

A Comparative Analysis of Initiatives Aimed at Enhancing Digital Health Literacy (DHL) on a Global Scale

Küresel Ölçekte Dijital Sağlık Okuryazarlığını Geliştirmeyi Amaçlayan Uygulamaların Karşılaştırmalı Analizi

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ABSTRACT

This study aims to provide a comprehensive review of educational campaigns and projects designed to enhance DHL. The study was conducted as a systematic review. It comparatively evaluated the objectives, educational strategies, and outcomes of educational programs and projects related to DHL. Data were collected through literature searches in databases such as Scopus, PubMed, and Google Scholar. DHL projects and educational programs have significantly improved individuals' access to and management of health information. These initiatives have not only enhanced individual health literacy but have also played a critical role in improving overall public health. The primary focus of DHL projects and educational programs is to increase the accessibility of digital tools and strengthen technological infrastructure. This focus aims to ensure sustainability and create long-term positive effects on public health literacy. The global dissemination of such initiatives could contribute to the sustainable development of public health.

Keywords: Health, Digital, Literacy

INTRODUCTION

The advancements in technology have significantly influenced the healthcare sector, giving rise to the concept of digital health. Digital health encompasses the use of digital technologies in healthcare, including the Internet of Things (IoT), advanced computing, big data analytics, and artificial intelligence (1). Among digital health applications, big data analytics is frequently employed in public health to understand population trends or monitor individuals' healthcare needs (2). These developments in healthcare necessitate improvements in individuals' health literacy. As digital applications in healthcare become more prevalent, the concept of digital health

ÖZ

Bu çalışma, DSO'nu geliştirmeyi amaçlayan eğitim kampanyalarını ve projeleri, kapsamlı bir inceleme olacak şekilde ortaya koymayı amaçlamaktadır. Çalışma, sistematik derleme türünde hazırlanmıştır. DSO ile ilgili eğitim programları ve projelerin; hedefleri, eğitim stratejileri ve sonuçlarını karşılaştırmalı bir şekilde değerlendirmiştir. Çalışmada veriler; Scopus, PubMed ve Google Scholar gibi veri tabanlarında yer alan literatür taramalarından elde edilmiştir. DSO projeleri ve eğitim programları, bireylerin sağlık bilgilerine erişimini ve bu bilgileri yönetme becerilerini önemli ölçüde artırmıştır. Bu girişimler yalnızca bireysel sağlık okuryazarlığını artırmakla kalmamış, genel halk sağlığı seviyesinin iyileştirilmesinde kritik bir rol oynamaktadır. DSO projeleri ve eğitim programlarının ana odağı, dijital araçların erişilebilirliğini artırmak ve teknolojik altyapıyı güçlendirmektir. Bu odak, sürdürülebilirliği sağlamayı ve halk sağlığı okuryazarlığında uzun vadeli olumlu etkiler yaratmayı hedeflemektedir. Bu tür girişimlerin küresel ölçekte yaygınlaştırılması, sürdürülebilir halk sağlığı gelişimine katkıda bulunabilir.

Anahtar Kelimeler: Sağlık, Dijital, Okuryazarlık

literacy (DHL) has emerged (3). DHL is defined as the ability to access, evaluate, integrate, and apply health information obtained from online environments (4).

To enhance digital health literacy, comprehensive educational campaigns and awareness-raising strategies should be developed. These strategies aim to inform individuals about the effective use of digital tools and facilitate their access to health information, which is crucial to achieving the desired outcomes (5). Emerging technologies such as artificial intelligence (AI), machine learning, and big data analytics have the potential to improve digital health literacy by enabling personalized and efficient access to health information (6). For instance, AI-based virtual assistants can provide users with rapid access to health information, empowering individuals

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to manage their own health effectively (7). Additionally, online training modules, mobile applications, and interactive video content help individuals utilize digital health information more effectively (8).

The adoption of digital health applications, amplified by AI, needs to be embraced by society. To achieve this, educational programs and projects that can be tailored to individuals should be developed. Implementing these programs will play a crucial role in enhancing digital health literacy among the masses. Moreover, the widespread dissemination of training programs that improve digital health literacy can also help reduce health disparities and ensure equal access to health information for all individuals (9).

