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ARTIFICIAL INTELLIGENCE AND GAMIFICATION FOR DIGITAL HEALTH EDUCATION: DEVELOPMENT OF A WEB APPLICATION

INTELIGÊNCIA ARTIFICIAL E GAMIFICAÇÃO PARA O ENSINO EM SAÚDE DIGITAL: DESENVOLVIMENTO DE APLICATIVO WEB

INTELIGENCIA ARTIFICIAL Y GAMIFICACIÓN PARA LA ENSEÑANZA EN SALUD DIGITAL: DESARROLLO DE UNA APLICACIÓN WEB

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RESUMO

Objetivo: Descrever o processo de prototipagem do aplicativo web gamificado *SaudeDigital.Quest*, estruturado em formato de *Role-Playing Game* (RPG) educacional com inteligência artificial (IA) para personalização do ensino e *feedback*, voltado a competências em saúde digital (telessaúde, prontuário eletrônico, IA clínica, segurança de dados e interoperabilidade) para profissionais e estudantes de saúde. **Método:** Estudo metodológico de desenvolvimento de protótipo de tecnologia educacional, fundamentado em *Design Thinking* e revisão narrativa. Conduzido conforme o SQUIRE-EDU em universidade pública do Rio de Janeiro, entre abril e maio de 2026. **Resultados:** O processo percorreu empatia, definição, ideação, prototipagem e teste, gerando um aplicativo web gamificado, responsivo, de acesso livre e sem cadastro. A ferramenta utiliza narrativas clínicas contextuais em RPG, oferecendo casos em seis domínios da saúde digital com trilhas personalizadas por IA conforme perfil, formação e autopercepção do usuário, além de pontuação, feedback contextualizado, glossário e avaliação. **Conclusão:** O *SaudeDigital.Quest* constitui tecnologia educacional inovadora que integra gamificação e IA, apresentando potencial para incorporação em currículos de graduação, pós-graduação e educação permanente.
Descritores: Saúde Digital; Gamificação; Inteligência Artificial; Tecnologia Educacional; Educação em Saúde; Pessoal de Saúde.

ABSTRACT

Objective: To describe the prototyping process of the gamified web application *SaudeDigital.Quest*, structured as an educational Role-Playing Game (RPG) featuring artificial intelligence (AI) for teaching personalization and feedback, aimed at digital health competencies (telehealth, electronic health records, clinical AI, data security, and interoperability) for healthcare professionals and students. **Method:** A methodological study on the development of an educational technology prototype, grounded in Design Thinking and a narrative review. Conducted in accordance with SQUIRE-EDU at a public university in Rio de Janeiro between April and May 2026. **Results:** The process spanned empathy, definition, ideation, prototyping, and testing, resulting in a gamified, responsive, free-access web application with no registration requirement. The tool utilizes contextual clinical RPG narratives, offering cases across six digital health domains with AI-personalized pathways tailored to the user's profile, training, and self-perception, alongside scoring, contextualized feedback, a glossary, and evaluation. **Conclusion:** *SaudeDigital.Quest* constitutes an innovative educational technology that integrates gamification and AI, presenting potential for incorporation into undergraduate, graduate, and continuing education curricula.
Descriptors: Digital Health; Gamification; Artificial Intelligence; Educational Technology; Health Education; Health Personnel.

RESUMEN

Objetivo: Describir el proceso de creación de prototipos de la aplicación web gamificada *SaudeDigital.Quest*, estructurada en formato de Juego de Rol (RPG) educativo con inteligencia artificial (IA) para la personalización de la enseñanza y la retroalimentación, dirigida a competencias en salud digital (telesalud, registro electrónico de salud, IA clínica, seguridad de datos e interoperabilidad) para profesionales y estudiantes de la salud. **Método:** Estudio metodológico de desarrollo de prototipos de tecnología educativa, fundamentado en *Design Thinking* y revisión narrativa. Realizado según SQUIRE-EDU en una universidad pública de Río de Janeiro entre abril y mayo de 2026. **Resultados:** El proceso abarcó empatía, definición, ideación, creación de prototipos y pruebas, dando como resultado una aplicación web gamificada, receptiva, de libre acceso y sin registro. La herramienta utiliza narrativas clínicas contextuales en RPG, ofreciendo casos en seis dominios de la salud digital con rutas personalizadas por IA según el perfil, la formación y la autopercepción del usuario, además de puntuación, retroalimentación contextualizada, glosario y evaluación. **Conclusión:** *SaudeDigital.Quest* constituye una tecnología educativa innovadora que integra la gamificación y la IA, presentando potencial para su incorporación en los planes de estudio de grado, posgrado y educación continua.
Descriptores: Salud Digital; Gamificación; Inteligencia Artificial; Tecnología Educacional; Educación en Salud; Personal de Salud.

