to a role as a facilitator of knowledge, encouraging a culture of internet search and self-assessment of competencies and skills gained through the experiential learning method [1]

During the COVID-19 pandemic in 2020, UDELAS conducted a study to understand the living conditions of older adults, given the movement restrictions imposed by the national government to protect their lives due to the high risk of morbidity and mortality the coronavirus posed to this age group [2]. One of the main limitations for older adults was the lack of knowledge and fear of using cell phones, leading to their dependence on communication and accessing services through the internet [3].

From the reality found among the older adults that UDELAS was already serving in its community programs, the idea for a digital literacy program emerged. This initiative considered the involvement of undergraduate students who needed to complete their community service hours. Thus, Digital School 60 was born as a project aimed at supporting older adults in the virtual environment.

The research described is based on a 3-year experience of the Digital School 60, resulting in 3 graduating cohorts (36 individuals). It implements a digital didactic strategy with three training components (Communication, Technology, and Information), integrating artificial intelligence generative mm tools to validate emerging criteria in analyzing the new culture of older adults' participation in the digital world.

Finally, the main research objetive is to evaluate and redesign the digital literacy program for older adults by validating desirable skills with AI. This redesign is based on the execution of the specific objectives of this research, highlighting among them: 1) identifying the training requirements for older adults to bridge the digital divide in access and use of ICTs; 2) redesigning the digital didactic management model of the digital literacy program; and 3) validating the course redesign proposal by incorporating feedback with artificial intelligence.

II. LITERATURE REVIEW

Designing a teaching-learning experience in virtual environments for a population such as older adults entails the objective of evaluating the digital didactic teaching method. This involves addressing socio-cultural aspects of the beneficiary population and how new relationships with the digital environment are formed, as well as how individuals reorganize themselves in response to this new knowledge [4]. The social responsibility of excluding older adults from the digital society is taken on by the Panamanian public university through innovative actions, recognizing that at its core, the digital divide issue ultimately revolves around access to knowledge.

II.1. Older Adults and Digital Literacy Needs

One of the most serious issues of 21st-century society is the rapid aging of the global population. This is primarily due to declining fertility rates, resulting in a demographic shift where individuals aged 65 and over are increasingly prominent. In Latin America, the aging process is categorized into four stages: initial, moderate, advanced moderate, and advanced. In fact, according to this classification, Panama is currently in the moderate aging phase [5].

In Europe, current statistics indicate that 20% of the population is over 65 years old, with projections suggesting this age group will reach 30% by 2070. Moreover, the percentage of individuals over 80 years old is expected to more than double, reaching 13% by 2070 [6].

To support the new focus of public policies towards older adults worldwide, one crucial aspect is aligning all Sustainable Development Goals (SDGs) with issues concerning older adults. Another initiative is the declaration of the Decade of Healthy Aging in the Americas by the World Health Organization (WHO) [7], alongside the monitoring of the Madrid International Plan of Action on Aging by countries that signed the agreement in 2002 [8].

Based on these new public policies promoting active aging, efforts are directed towards narrowing the digital divide among older adults. This involves encouraging their active engagement in the digital world, reducing technophobia, and providing materials tailored to their interests [9].

Addressing the issue of reducing the digital divide in access to and use of ICTs across the entire population, including older adults, is a complex process. While many studies focus on adapting the design of current technologies (hardware and software), the immediate need to close the digital divide for older people must "focus on community programs to improve access, motivation, and digital skills for older adults" [10].

These digital literacy efforts should be a commitment from all social actors involved in comprehensive care programs for older adults. As promoted by the government of Panama within the framework of the National Plan for older adults, in section 2.3.2. Digital Literacy Program for Older Adults, it "promotes the establishment of agreements with academia to formalize the training of older adults in the use of new technologies, which will be delivered by students as part of the requirements for the completion of their professional careers" [11].

One of the most important approaches in the transformation process proposed by the program is the development of digital skills. This is a highly dynamic concept because it is based on technologies that change rapidly in both form and structure, requiring continuous adaptation and constant practice. One of the main emphases of this type of digital literacy program for older adults should be the inclusion of older people in cyberspace through the exercise of their digital citizenship, which involves awareness, the development of critical attitudes, thoughts, and opinions, as well as the strict fulfillment of responsibilities. Digital citizenship is relevant for accessing online information, understanding digital technology, creating content in the digital environment, and adhering to ethical principles, rules, and expectations for online behavior [12].

