Development of an educational application for the health area

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ABSTRACT

The study aims to describe the experiences about the development of an application in game format for android devices as a contribution to infection prevention in health services. Material and method: descriptive and methodological study, which took place through an experience report. Results and Discussion: the application was developed with a focus on undergraduate students in the health area. The activities took place in the second half of 2023, in three stages. The application of the game took place in three phases, namely: the first phase is related to the issues of elaboration of the game itself; the second phase of its application in the remote environment via Google Meet® during the meeting of the Health Research, Teaching and Extension Project at the University (Pensu) and the third phase, about its distribution. Conclusion: the benefits involved the fixation of the content in a way that transcends expository classes, stimulating the individual's protagonism in the path of knowledge.

Keywords: Remote teaching, Mobile applications, Health information technology.

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INTRODUCTION

In the context of the health area, when looking to the past, it is observed that infection control began in 1935 with the discoveries of sulfanilamide and penicillin. Since then, new research has begun to emerge with the scope of improving and discovering more efficient ways to control bacteria, seeking to intervene in any of the mechanisms (mutation, transduction, transformation and conjugation) that guarantee the continuity of bacteria, since such microorganisms have started to demonstrate resistance to antibiotics [1].

Within this scenario, the Hospital Infection Control Commission (CCIH) was created in Brazil in 1983, by Ordinance GM/MS No. 196, in the context of awareness, monitoring of outbreaks and health promotion. CCIH is a vital component in ensuring that patients are safe, promoting the quality of health care in hospitals, and for playing an important role in the fight against healthcare-associated infections (HAIs), a public health problem that has a significant impact on morbidity, mortality, and hospital costs[2].

That said, the CCIH is responsible for providing data that allow the evaluation of the quality of care, in this sense, allowing the deployment of actions and coping strategies in activities related to the control of the environment, personnel, chemical products, creation of standards, epidemiological investigation, continuing education and periodic meetings [3].

The trajectory of the CCIH in Brazil has been marked by historical events that have consolidated its essential role and defined its responsibilities. Created as a deliberative commission by Ordinance GM/MS No. 196/1983, which established its objectives and responsibilities. Subsequently, Law No. 8,080/1990, which regulates the Unified Health System (SUS), included the CCIH as one of the support services for hospital care, increasing its importance. Law No. 9,431 of 1997 made the CCIH mandatory in all hospitals in the country, recognizing its vital role in patient safety [4].

The effectiveness of the CCIH depends on the experience of its members, who are a multidisciplinary and interprofessional team. The minimum composition of the CCIH is established by MS Ordinance No. 2,616/1998 and includes physicians, nurses, pharmacists, microbiologists, biochemists, physiotherapists, dentists, psychologists, public health professionals, and other health professionals, depending on the need for the service. The diversity of perspectives and knowledge allows for a comprehensive and effective approach to hospital infection control, ensuring the integration of different areas of health care [5].

The responsibilities of the CCIH are broad and cover a variety of activities essential for the prevention and control of hospital-acquired infections. The Hospital Infection Control Program (HICP) is developed, implemented, and evaluated by the HICC. The HICP is a strategic document

that guides all CCIH actions and establishes goals, objectives, and performance indicators for infection control [6].

During the pandemic context, the systematic work of the Hospital Infection Control Commission gained notoriety and, without a doubt, was essential to go through a period marked by uncertainty and fear, adopting fundamental protocols and guidelines for the management of the disease during this critical period for global health [7,8].

The present study aims to amplify the current theme through the construction of an application aimed at mobile devices with the android operating system.

METHODOLOGY

It consists of an exploratory methodological study with a descriptive approach, elaborated through an experience report. Methodological research is aimed at the development, validation, and evaluation of technologies or methodological strategies. The purpose of the study was to build a game application to provide reliable information available at the Ministry of Health on the prevention of infections in health services [9] .

The application was programmed in the C# language in 2D on the *Unity®* platform by a nursing undergraduate and collaborators. The *Unity®* platform has several elements for different creations, serving a different range of audiences. In this way, the features offered fluctuate from the most basic to the most advanced tools, depending on the level of the programmer. In addition, the same free mode offers a compilation of courses of varying levels for a better handling of the platform. This initiative gives individuals access to the world of programming, enabling the first steps within this scenario.

The creation of the game's design was made by using the public domain platforms *Pixabay® and Canva®.* Additionally, the theoretical framework selected for the elaboration of the content was the work "Conducts in Hospital Infection Control", written by Professor Márcia Valéria Rosa Lima from the Fluminense Federal University (UFF).