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What is already known:

- Gamification in healthcare education promotes engagement, knowledge retention, and critical-reflective thinking.
- Artificial intelligence enables the personalization of educational content according to the learner's profile and performance.
- There is a scarcity of interactive educational technologies aimed at developing digital health competencies in Brazil.

What this article adds:

- *SaudeDigital.Quest* integrates gamification and artificial intelligence for digital health education across eight professional categories within a free-access platform.
- Personalized clinical pathways in a Role-Playing Game format constitute a viable strategy for developing digital health competencies in initial training and continuing health education.
- The use of a large language model enabled the development of the prototype by a team without exclusive technical training in programming.

INTRODUCTION

Digital health is defined as the set of knowledge, techniques, practices, and values related to the use of digital technologies in the healthcare field and the expansion of the digital space. Its multidisciplinary approach encompasses a vast array of applications, including interoperable information systems, electronic health records, data science, artificial intelligence (AI), telemedicine, wearable devices (wearables), applied robotics, and the Internet of Things[1-2].

Practical evidence demonstrates that the use of these technologies in Primary Health Care (PHC) can resolve up to 72.4% of cases through teleconsultations, significantly reducing waiting lists for specialties. However, a critical gap is observed in the training of healthcare professionals, who frequently encounter the use of new technologies without proper preparation or prior awareness[3-4].

Obstacles such as technological illiteracy (24%) and low digital literacy, coupled with the perception that digital tools represent "extra work" or dehumanize care, rank among the main challenges. To reverse this scenario, it is urgent to prioritize the inclusion of digital health in initial training and continuing education, aiming at the development of competencies in communication, remote clinical practice, and digital ethics[5-6]. Such gaps directly impact care practice, since insecurity in handling electronic health records, telehealth systems, and AI tools can compromise continuity of care, the quality of clinical information, and patient safety, thereby reinforcing the need for effective training strategies.

In this sense, AI presents itself as a strategic resource to overcome these training deficiencies, acting both in the personalization of teaching and in practical support for the professional. Among its main applications in health education are: a) an instrument for continuing education; b) the promotion of digital literacy; c) assistance in knowledge management; d) the facilitation of content curation; and e) integration with active methodologies, such as gamified activities[7-8].

Digital gamification consists of the application of game elements and mechanics to non-ludic contexts, such as education, with the purpose of promoting engagement, motivation, and active learning. This approach has been increasingly used in training processes, especially in topics where knowledge gaps persist even within curricular guidelines, such as digital health. Digital games assist in skill development, increase student confidence, and constitute an important support tool for decision-making[9-10].

Although the integration between AI and gamification has been increasingly explored in health education, few initiatives specifically target the development of digital health competencies, and technologies that integrate AI personalization for this purpose are even scarcer. An exploratory search in application stores identified no free tools structured in an educational Role-Playing Game (RPG) format and directed at multiple healthcare professional categories with a scope similar to the one proposed here, which ratifies the gap to be filled.

Given this scenario, *SaudeDigital.Quest* was developed—an application that differs from existing initiatives by integrating, in a single free-access platform without registration requirements, interactive clinical cases structured as an educational RPG, AI personalization based on the professional profile, educational level, and user self-perception, and coverage of six thematic domains of digital health targeted at eight professional categories.

Thus, this article aims to describe the prototyping process of the gamified web application *SaudeDigital.Quest*, structured as an educational RPG format with AI for teaching personalization and feedback generation in digital health for healthcare professionals and students.