II.2 Management Models for Digital Literacy Programs

When the Digital Literacy Program was initiated, a literature review was conducted to select the thematic areas and their content. Several programs found for older adults agreed on topics such as social networks, WhatsApp, and videoconferences [13]. The next module focused on technology topics, addressing how electronic devices such as cell phones, tablets, or laptops work, and the final module covered content creation.

The review of experiences from other universities, such as in Argentina, where the Faculty of Journalism and Social Communication at the National University of La Plata (as part of its extension activities) manages the Directorate of Communication and Older Adults, aims to "promote intergenerational exchange and position older adults as active and proactive subjects in the context of media-driven societies. It seeks to open questions, discussions, and debates about the role of older adults today, reframe prejudices and stigmatizations, and achieve instances of visibility, inclusion, and social integration" [14].

The University of La Plata's Workshops on the Use of Cell Phones and Tablets I and II produced the Pedagogical Didactic Manual for the Use of Cell Phones for Connected Older Adults. These workshops are designed to shorten the social, emotional, and practical distances that many older individuals face and especially to promote the social integration and inclusion of all. This social integration contributes to the development of holistically healthy lives [15].

A joint study between Guangxi Normal University in China and the State Vocational Pedagogical University in Russia reveals the importance of valuing "the concept of multisensory learning in the digital environment. From this study, the proposed model for didactic ICT management is used, based on the three-layer scheme of digital didactics, which build upon each other: starting with didactic interactions, followed by digital didactic design, and finally, the digital conditions of the didactic program. This encompasses all components of the didactic system: defining objectives, selecting content, organizing and implementing the learning process, diagnosing results, and satisfying social needs for successful realization" [16].

The construction of a new digital didactics, in addition to changing the role of the teacher to that of a facilitator, includes the dynamic management of today's didactic resources to guide, facilitate, motivate, and spark the interest of the learner. Providing tools that facilitate communication and knowledge creation involves reviewing aspects such as: learning assessment, teaching strategies, creation of didactic resources, learning activities, and self-assessment tests [17].

II.3. Cyberculture

Cyberculture is linked to how people interact with information, knowledge, and civic participation in digital environments. It also addresses ethical issues such as online privacy, cybersecurity, and digital equity.

For the full participation of older adults in cyberspace and their complete digital inclusion, there are barriers that need to be overcome, such as digital skills, lack of access to technology, and difficulties such as vision, hearing, or physical skills impairments resulting from diseases like Parkinson's, arthritis, and other degenerative movement disorders. An important barrier is resistance to change, which can be addressed from the perspective of mental health therapies [18].

After educating and encouraging the digital participation of older adults, the next stage is monitoring. For this, criteria must be created and validated to verify that the objective of cultural change in the use and participation in cybersociety is being met. In the last five years, many tools have been developed that leverage generative artificial intelligence (e.g., ChatGPT) to streamline the search and analysis of relevant scientific literature on a specific topic [19].

According to the definition by Ribera and Díaz Montes de Oca [20] "a chatbot is a computer program designed to simulate a natural language conversation with humans through a text, voice, or even image channel. This technology uses generative AI techniques, such as natural language processing and machine learning, to process and understand users' questions and requests and provide relevant and coherent responses."

Since it is the first time that it is put into practice, the idea of comparing the results of surveys applied to older adults with results from different generative artificial intelligence models. Differences that are based on language comprehension, logical reasoning, and text generation [21]. (Sengar, et al., 2024), three commercial applications are used, free of charge that can be found in the cloud, such as: OpenAI, Sider and Copilot.

For the validation of the results, a text analysis [22] is first prepared, which indicates the thematic priorities that are in the cloud, and then compared with the results of the surveys applied to validate the validity of the topics and then the analysis of the contents is done in a comparative way.

III. METHODS AND MATERIALS

The design of this social experiment was based on a process of ICT training promoted in Panama to address the challenges of the digital divide in access to and use of electronic devices and applications by older adults.

The study population comprises older adults enrolled in the Digital School 60 from 2020 to 2023. This population applies for digital literacy services through an electronic registration form using Google Forms. After acceptance into the school, they are included in a WhatsApp group, where continuous communication with individuals begins.

Likewise, undergraduated students who must complete up to 60 hours of social service join the Digital Literacy Program's working group as digital tutors. These digital tutors also participate in the WhatsApp group. There, user care, tasks, and ideas on how to interact with older adults are organized. Once they complete their mission, they leave the chat group.