The creation of the game was aimed at devices that use android as an operating system and followed the steps described below:

Figure 1: stages of the elaboration of the CCIH game, Niterói-RJ, 2023

1	2	3	4
Conceitos básicos sobre CCIH	Seleção da Plataforma Unity®	Criação de documento contendo todas as perguntas	Primeiro teste pela própria desenvolvedora
Referência: Livro escrito pela professora doutora Márcia Valéria Rosa Lima: Condutas em Controle de Infecção Hospitalar, uma abordagem simplificada	Jogo em 3 formatos: Verdadeiro ou Falso; Quiz com 4 alternativas e Mini game de desembaralhar.	Seleção de sons e imagens de domínio público : *Pixabay*® e *Canva*®	Identificação de erros e ajustes e Segundo teste pelo PENSU
Público - alvo : graduandos em saúde	Busca de material sobre programação na plataforma Unity® e no Youtube®	Construção das Telas do jogo e programação	Disponibilização de modo gratuito na plataforma Zenodo. DOI: 10.5281/zenodo.1054083 5

Source: authors (2023).

Considering that the present study is an experience report, no information or opinion of those involved will be exposed. Thus, ethical implications are avoided, since the research is concerned with exposing only the authors' perspective, excluding information from third parties.

This method consists of the expression of experiences in written form, thus making it possible to contribute to the construction of knowledge and value this experience using critical-reflective thinking with theoretical-methodological support [10].

RESULTS AND DISCUSSION

The game was tested at a meeting of the PENSU research group held on the *Google Meet*® *platform. In the platform's chat, the download link was made available in the mobile application. The activity was supervised by the project's advisor professor. The purpose of this article is to awaken to the new possibilities of continuity of health education. In addition, to stimulate students from different areas of health and teachers about the benefit of uniting other fields of knowledge.*

The elaboration of the application followed the following phases of the methodological study:

1 Separation of the parts to be worked on within the book "Conducts in Hospital Infection Control", written by Professor Márcia Valéria Rosa Lima of the Fluminense Federal University. It was preferred to work on basic and introductory concepts to the theme;

2 Selection of students in the health area as a target audience;

3 Survey of the theoretical framework to be used for the elaboration of the questions;

4 Choice of the Unity® platform for game development;

5 Delimitation of three game formats to be offered: true or false; quiz with four alternatives and minigame to unscramble words;

6 Survey of material on the internet to program the selected game formats;

7 Elaboration of all questions and words in a spreadsheet;

8 Delimitation of the number of screens for the game - main screen, themes screen, true or false (V/F) screen, wanted screen, minigame screen, final score screen, and final considerations screen;

9 Selection of visual and sound material in the public domain for creating the design of the game's screens (*Pixabay® and Canva®);*

10 Construction of the main screen displaying only the subject of the game and the play button;

11 Building Screen Themes: Soldier Button 1 (True or False Game); soldier button 2 (quiz); mini game button (game to unscramble words); information button (final considerations screen) and door button (exit the application);

12 Creation of the true or false (V/F) game screen with 13 questions with the correct alternative signaling feature, sound effect signaling error and success, response time of 30 seconds and progress bar exposing the number of questions and quantity answered, as shown in figure 2;

13 Creation of the quiz screen containing a challenge with 61 questions, a mechanism for signaling the correct (green) and wrong (red) options, sound effect for error and success, a response time of 25 seconds, a progress bar showing the number of questions and the number answered and a button to exit, according to figure 3;

14 Construction of the final score screen common to the two game formats (V/F and Quiz 4 alternatives) with the button to return to the Main Screen, button to the Themes Screen and button to redo every block of questions again. The scoring system is based on the 3-star mechanism, like this: 100% accuracy equals 3 stars, 70% - 90% accuracy gets 2 stars, 50%- 60% accuracy scores only 1 star, and 0 - 40% accuracy no stars. In addition, along with the score, some messages appear depending on the score;

15 Construction of the game's final considerations screen showing the references for bibliographic elaboration, menu button to return to the themes screen, name of the project's advisor professor and name of the application developer;

16 Creation of the minigame screen containing 12 words within the subject addressed, menu button to return to the themes screen, with a response time of 20 seconds and a score being the sum of the response time, as shown in figure 4;

17: First test carried out on the developer's own cell phone;

18: Adjustments and correction of errors identified in the previous step;

19: Second test of the game by volunteers from the PENSU project on the *Google Meet®*
platform

in order to identify errors in formatting, buttons and improve the game;

20: Adjustments to the functionality of some buttons and fixes to alternatives;

21: Developer's observation of university student engagement;

22: Creation of a pamphlet, as shown in figure 5, for distribution in the hospital,
amplifying the public and bringing another educational initiative;

23: Arrangement of the game on Zenodo's free platform. DOI: 10.5281/zenodo.10540835
in order to reinforce education for all, application in the phase of being made available
for free on the *Play Store platform.*

Figure 2: V/F screen.