METHOD

Study type and design

This is a methodological study on the development of a digital educational technology prototype, grounded in Design Thinking principles. This approach was selected because it favors user-centered processes, allowing for the understanding of the target audience's needs, the iterative generation of creative solutions, and the construction of functional prototypes prior to their application and formal validation[11]. It should be noted that, at this stage of the study, the process was conducted predominantly by the technical-pedagogical team responsible for development, without the direct participation of end-users in the conception and prototyping stages.

The study followed the guidelines of the Standards for Quality Improvement Reporting Excellence in Education (SQUIRE-EDU), a methodological framework recommended for reporting educational interventions aimed at improving the quality of teaching and professional practice

in healthcare. Furthermore, efforts were made to ensure a detailed characterization of the educational intervention, the pedagogical foundation of the methodological choices, and the description of elements that favor the reproducibility of the process by other researchers, as detailed in the following subsections.

Setting

The study was conducted within a public university located in the municipality of Rio de Janeiro, between April and May 2026. The development of the technology was motivated by the identification of a learning gap in the field of digital health—a rapidly expanding area, yet still poorly integrated into traditional professional health training in Brazil. The absence of interactive and accessible educational resources that promote the development of digital competencies in a manner contextualized to clinical practice was verified.

Development participants

The prototype was developed by faculty members with expertise in digital health, educational technologies, and teaching-learning processes in health. The team assumed the roles of researcher, instructional designer, and developer of the digital platform, configuring an intra-team multidisciplinary process.

Description of the intervention

The educational technology developed is named *SaudeDigital.Quest*, a gamified web application based on an educational RPG, accessible via mobile devices and desktops. Each clinical case is preceded by a contextual narrative composed of a scenario, a character, and a problem situation, positioning the user in the role of a decision-making agent and providing the experience with elements characteristic of RPG mechanics. The application is intended for professionals and students in the fields of Nursing, Medicine, Dentistry, Physical Therapy, Psychology, Speech-Language Pathology, and Nutrition.

The platform provides interactive clinical cases structured in sequential stages (context, decision, consequence, and learning), covering six thematic domains of digital health: telemedicine and teleconsultation; electronic health record (EHR) and interoperability; AI applied to diagnosis; data security and the General Data Protection Law[12]; digital epidemiology and the use of health dashboards; and digital hospital management.

The user experience is personalized according to the user's professional category, educational level (undergraduate, graduate/residency, professional practice, teaching/research, or management), and self-perception of knowledge in digital health. The gamified scoring system awards points for correct answers (+100 points), fast answers—submitted in less than 10 seconds (+20 points)—and consecutive correct streaks (+50 points), while applying penalties for incorrect answers (-25 points). The application also features a glossary of digital health terms and a result-sharing functionality.

Development stages – Design Thinking

The development process was organized into the five stages of Design Thinking:

1. Empathy: an immersion into the context of digital health education was conducted through a narrative literature review of scientific evidence on learning gaps, required digital competencies for healthcare professionals, and active pedagogical strategies. This step was complemented by an exploratory search in application stores (Google Play and App Store) to identify similar available technologies. A narrative review approach was chosen, without a systematic search protocol (databases, descriptors, and formal eligibility criteria). No technologies with a scope and target audience similar to those proposed in this study were identified in this search, highlighting the need for playful and contextualized approaches to engage the target audience.

2. Definition: based on the findings of the literature review and the verification of the absence of similar technologies in application stores, the central problem was delineated: the scarcity of interactive digital educational resources aimed at developing digital health competencies for healthcare professionals and students. Subsequently, the pedagogical objectives and the profile of the target users were established.

3. Ideation: proposals for pedagogical solutions were generated, opting for the Game-Based Learning model with an educational RPG structure. This choice was grounded in evidence regarding the effectiveness of gamification for engagement, motivation, and knowledge retention in health education. In this stage, the pedagogical guidelines of the technology were defined: the structuring of clinical cases into sequential steps (context, decision, consequence, and learning); the selection of the six priority thematic domains of digital health, based on the gaps mapped during the Empathy stage; and the adoption of personalization according to the professional category, educational level, and user self-perception, aiming to favor the applicability of the content to different health professions.