The facilitators of the Digital Literacy Program are a group of UDELAS teachers or experts in certain topics or the use of certain applications. Their work methodologies were recorded and included in the program's management statistics. Primary sources used include class annotation logs, the program's annual execution report, records of social media conversations, and self-assessment rubrics.

Methodologically, several digital questionnaires were developed using the Google Forms electronic tool, serving as the basis for the quantitative-qualitative analysis of research, both for the group of older adults and UDELAS undergraduate students. Table 1 lists all the instruments formulated in this educational didactic management experience.

Table 1.

Questionnaires for the (self) assessment processes of the digital didactic experience

Instrument	Objective
Digital School 60 Registration Form	Collect general data on digital habits and behaviors for enrollment in the Information and Communication Technology Level (Semester).
Participant Self-Assessment Form by Level	Self-assess the progress of skills and abilities against the objectives of the level.
Evaluation of Digital Tutoring Service at Digital School 60 (undergraduate students)	Students completing their social service at Digital School 60 will fill out this evaluation survey to provide feedback on the digital literacy program for older adults.

Elaborated by: Author

For qualitative analysis, Likert scales are used to measure behavioral changes and knowledge advances. The variables are divided according to the students (older adults) and digital tutors. Monitoring and evaluation of the digital didactic experience are carried out at the end of each program level.

In the area of didactic design, monitoring, and evaluation of the content, the experience of older adults has been validated through the use of ChatGPT in applications like Copilot, OpenAI, and Sider, requesting responses to the same prompt: "act as an older adult participating in a digital literacy program, what elements should you incorporate into your daily culture to know if you are making a behavioral change towards a digital culture or demonstrating digital citizenship behavior."

IV. RESULTS

The results will be approached from two perspectives: the digital didactic management model to support didactic changes and the use of generative artificial intelligence resources to compare responses for significant changes in users after completing the literacy program.

Digital Didactic Management Model

The proposed redesign of the Digital Didactic Management Model for Digital School 60 incorporates the results of a comprehensive analysis of the experience, recognizing the interdependence between the actors in the educational act, the didactic design, the monitoring, and evaluation process, and the political and administrative will of university authorities to address the digital illiteracy of older adults.

The interactive layer model of digital didactic management developed by Guangxi Normal University in China was adopted as a reference to redesign our Digital Literacy Program for older adults. It describes the general characteristics and criteria of the three specific action strategies of the model: didactic interactions, digital didactic design, and institutional development conditions. Table 2.

Table 2.

Basic Characteristics of the Digital Didactic Management Model for the Digital Literacy Program for Older Adults

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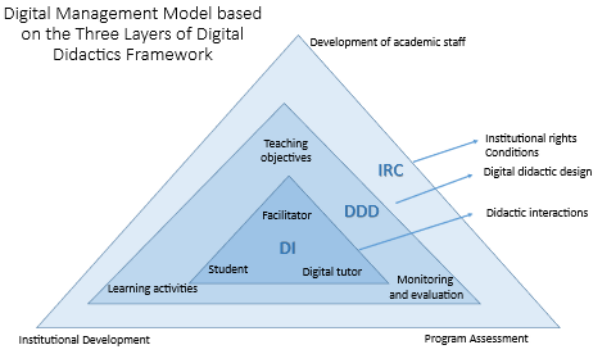
Layer 1. Didactic Interactions	• The didactic interaction layer between the facilitator, the digital tutor, and the student lasts two hours per week. • The content of the digital literacy program is delivered through a common communication space via a webinar platform. • The digital tutor is an undergraduate student at the university who provides personalized support to the student (older adult) during the program.
Layer 2. Digital Didactic Design Layer	• The digital didactic design is the core of innovations and meaningful learning for all actors in the digital didactic methodology • Digital didactic materials are created in video format by digital tutors. • Evaluation mechanisms are prepared using Google Forms. • Monitoring and evaluation elements are validated with artificial intelligence tools.
3. Institutional Development Conditions	• Digital School 60 has its own digital identity within the university's domain through its email: • escuela.digital60@udelas.ac.pa • It has other digital communication elements: • blog, social media, mobile line, • video channel (YouTube)

Elaborated by: Author

The social innovation of this project is based on the "learning by doing" [23]. which combines the explanation of new concepts related to the digital world with the practical use of applications for various types of access to digitized processes. This approach is accompanied by digital tutors, who are UDELAS undergraduate university students. This is based on the premise that they are native citizens of the cybersociety, facilitating better intergenerational dialogue for digital learning.