Figure 3: Quiz.

Figure 4: Mini game.   Figure 5: Panfletus.

Source: authors (2023).

Nowadays, games are revealed as a great didactic alternative to traditional teaching spaces, since they encourage learning through challenges, problem solving, and rewards. In addition, games allow the association between pre-acquired and new knowledge, as well as the articulation between different themes [11]. Health education is a set of practices that aims to raise awareness and empower individuals about care for their own health and community. In this way, games become great allies to health education [12].

One of the main benefits of games as a teaching tool is that it allows you to review and evaluate all theoretical knowledge quickly, easily and attractively. Additionally, they promote the articulation between different contents and areas of knowledge, contributing to a greater assimilation of a given subject and the reality of each individual. Thus, removing the old stigma that studying is slow and boring [13].

The use of mobile technologies as an educational resource favors individuals by facilitating access to content. This process, in the context of health education, in addition to providing safe information to users, promotes the improvement of the quality of care and decision-making. It contributes to improving communication between health professionals and patients, thus favoring more effective monitoring of the health-disease process. Therefore, these instruments generate benefits in the care provided to the community [14].

It is also noted that games are a way to insert and complement subjects that are little addressed and commented on in the classroom, stimulating questions and arousing greater interest on

the part of students in seeking more information on the subject. In view of this, one of the main impacts of the use of games as a teaching methodology, in addition to its direct application in the routine of students and health professionals, is its versatility [15].

Healthcare-associated infections (HAIs) have a significant socioeconomic impact, with limited data in developing countries, but evidence from the US and Europe reveals annual costs for American hospitals of between US$35.7 billion and US$45 billion, while European hospitals face around $7 billion [16].

The prevention and control of HAI is crucial, and the effectiveness of the Hospital Infection Control Commission (HICC) was highlighted by a study by the Centers for Disease Control and Prevention (CDC). This study showed a 30% reduction in HAI in hospitals with effective programs, while hospitals without adequate structure experienced an 18% increase in infections over a six-year period [17].

The implementation of actions for the prevention and control of HAI can significantly reduce infections and their impacts on patients, achieving a reduction of more than 30% in rates. Positive examples include a program in the U.S. that decreased the incidence of urinary tract infections by 17% and central line-associated infections by 50%. In Africa, the adoption of a safety culture and prevention program resulted in a 44% reduction in the risk of urinary tract infections [16].

In view of this, one of the great challenges of the Hospital Infection Control Committees (HICC) is, specifically, the training and updating of health professionals to act directly in the prevention of these infections. Game technologies can be used by Hospital Infection Control Committees as a strategy to reinforce content and support in professional training [18].

FINAL CONSIDERATIONS

In general, it can be inferred that the game mentioned in this article enables positive effects in the learning process on the CCIH theme, since it enabled the demystification and provided students with a more interactive space. The main purpose was to stimulate the amplification of the theme, fixation and apprehension of knowledge in a relaxed and creative way, envisioning the creation of other bridges for the continuity of health education.

REFERENCES

1. Horr, L., Oro, I. M., Lorenzini, A., Silva, L. M., & Comissão de Controle de Infecção Hospitalar. (1978). *Revista Brasileira de Enfermagem*, 31(2), 182–192. Disponível em: https://www.scielo.br/j/reben/a/B3q8WWxb9BqhSwd3w4jLYSq/?format=pdf&lang=pt. Acesso em: 14 de setembro de 2021.

2. De P, Hospitalares, P., Aparecida, A., Santos, M. D., Freitas, F., Lopes, P., et al. (n.d.). Diagnóstico do controle da infecção hospitalar no Brasil. Disponível em: https://antigo.anvisa.gov.br/documents/33852/271855/Diagn%C3%B3stico+do+Controle+de+Infec%C3%A7%C3%A3o+Hospitalar+no+Brasil/56b863d5-eb35-4416-bf82-fe1cd200c8eb?version=1.0. Acesso em: 3 de março de 2024.

3. Barbosa, L. C., Nascimento, C. S. do, & Santos, J. S. do N. T. dos. (2020). O desafio de implantar protocolos de enfermagem na pandemia do novo coronavírus: Relato de experiência. *Enfermagem em Foco*, 11(2.ESP). Disponível em: http://revista.cofen.gov.br/index.php/enfermagem/article/view/3760/994. Acesso em: 27 de dezembro de 2021.

4. Portal da Câmara dos Deputados. (n.d.). *Lei nº 9.431, de 6 de janeiro de 1997*. Disponível em: https://www2.camara.leg.br/legin/fed/lei/1997/lei-9431-6-janeiro-1997-352339-veto-19786-pl.html. Acesso em: 3 de março de 2024.