The aim of this study is to conduct a comparative analysis of international initiatives designed to improve digital health literacy, by evaluating their core strategies, effectiveness, and suitability for different target populations. Within this scope, digital health literacy programs implemented in various countries will be analyzed in terms of access methods, use of technology, educational content, user engagement, and sustainability criteria. Furthermore, the study will examine the impact of digital health literacy on individuals' access to healthcare services, their ability to manage their own health, and their competence in utilizing digital health technologies effectively. The ultimate goal is to identify global best practices and to develop adaptable policy and strategy recommendations for developing countries such as Türkiye.

Digital Health Literacy Applications

Health information produced using information and communication technologies has the potential to offer accessible, comprehensive, up-to-date, and high-quality content. However, given the sensitivity of health-related information, it is crucial to closely monitor digital platforms (10). Analyses of health information websites have revealed that the information shared is often incomplete or outdated. Such misinformation can spread rapidly through social networks, posing

a significant risk (11). In many cases, this can mislead individuals, causing them to attempt self-diagnosis or seek alternative treatments, which can result in serious negative consequences (12). To counter these potential risks, it is essential to enhance individuals' digital health literacy skills to help them identify which health information on digital platforms is accurate and useful in everyday life. According to the World Health Organization (WHO), approximately 27% of countries worldwide have implemented digital health policies (13). However, some of these policies have failed due to poor design and negative outcomes during implementation. A holistic approach is one of the most critical considerations when developing policies to enhance digital health literacy (14). This approach should address socioeconomic and technical challenges such as cultural barriers, inadequate funding, shifting priorities, political uncertainties, insufficient technical skills, limited sharing of health information, the undue influence of development partners, and resistance to change (15). By addressing these challenges, digital health literacy initiatives can be more successful and achieve the desired impact across society.

METHOD

This study is a review that investigates educational campaigns and projects aimed at enhancing digital health literacy globally. It conducts a comparative analysis of specific training programs and projects, outlining their core features, objectives, educational strategies, and outcomes. The study employs a qualitative data analysis method. The primary digital health literacy projects and educational campaigns examined include the Be He@lthy, Be Mobile (BHBM) Program, the DH21: Digital Health Literacy for the 21st Century Project, the USAID Digital Health Literacy Initiative, the eHeLA: eHealth Literacy for Older Adults Project, and the NHS Digital Literacy Programme.

The Aim and Type of The Research

The study's strategy was developed in three phases: thematic analysis, comparative analysis, and comprehensive evaluation.

- **Thematic Analysis:** Data from the projects were analyzed using a thematic analysis approach, identifying the main themes, strategies, and outcomes of each project. During the analysis, frequently mentioned topics, success stories, challenges, and health outcomes in project reports and documents were considered.
- **Comparative Analysis:** The goals, strategies, and impacts of each project were analyzed through a comparative approach. This analysis aimed to reveal the similarities, differences, and success factors of each initiative.
- **Comprehensive Evaluation:** Each educational campaign was assessed based on criteria such as access capacity, effective communication strategies, personalized educational materials, cultural adaptation, and data security. This evaluation aimed to identify the strengths and weaknesses of the projects and provide recommendations for future studies.

Data Analysis

Projects and educational campaigns included in the study were selected based on their focus on improving digital health literacy. Priority was given to initiatives that included strategies related to accessing digital health information, effective use of digital tools, and participation in digital health services. Projects implemented across different continents, including Europe, North America, Asia, and Africa, were selected to evaluate the global impact of digital health literacy initiatives. Another important criterion was that the projects targeted diverse demographic groups, particularly those facing challenges in accessing digital health services, such as women, youth, the elderly, rural residents, and minority groups. Projects that achieved success or demonstrated tangible outcomes were also prioritized to better understand their effectiveness on health literacy.

The study selection process followed a systematic and step-by-step approach, covering projects and educational campaigns aimed at enhancing digital health literacy globally. The process included literature review, eligibility screening, scope determination, data verification and analysis, and final reporting.

Limitations of the Research

The strengths of this study include a comprehensive and multifaceted examination of digital health literacy projects globally, focusing on the needs of different groups, and providing practical recommendations for future projects. However, limitations such as data access, long-term impact measurement, and cultural adaptation make it challenging to generalize the findings. In the future, these limitations should be addressed through increased data access, quantitative measures, and more adaptable strategies.