4. Prototyping: the functional prototype of the web application *SaudeDigital.Quest* was developed, encompassing the construction of the information architecture, interface design, creation of interactive clinical cases, and platform programming. The information architecture included the personalization screening flow (professional category, educational level, and self-perception), the library of clinical cases organized into the six thematic domains, the gamified scoring system, and the AI personalization and feedback generation engine. The source code was developed with the assistance of the large language model Claude (Anthropic, San Francisco, USA), version Claude Sonnet 4.6, employed as a programming and instructional design assistance tool. The resource was used for code generation, review, and iterative refinement, enabling the construction of the prototype by a team without exclusive technical training in software development. The prototype was published and hosted on the Netlify platform (Netlify, Inc., San Francisco, USA), a cloud service that ensured public access to the application at no additional cost and with continuous availability. The

results presented below reflect the products, decisions, and justifications constructed throughout the Design Thinking stages: the architecture, user flow, and personalization system (Ideation and Prototyping stages); the educational content and gamification mechanics (Ideation and Prototyping stages); and complementary resources (Prototyping stage).

5. Testing: this stage, which comprises the evaluation of the prototype by expert judges and/or end-users, constitutes the next step of the investigation and was not executed within the scope of the present work. The validation process will be conducted in a subsequent phase, as recommended by methodological frameworks for the development of educational technologies, using the System Usability Scale (SUS)[13] and the Technology Acceptance Model (TAM)[14]. Thus, the results described in this manuscript refer to the development of a functional prototype, whose usability, acceptability, and educational potential have not yet been empirically evaluated.

Ethical considerations

Because this is a methodological study on prototype development, without data collection involving human beings at the current stage, prior approval by a Research Ethics Committee (REC) was waived for this phase. However, with a view to future testing and validation phases, the study protocol was submitted to and approved by an REC, under opinion number 8,614,003.

RESULTS

The prototype was registered with the National Institute of Industrial Property (INPI) on June 5, 2026, under protocol no. 512026004202-0. The application is available for open access at the web address: https://saudedigitalquest.app/[15].

Architecture and user flow

Upon accessing the application, the user is directed to a personalization screening consisting of three sequential steps. In the first step, the user selects their professional category from eight options: nurse, physician, physical therapist, psychologist, speech-language pathologist, nutritionist, dentist, and health manager. In the second step, the user reports their level of training or practice, covering undergraduate student, graduate student or resident, practicing professional, educator or researcher, and health manager. In the third step, the user describes their current perception of digital health through four attitudinal profiles, ranging from complete unfamiliarity with the topic to recognition of its potential. These data are processed by AI, which selects and adapts the presented clinical cases according to the identified profile, without storing personal data. This registration-free screening structure was defined during the Ideation stage as a way to ensure personalization with minimal access barriers, in response to the digital literacy gaps identified in the Empathy stage.

Figure 1 – Initial screen of the *SaudeDigital.Quest* application



Source: prepared by the authors, Rio de Janeiro, 2026.