Moreover, the digital didactic management, outlined in Figure 1, creates a teaching combination between the facilitator and the older adults, as well as between the facilitator and the digital tutors. The tutors contribute by developing digital didactic materials in video and image formats and by supporting the learning activities of the group they are assigned to follow up on.

Figure 1: Digital Didactic Management Model of the Digital Literacy Program for Older Adults



Elaborated by: Author based on the Liu-Tretyakova-Fedorov-Kharakhordina model (Liu et al, 2020)

The curriculum of the Digital Literacy Program, described in Table 3, associates topics with the three main blocks of the Technology, Information, and Communication (ICT) concept. Considering that communication is the most urgent factor to learn, it is the first module taught.

Each class lasts two hours, divided into four 30-minute segments: 15 minutes of explanation and 15 minutes of exchange and questions among the entire group. Each level lasts 10 to 12 weeks, meaning the entire program spans 30 to 36 weeks, concluding with a face-to-face graduation ceremony. Each cohort names their group, and participation certificates are prepared accordingly.

Table 3.

Curriculum of the Digital Literacy Program

Communication (Level 1)	General Aspects • Cybersociety • Digital Identity • Digital Platforms • Cybersecurity Videoconferences (webinar) • Zoom • Meet Social networks • WhatsApp I • Instagram I • Facebook I
Technology (Level 2)	Internal management of the mobile device Organization of files File cleaning Application installation Readers file • Images/Sound

	• Video/Documents
Information (Level 3)	Social Networks • • WhatsApp II • • Instagram II • • Facebook II Connectivity with peripheral devices • Bluetooth/wifi Editing with CANVA • Images / Audio / Video

Elaborated by: Author

4.1. Validation of Results with Artificial Intelligence

The results of evaluating the chosen topics are obtained from the older adults through a self-assessment form of topics and applications. The following question is whether the chosen elements remain valid in the teaching process within Digital School 60.

The task of quickly validating and comparing the selected topics and reviewing if there are new challenges after three years of the program's execution was necessary to finalize the redesign process. This led to the idea of using generative artificial intelligence, asking the same question to three different generative AI applications for data search and analysis: Copilot, OpenAI, and Sider.

The results of consultations through generative artificial intelligence tools show that the prioritized topics for the digital literacy program content and the importance assessments by students in the self-evaluation rubrics, are very similar. This concludes that the addressed topics remain relevant, as summarized in Table 4.

Table 4:

Validation and Comparison of Thematic Emphases of Digital School 60

Experience of Digital School 60	Copilot	OpenAI	Sider
Cybersociety and Digital Identity	Active Exploration	Online Information Access	Safe and more friendly digital environment
Communication • Teleconferences • Social Networks	Digital Communication	Adoption of Digital Communication Methods	Frequent use of digital devices
Digital Tools	Applications and tools	Digital Tool Management	Learning to navigate the internet safely
Invitation to teleconferences	Continuing Education	Participation in Online Learning Activities Participation in online courses	Staying updated on the latest digital technologies and trends

Digital Security Awareness	Digital Security	Awarenss of online safety	Secure and responsible use of digital tools
Digital Culture	Digital Ethics	Respect for Online Norms	
Digital Citizenship	Digital Citizenship	Participation in social networks	Participation in online social networks and communities

Elaborated by: Author.

The most relevant results from the thematic axes comparison highlight digital citizenship participation, digital ethical culture, and continuous online learning as transversal topics constantly reinforced in classes as part of promoting new habits for interacting in the digital world. Similarly, students from Digital School 60 become permanent participants in online university extension activities.

V. CONCLUSION

The digital didactic strategy was redesigned considering elements not initially contemplated, as they were assumed to be natural conditions of the digital literacy process. The digital tools and the general conceptual framework required to bridge digital access and usage gaps have been identified and validated. However, concerning the promotion of new habits, a more in-depth and reflective Digital Inclusion Program could be designed as part of the continuing education for older adults, covering aspects such as Cybersecurity, Digital Culture, and Digital Citizenship.

The redesigned digital didactic management model of the digital literacy program firstly emphasizes the digital tutor's role as an intergenerational interlocutor and producer of digital didactic content. Secondly, self-assessment plays a key role, as students themselves determine if their competency and skill levels meet their expectations based on their participation pace and daily practice with ICT.

As a result of validating the thematic proposal of the Digital Literacy Program for older adults with generative artificial intelligence, it is observed that the thematic axes remain globally relevant. This exercise of contrasting the training experience with new types of digital tools should be regularly performed to update the digital didactic management model and the curriculum of the Digital Literacy Program.

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