Ethical Permissions

All data and materials used in this study were collected and analyzed in accordance with ethical guidelines and data privacy principles. Materials containing non-public or sensitive data were excluded from the study following ethical protocols and data protection policies.

RESULTS

Numerous educational campaigns and projects have been implemented globally to enhance digital health literacy. Figure 1 presents some of the major digital health literacy projects and training initiatives conducted over the past decade.

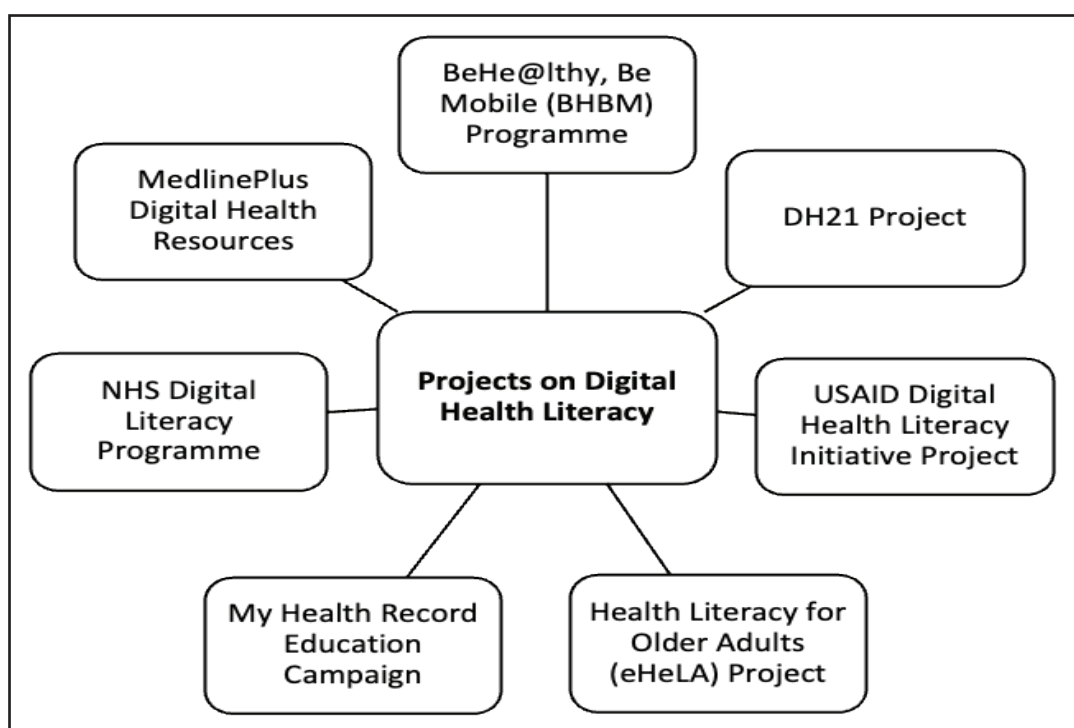


Figure 1. Projects and Trainings on Digital Health Literacy

1. *Be He@lthy, Be Mobile (BHBM) Programme*

This global digital health initiative, jointly led by the World Health Organization (WHO) and the International Telecommunication Union (ITU), aims to improve access to health information and enhance digital health literacy through mobile technologies targeting non-communicable diseases (NCDs). Its main goal is to use mobile health (mHealth) solutions to reduce NCD risk factors such as tobacco use, poor diet, physical inactivity, and alcohol consumption (16). The program promotes healthier behaviors, greater healthcare access, and NCD prevention through digital tools. It is active in countries including Bangladesh, India, Costa Rica, Senegal, Zambia, and Mexico (13). Strategies are adapted to each country’s needs. For instance, in Bangladesh, SMS reminders have improved tuberculosis treatment adherence (17); in Costa Rica, tobacco cessation messages led to a 10% quit rate—twice the usual level; and in Zambia, diabetes apps have helped patients track glucose levels and communicate better with providers (13).