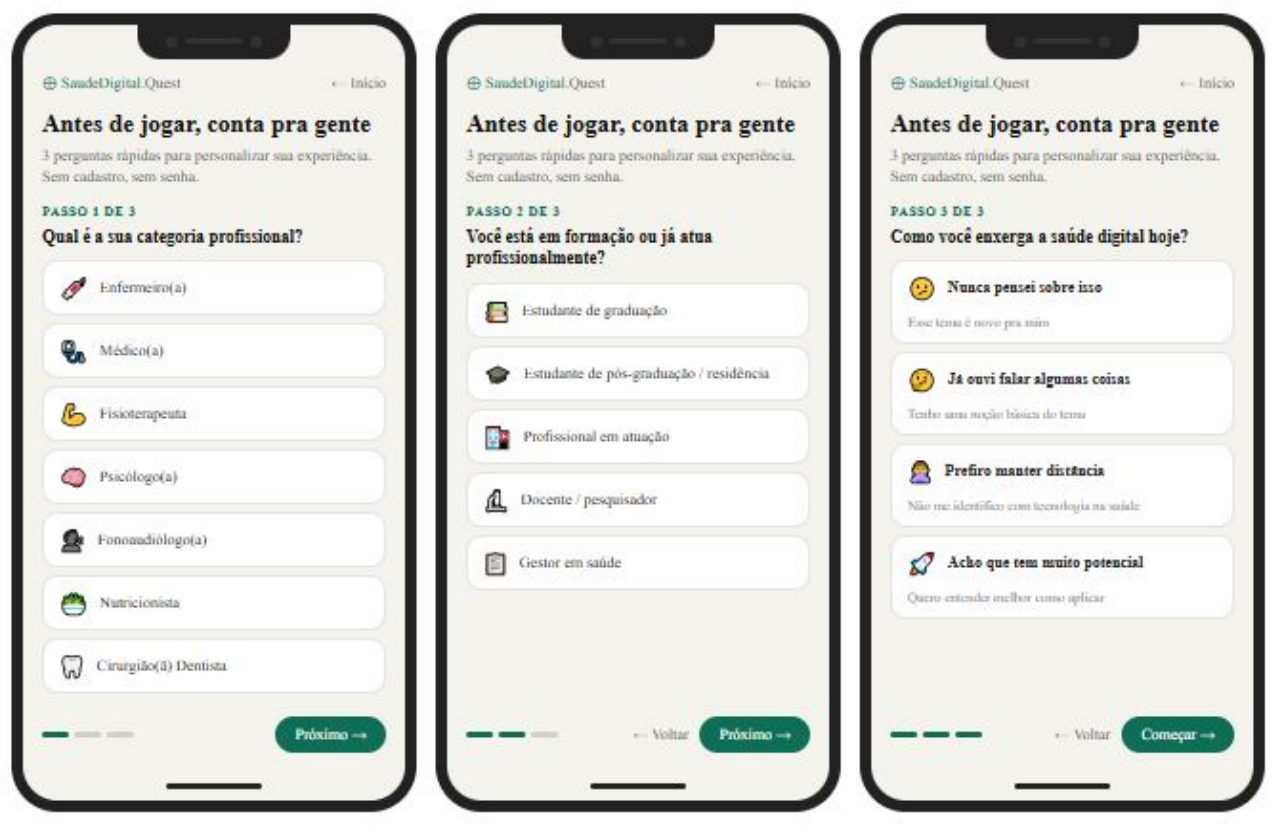
Educational content

The application covers six thematic domains of digital health: telehealth, electronic health records, clinical AI, information security and the General Data Protection Law, interoperability, and the use of mobile devices in clinical practice. The content is presented in a differentiated manner according to the professional category and the level of prior contact with the topic, establishing an individualized learning pathway. The learning track is composed of three specific cases for each category, in addition to cross-cutting cases applicable to all professions. Users can follow the suggested track or randomly select the cases to be solved. The definition of the six thematic domains resulted from the Ideation stage, with the criterion of adherence to the competency gaps identified in the literature review conducted during the Empathy stage.