5. Ministério da Saúde. (1998). *Portaria No 2616, de 12 de maio de 1998*. Disponível em: https://portaldeboaspraticas.iff.fiocruz.br/biblioteca/portaria-no-2616-de-12-de-maio-de-1998/.

6. Cabral, F. W., & Silva, M. Z. O. (2013). Prevenção e controle de infecções no ambiente hospitalar. *SANARE - Revista de Políticas Públicas*, 12(1). Disponível em: https://sanare.emnuvens.com.br/sanare/article/view/330.

7. Silva, M. F. B. da, Santana, J. D. S., & Lima e Silva, C. C. F. de. (2020). Atuação dos profissionais de enfermagem na prevenção e controle das infecções relacionadas à assistência à saúde. *Inova Saúde*, 10(2), 139.

8. Organização Mundial da Saúde. (n.d.). *Global report on infection prevention and control*. Disponível em: https://www.who.int/publications-detail-redirect/9789240051164.

9. Machado, J. dos S. M., Luna, A. A., Souza, P. A. de, Silva, C. M. de C., & Silva, N. C. M. da. (2022). Coleta de dados de enfermagem direcionada ao adulto e ao idoso hospitalizado: Uma revisão integrativa. *Revista de Enfermagem e Atenção à Saúde*, 11(1).

10. Mussi, R. F. de F., Flores, F. F., & Almeida, C. B. de. (2021). Pressupostos para a elaboração de relato de experiência como conhecimento científico. *Práxis Educacional*, 17(48), 60–77. Disponível em:

https://periodicos2.uesb.br/index.php/praxis/article/view/9010/6134.

11. Fernandes, C. J. da S. C. (2021). A gamificação como estratégia para iniciativas de educação em saúde sexual e reprodutiva voltadas para a juventude: Apresentação de um jogo virtual sobre Infecções Sexualmente Transmissíveis (IST). *Revista de Ensino de Biologia da SBEnBio*, 251–271. Disponível em: https://renbio.org.br/index.php/sbenbio/article/view/477/183.

12. Santos, M. C. T. dos. (1871). *Tecnologia educacional: A enfermagem e os jogos educativos na educação em saúde*. *Educational technology: Nursing and educational games in health education*. Disponível em: https://rsdjournal.org/index.php/rsd/article/download/16471/14706/209914&ved=2ahUKEwis-uHU6rvzAhW9lZUCHRMEAW4QFnoECBsQAQ&usg=AOvVaw0eK-nyBzhZNdloKJLsHmNd.

13. Sande, D., & Sande, D. (2018). Uso do Kahoot como ferramenta de avaliação e ensino-aprendizagem no ensino de microbiologia industrial. *HOLOS*, 1, 170–179.

14. Santos, S. V., Ramos, F. R. S., Costa, R., & Batalha, L. M. da C. (2020). Avaliação da qualidade de um software para prevenção de lesões de pele em recém-nascidos. *Revista Latino-Americana de Enfermagem*, 28, e3352. Disponível em: https://www.scielo.br/j/rlae/a/C89Q6HsKktJfKx7RDhGNtfR/?lang=pt.

15. Souza, A. N. M., Meurer, A. M., Costa, F., & Musial, N. T. K. (2020). Utilização de metodologias ativas e elementos de gamificação no processo de ensino-aprendizagem da contabilidade: Experiência com alunos da graduação. *Desafio Online*, 8(3). Disponível em: https://desafioonline.ufms.br/index.php/deson/article/view/10317/8489.

16. World Health Organization. (2018). *Infection Prevention and Control Global Unit WHO Global Infection Prevention and Control Network Meeting report*. Disponível em: https://cdn.who.int/media/docs/default-source/integrated-health-services-%28ihs%29/infection-prevention-and-control/gipc-network/gipcn-meeting-report-2018.pdf. Acesso em: 3 de março de 2024.

17. Haley, R. W., Culver, D. H., White, J. W., Morgan, W. M., Emori, T. G., Munn, V. P., et al. (1985). The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *American Journal of Epidemiology*, 121(2), 182–205.

18. Associação Brasileira de Profissionais em Controle de Infecção e Epidemiologia Hospitalar. (n.d.). *Official Journal of the Brazilian Association of Infection Control and Hospital Epidemiology Professionals*. Disponível em: [https://www.lume.ufrgs.br/bitstream/handle/10183/229325/001130718.pdf?sequence=1&isAll

owed=y](https://www.lume.ufrgs.br/bitstream/handle/10183/229325/001130718.pdf?sequence=1&isAllowed=y).