As part of the “Be He@lthy, Be Mobile” initiative conducted in collaboration between the World Health Organization (WHO) and the International Telecommunication Union (ITU), the mDiabetes program was implemented in Senegal. The program aims to support diabetes management by sending informative messages to patients via mobile phones. Between 2014 and 2015, more than 12,000 individuals participated in the program and received regular health information through text messaging. As a result, one participant, Khady, experienced a reduction in her daily insulin dosage from 10 units to 6 units, with her blood glucose levels returning to normal. In Senegal, where approximately 90% of the population owns a mobile phone, the program has been able to reach a wide audience. Furthermore, the program has sought to enhance accessibility by offering alternative communication methods such as voice messages, especially for individuals with limited literacy skills (18).

2. Digital Health Literacy for the 21st Century (DH21) Project

The DH21 Project, funded by the European Commission, is a broad initiative to improve digital health literacy and reduce health inequalities across Europe. It aims to help individuals use digital health technologies effectively and make more informed health decisions (19). Key goals include removing barriers to accessing digital health information, increasing participation in healthcare, and raising digital literacy levels, with a focus on vulnerable groups such as older adults, minorities, rural residents, and low-income individuals (20). The project is active in countries like Germany, Spain, the Netherlands, Italy, and France. In Germany, literacy modules for older adults improve their understanding and use of digital health tools (21), while in the Netherlands, a mobile health app has enhanced access to health information and chronic disease management. Overall, DH21 is a model for broader European health strategies, helping expand access to digital health services and promote health equity (19).

A study was conducted in the United States to improve digital access and literacy among older adults who had difficulty using or had never used technology. Over the course of six months, nine elderly participants received weekly interactive training sessions. As a result of the intervention, 100% of the participants learned how to use digital devices. Access to patient portals increased by 88.8%, and self-assessed internet literacy skills showed a 100% improvement (22).

3. USAID Digital Health Literacy Initiative

The USAID Digital Health Literacy Initiative is a global effort by the United States Agency for International Development (USAID) to strengthen digital health literacy, particularly in developing countries (23). Its main goals include expanding access to digital health information, promoting healthcare participation, and reducing health inequalities, especially among vulnerable groups such as women, youth, rural residents, and minorities (24); (25). The initiative supports individuals in low- and middle-income countries

in understanding and using digital tools to manage their health more effectively. It is active in countries like India, Kenya, Nigeria, Bangladesh, and Ghana, where targeted programs are improving digital health literacy and access to care (23). In India, mobile health apps have boosted maternal and child health awareness, increasing prenatal care attendance and lowering infant mortality (21). In Kenya, HIV/AIDS campaigns have raised awareness and testing rates (26), while in Bangladesh, mobile-based health education has increased vaccination coverage and helped prevent infectious diseases (27). Overall, the initiative plays a key role in promoting equitable access to digital health services and empowering individuals to make informed health decisions, ultimately improving health outcomes in underserved populations (23).

In a study conducted in Indonesia—one of the countries where USAID has invested—460 participants were assessed in terms of their digital health literacy. The results showed that participants had a mean score of 4.13 ± 0.56 in accessing health-related information online, and a mean score of 3.67 ± 0.78 in applying this information to their own health decisions (28). On the other hand, significant digital inequalities persist across the country. While internet access reaches up to 85% in western regions such as Jakarta, it is as low as 26% in eastern regions like Papua, highlighting substantial regional disparities in access to and utilization of digital health services (29).

4. Health Literacy for Older Adults (eHeLA) Project

The eHeLA Project, implemented in Canada, focuses on improving digital health literacy among older adults, particularly those aged 65 and above. Its main goal is to help older individuals access and effectively use digital health information, thereby enabling them to play a more active role in managing their health. By reducing barriers to digital services and simplifying access, the project aims to decrease health disparities among the elderly. eHeLA has been deployed across both rural and urban

regions in Canada to enhance access to health information and services (30). Research shows that participants in the program are better able to evaluate the accuracy of online health content and use digital tools effectively. Outcomes also indicate improvements in medication adherence and disease self-management skills. Overall, eHeLA contributes significantly to promoting health equity and improving outcomes for older populations by increasing their engagement with digital health services (31).