Gamification mechanics

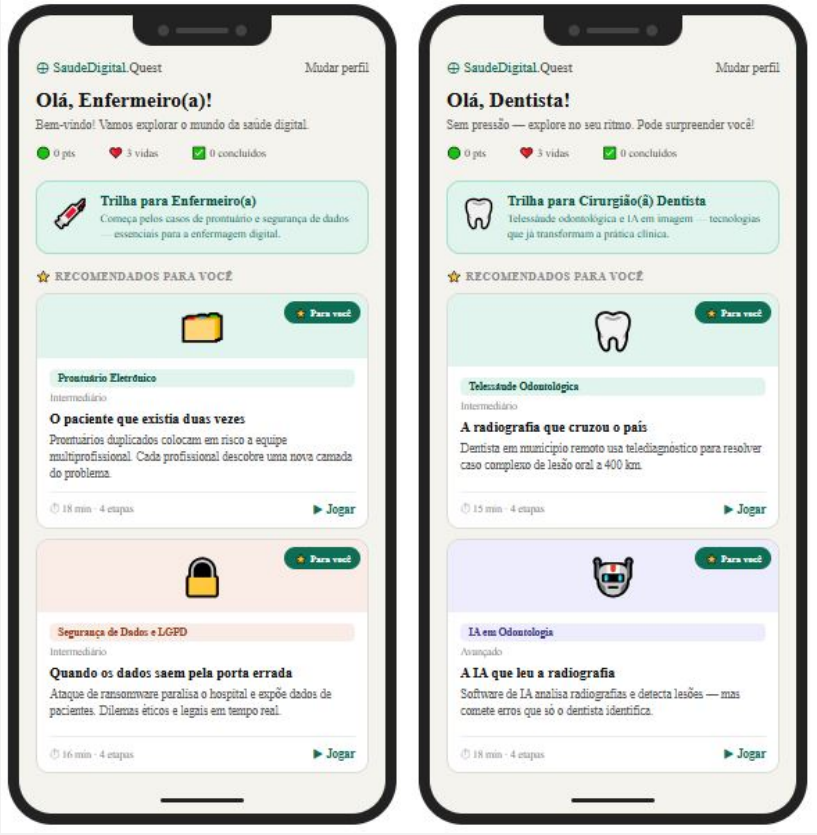
The game logic adopts elements characteristic of Role-Playing Games (RPGs), with clinical cases structured into four to five decision-making stages. Each case is preceded by a contextual narrative composed of a clinical scenario, a character, and a problem situation—as illustrated in Figure 4—which positions the user in the role of a decision-making agent in the story, a structuring element of the adopted RPG mechanics. The user accumulates points with each correct decision, displayed on a continuous scoreboard on the interface. The AI system is also responsible for generating contextualized feedback at the end of each stage, explaining the consequences of the decisions made and reinforcing the concepts covered.

Figure 2 – Professional profile selection mechanics



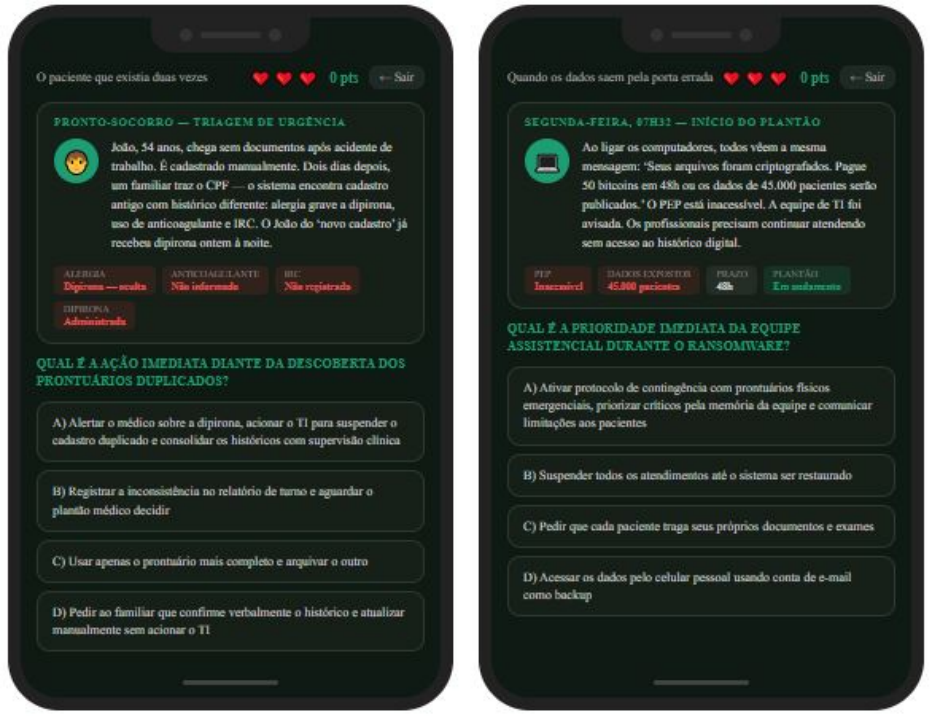
Source: prepared by the authors, Rio de Janeiro, 2026.