5. My Health Record Education Campaign

The My Health Record Education Campaign, led by the Australian government, is a digital health initiative aimed at promoting the use of personal digital health records (32). The campaign seeks to enhance health literacy by enabling individuals to store, manage, and share their health information through a centralized platform (33). By improving access to health records, it encourages individuals to take a more active role in managing their health and supports informed decision-making (34). The initiative particularly targets vulnerable populations, including the elderly, people with chronic conditions, and those living in rural areas (30). It also aims to strengthen coordination with healthcare providers by allowing users to store treatment histories, prescriptions, and test results in one place, thereby simplifying chronic disease management (35). Overall, the campaign plays an important role in increasing digital health literacy and participation in healthcare services in Australia.

During the opt-out registration process launched in 2018, public awareness of the My Health Record system increased from 63.6% to 92.1%, as a result of communication campaigns conducted by the Australian Digital Health Agency (ADHA) (36). In the 2020–2021 period, 2.69 million out of 23 million registered users accessed the My Health Record system, corresponding to approximately 11.7% of the total users. Between 2022 and 2023, the usage of the system by healthcare providers increased by 30.43% (37).

6. NHS Digital Literacy Programme

The NHS Digital Literacy Programme, led by the UK's National Health Service (NHS), aims to improve digital health literacy by promoting the effective use of digital tools to access reliable health information and manage care more actively (38). The programme focuses on expanding access to healthcare services and reducing health inequalities, particularly among older adults, low-income individuals, and those with limited digital Access (39). It is implemented nationwide, with educational strategies tailored to the needs of different communities (34). The programme has increased digital health service use among older adults, improving their understanding of health information and enabling better access to medical records and medication management. It has also supported individuals with chronic illnesses in using digital applications, contributing to enhanced self-management skills (36). Overall, the NHS Digital Literacy Programme plays a vital role in improving digital health access, empowering individuals, and promoting equitable healthcare participation (34).

In the United Kingdom, the NHS Digital Literacy Programme has been developed to address widespread gaps in digital inclusion and health literacy. National data indicate that approximately 11.9 million individuals—around 22% of the UK population—lack basic digital skills, and 4.8 million people have never used the internet. Furthermore, an estimated 43% of adults in England struggle with low health literacy, a figure that increases to 61% when numeracy is involved. To address these challenges, the NHS launched several initiatives, including the Widening Digital Participation (WDP) programme, which reached 387,000 people between 2013 and 2016, of whom 221,000 received digital skills training. In addition, NHS Digital and Health Education England have introduced a digital capabilities framework and an interactive self-assessment tool to evaluate and support digital skill development among health and care staff. These initiatives aim to reduce digital disparities and promote equitable access to digital health services (40).

7. MedlinePlus Digital Health Resources

MedlinePlus is a digital health information platform developed by the U.S. National Library of Medicine (NLM) to provide reliable, up-to-date, and verified health content to users [(38)]. It aims to improve health literacy by enabling individuals to better understand and use health information in making informed health decisions and managing care effectively [(39)]. Offered in both English and Spanish, the platform supports access among diverse ethnic and linguistic communities in the United States, helping to reduce health disparities and encourage broader participation in healthcare [(41)]. While primarily designed for U.S. residents, MedlinePlus is globally accessible and widely used by health professionals, including doctors, nurses, and educators [(38); (41)]. By addressing language and access barriers, MedlinePlus plays a key role in improving digital health literacy and supporting more equitable health outcomes.

MedlinePlus is a digital health information platform that reaches millions of users worldwide. According to 2021 data, the platform was accessed by a total of 418 million users, who generated approximately 888 million page views. In addition to English and Spanish, MedlinePlus offers content in over 50 languages, aiming to reduce language barriers and provide more inclusive access to health information. With a broad content base, the platform delivers scientifically grounded information on more than 1,000 diseases and health conditions, 1,300 genetic disorders, and 1,400 genes. These statistics clearly demonstrate the global reach and strong potential of MedlinePlus to enhance digital health literacy across diverse populations (42).

DISCUSSION

The findings of this study indicate that digital health literacy projects generally have a positive impact by improving individuals' access to health information and enhancing their ability to understand and use it effectively (43). Strategies such as mobile health applications, online training modules, and multimedia-based educational campaigns have proven particularly effective in

this regard. However, the outcomes vary across different demographic groups; older adults, women, and rural populations often face greater challenges in accessing and utilizing digital health tools (44). This suggests the need for more inclusive and adaptable approaches.

While most initiatives employ user-friendly content, interactive formats, and mobile-compatible platforms, the degree of cultural adaptation significantly influences project success. Culturally sensitive materials enhance comprehension and behavioral change, whereas projects lacking localization tend to fall short in engaging communities and meeting their needs (45).

A major limitation affecting these initiatives is the digital divide. Access barriers remain prominent for rural, elderly, and low-income populations due to limited connectivity, low digital literacy, and high data costs (46); (47). Addressing these barriers through infrastructure development and more affordable technologies is essential to ensure inclusivity and equity in digital health interventions (48).

Another critical challenge is data privacy and security. Concerns about the safety of personal health data can undermine user trust and participation (49). Therefore, robust data protection protocols must be embedded in project design. Additionally, the long-term sustainability of digital health literacy programs is key. Emerging technologies like artificial intelligence and big data offer opportunities to personalize health services and improve learning outcomes. Developing sustainable funding mechanisms and fostering public-private partnerships will be vital for expanding program reach and impact (50).

In conclusion, while digital health literacy projects have demonstrated success in improving access to and use of health information, several challenges remain. Bridging the digital divide, enhancing cultural relevance, ensuring data security, and establishing sustainable models are essential to maximizing the effectiveness and inclusivity of these initiatives. Comprehensive,

innovative strategies will be needed to reduce health disparities and promote equitable digital health access in the future.

CONCLUSIONS

The reviewed digital health literacy programs display significant diversity in terms of geographic scope, delivery models, target demographics, and measurable outcomes. Be He@lthy, Be Mobile (BHBM), led by WHO and ITU, is notable for its global scope and disease-specific interventions, particularly non-communicable diseases (NCDs), using SMS and mobile apps in countries like Senegal, India, and Costa Rica. By contrast, the Digital Health Literacy for the 21st Century (DH21) Project targets European populations, with a specific focus on health equity through structured training and mobile tools, tailored for older adults and vulnerable groups.

USAID's Digital Health Literacy Initiative extends across low- and middle-income countries, including India, Kenya, and Indonesia, and emphasizes public health campaigns via mobile apps. Its inclusion of diverse vulnerable groups and demonstrated impact (e.g., increased vaccination and HIV awareness) reflects a comprehensive population-level approach. The eHeLA Project in Canada focuses exclusively on the elderly, leveraging regional networks to improve digital inclusion, with proven improvements in health information use and medication adherence.

The My Health Record Education Campaign in Australia is a national-level effort focused on increasing usage of a centralized digital health portal. Though usage remains low relative to registration (11.7% access rate), awareness campaigns were highly effective. Similarly, the NHS Digital Literacy Programme in the UK uses a multipronged approach to reduce digital inequality, training over 220,000 individuals and embedding tools to assess digital capabilities.

Lastly, MedlinePlus, while not a “program” in the traditional sense, functions as a long-standing digital resource platform with massive reach—418 million users in 2021 alone—providing multilingual, validated health content.

Collectively, these initiatives underscore the global importance of digital health literacy as a determinant of health equity and participation. Programs targeting specific vulnerable populations—such as the elderly (eHeLA, NHS) or low-income groups (USAID)—demonstrated greater behavioral impact and sustained engagement. Campaigns combining multiple modalities (e.g., SMS + apps + training) yielded better health management outcomes, as seen in BHBM and DH21.

Successful initiatives share several characteristics: strong institutional backing (e.g., WHO, NHS, USAID), localization of content (language, cultural adaptation), and integrated feedback or assessment tools. While some programs showed outstanding reach (MedlinePlus, My Health Record), actual engagement or use remains a challenge, highlighting the gap between access and active utilization.

Despite progress, disparities persist, particularly in regions with lower digital infrastructure (e.g., Papua, Indonesia). Future programs should invest in infrastructure, develop localized content, and embed evaluation mechanisms from the outset. A greater emphasis on cross-sector collaboration—between health, technology, and education sectors—would also enhance the long-term impact of these digital health literacy efforts.

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