Figure 3 – Examples of learning tracks personalized by professional category



Source: prepared by the authors, Rio de Janeiro, 2026.

Figure 4 – Examples of cases presented in the application, featuring contextual narrative and RPG decision-making mechanics

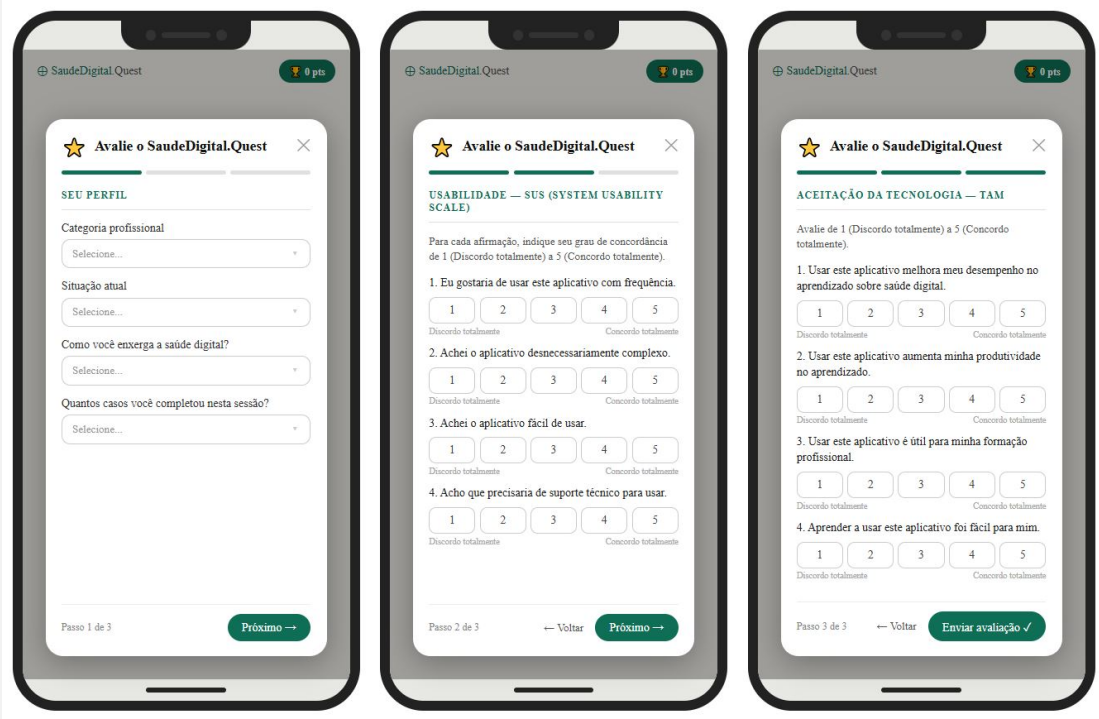


Source: prepared by the authors, Rio de Janeiro, 2026.

Complementary resources

The platform also provides a glossary of digital health terms, an introductory video on the fundamentals of the field, and a user experience evaluation questionnaire, integrating support resources for self-directed learning. The interface was developed in accessible language, with visual and textual elements that dialogue with the digital culture of contemporary healthcare professionals, without requiring prior technical knowledge in technology.

Figure 5 – Application evaluation screen



Source: prepared by the authors, Rio de Janeiro, 2026.

DISCUSSION

Although the integration between AI and gamification has been widely discussed in recent years[16-18], the development of the application responds to a relevant training gap: the absence of educational technologies focused on digital health for professionals from multiple categories[19]. Gamification has established itself as an innovative strategy in higher education in health, promoting greater engagement, knowledge retention, and the development of socio-emotional skills[20]; however, its application to the specific domain of digital health remains incipient in the Brazilian context.

Such a scenario highlights an expressive mismatch in relation to political and educational frameworks, especially those of Brazilian Nursing, whose National Curriculum Guidelines recommend teaching actions mediated by technologies, as well as their critical incorporation and enhancement for social and professional development[21].

The adoption of RPG mechanics as the central structure of clinical cases aligns with recent findings that reinforce the efficacy of gamified active methodologies[22-23]. The incorporation of gamification into the teaching-learning process in health contributes to the promotion of meaningful learning—especially when mediated by smartphones[24]—potentiating the development of competencies related to critical-reflective thinking[25]. In the presented application, this logic materializes through cases composed of four to five decision-making stages, in which the user assumes the role of an active agent in the clinical situation, being confronted with the consequences of their choices at each decision.

A central differential of the developed technology lies in the use of AI for two complementary functions: the personalization of cases according to the professional profile and the level of familiarity with the topic, and the generation of contextualized feedback at the end of each stage. This model fits into the paradigm of adaptive learning, which has received growing support in the scientific literature[26]. Personalized learning, mediated by adaptive algorithms, stands out as one of the most recurrent applications of AI in health education, adjusting content to individual performance, identifying training gaps, and favoring more flexible educational trajectories[27-28]. The three-dimensional profile screening—professional category, educational level, and perception of digital health—enables personalization that transcends simple content adaptation, also contemplating the learner's attitude toward the theme[29].

Regarding the relevance of the content, the six domains addressed—telehealth, electronic health records, clinical AI, the General Data Protection Law and information security, interoperability, and mobile devices—directly respond to the gaps identified in the training of healthcare professionals[30]. Furthermore, the incorporation of tools such as AI and practices linked to digital health constitutes a growing demand in the health work process, requiring continuous training and enhancement[31].

The accessibility of the technology also deserves emphasis: the application is open access, dispenses with registration or authentication, and features a responsive design for mobile devices. This model eliminates frequent barriers in health education platforms, such as financial costs, requirements for specific hardware, or mandatory institutional ties. Among the obstacles pointed out in the literature on health gamification are the high costs of application development, curricular rigidity, the lack of teacher appropriation for handling technologies, and low digital literacy[32].

Regarding the potential for scale and institutional adoption, *SaudeDigital.Quest* brings together the conditions to integrate undergraduate and graduate health curricula, in-service continuing education programs, and university extension initiatives, in consonance with the main research agendas and public policies aimed at digital transformation in health[33-34]. In this context, the global health information technology market projects an annual growth of 15%, reflecting the transformative impact of these innovations and the urgency of preparing professionals for this scenario[35].

As limitations of the present study, we highlight the fact that the Empathy stage was grounded in a narrative literature review, without a systematized search protocol, as well as the absence of direct participation from end-users in the conception and prototyping phases. These aspects restrict the methodological rigor of the Design Thinking framework adopted in this initial phase, and must be overcome in subsequent stages through the involvement of users and expert judges.

Furthermore, the application is currently in a closed testing phase in native app stores (iOS and Android), a stage subsequent to ethical appraisal and prior to making it available to the general public. These steps are underway to enable the large-scale dissemination of the tool. Future investigations should contemplate content validation, usability evaluation, and effectiveness trials that compare participants' performance before and after using the technology.

CONCLUSION

The development of *SaudeDigital.Quest* resulted in a gamified, free-access, and responsive web application that integrates artificial intelligence for teaching personalization and the generation of contextualized feedback in digital health, intended for professionals and students from eight healthcare categories. The technology covers six thematic domains of digital health organized into individualized pathways according to the professional category, educational level, and user self-perception, constituting an innovative educational proposal on the national scene by combining gamification, artificial intelligence, and content targeted at multiple professional profiles within a single platform.

The study contributes to the advancement of educational technologies in health by demonstrating the feasibility of developing a functional prototype that is accessible and contextualized to clinical practice, aligned with the National Curriculum Guidelines and national and international public policies for digital health transformation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE

We used artificial intelligence to correct potential grammatical errors and construct the supplementary file. The development of the prototype was entirely supported by artificial intelligence. The following was used: Claude Version 1.9659.2.0.

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All authors are responsible for drafting and critically revising the intellectual content, for the final published version, and for all ethical, legal, and scientific aspects related to the accuracy and integrity of the study.

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