



ENVIRONMENTAL HEALTH AND CLIMATE CHANGE IN NURSING STUDENT TRAINING: LEARNING THROUGH GAMIFICATION

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ABSTRACT

Objective: to analyze the use of gamification in the teaching-learning process related to environmental health and climate change in nursing student training. **Method:** qualitative, descriptive-exploratory, documentary research. The setting was a university extension program at a federal university and a non-governmental organization, both in northern Brazil. The sources used included documents from international and national organizations as well as reports produced by the project itself. The research was conducted between November 2023 and July 2024. **Results:** three phases were identified: investigation, in which documents that theoretically supported students were verified; diagnosis, in which nursing students applied the previous diagnosis based on the knowledge gaps identified in high school students; and gamification, in which the scavenger hunt organized in stations reflects the application of the gamified methodology. **Final considerations:** gamification offers an interactive and dynamic environment that favors the development of practical, cognitive and social skills, essential for preparing future healthcare professionals for environmental and public health challenges and effective for interdisciplinary training.

Keywords: Survivors. Breast Neoplasms. Adult Health. Health Service Needs and Demands. Validation Study.

INTRODUCTION

Environmental education (EE) plays an invaluable role in raising awareness and training citizens capable of making informed and responsible decisions regarding the environment⁽¹⁾. In Brazil, EE is provided for in legal frameworks such as the 1988 Federal Constitution, Law 9,795/1999, which establishes the Brazilian National Environmental Education Policy, the Brazilian National Curricular Guidelines for Environmental Education (CNE/CP Resolution 2/2012), and Law 13,005/2014, which refers to the Brazilian National Education Plan. These regulatory instruments ensure that EE is incorporated in a structured and continuous manner at various levels of education.

In the Amazon context, the need to promote EE becomes even more urgent due to the region's rich biodiversity and complex environmental challenges, such as deforestation, wildfires, and extreme weather events—the latter strongly linked

to climate change. The Northern region of Brazil, being one of the most vulnerable to climate change, suffers direct impacts that affect ecosystems and local populations' health, especially riverside and indigenous communities⁽²⁾.

These challenges require nursing professionals to be prepared to work in scenarios where environmental degradation and public health issues are intertwined. These situations are interrelated with environmental, social, and health factors that often influence each other. Adopting an integrated approach, such as the One Health concept⁽³⁾, also contributes to the development of the skills and competencies necessary for these professionals to understand and address environmental and public health challenges, especially in complex contexts, taking into account the active participation of society and vulnerable communities⁽⁴⁾.

Furthermore, it is essential that awareness of environmental health and climate change is not restricted to higher education, but also addressed at

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basic levels of education, such as elementary and high school⁽⁵⁾. By engaging with students of different ages and educational backgrounds, it is possible to foster a culture of environmental awareness^(4,5), enabling environmental health education practices that encourage social transformation and engagement in sustainable actions.

To prepare healthcare professionals, it is essential that training includes innovative strategies, such as gamification. Gamification is a pedagogical approach that uses game elements to increase engagement and motivation and has proven effective in several areas, including health education⁽⁶⁾. When applied through university extension, gamification allows students to interact with local socio-environmental realities and particularities and their diversity, as in the case of the Amazon.

Defined by the use of aesthetic, mechanical, and dynamic game elements in non-playful contexts, gamification has been widely explored in various educational fields, including nursing^(6,7). In environmental health and climate change education, this methodology offers an interactive environment where students can simulate real-life situations, apply theoretical concepts, and make decisions based on practical scenarios. Therefore, gamification enhances active learning and prepares students for the environmental challenges they will encounter in their professional practice⁽⁷⁾.

In this context, it is important to highlight the role of “encounters” – environments, mediators, and different groups of students – that foster collaborative learning processes and expand the qualifications of healthcare professionals^(7,8). University extension, as a mechanism for implementing health training, facilitates the creation of these encounters by connecting the university with communities, encouraging a two-way exchange of knowledge⁽⁹⁾. This process enriches student education and directly benefits the communities involved⁽⁸⁾.

Despite the relevance of studying the Amazonian context due to its unique characteristics⁽²⁾, there is a scarcity of studies exploring the intersection between gamification, EE, climate change, and university extension in nursing education. Research on the application of gamification in the teaching-learning process of ecological concepts for nursing students is essential

to reveal models for environmental health education^(2,4).

Given the importance of EE in the training of healthcare professionals and the need to prepare them to deal with climate change⁽²⁾, innovative pedagogical methods, such as gamification^(6,7), emerge as promising alternatives. Despite the proven benefits of using gamification in health education⁽⁷⁾, a significant gap remains regarding its application in environmental health education.

In this regard, the potential of gamification to simulate practical scenarios, bringing students closer to local realities, suggests that this methodology can play an important role in developing skills for professional practice. Therefore, the question is: how can gamification, applied through a university extension project, improve environmental health skills training on Amazonian natural resources in nursing student education and in local communities?

This study aims to analyze the use of gamification in the teaching-learning process related to environmental health and climate change in nursing student education.

METHOD

This study is a qualitative, single-case report, descriptive-exploratory, and documentary research⁽¹⁰⁾ that investigated the use of gamification in its different phases in the context of EE and health. The research setting was the *Universidade Federal do Pará* Advanced Inclusive Extension Program (In Portuguese, *Programa de Extensão Inclusiva Avançado - PROEXIA*), whose objective is to promote greater scope and impact of extension in communities that already interact or are interested in dialoguing with the university.

The study was conducted in partnership with a social movement focused on children and adolescents in situations of social vulnerability in the Metropolitan Region of Belém (MRB), in the state of Pará. The research, conducted between November 2023 and July 2024, involved the participation of ten undergraduate nursing students.

Students were not the subject of research; in fact, they acted as agents in the pedagogical intervention. No identifiable data was collected from children/adolescents at the partner institution, only pedagogical observation and field records by extension workers regarding the development of the activities. All activities were planned and

supervised by a responsible professor and master's students, in partnership with educators from the participating social organization.

The data sources included activity reports from the PROEXIA extension project, entitled [NNNNNN], and from international organizations on the topic of climate change, as well as national documents related to EE. The *corpus* included 11 documents: two technical-pedagogical reports from PROEXIA (institutional record of the experience) and nine normative documents/guides from the World Health Organization (WHO)/United Nations (UN) and national agencies (Ministry of Education (MEC)/Ministry of Environment and Climate Change (MMA)), selected for thematic relevance to EE and climate change applied to health training and by their institutional authority.

Inclusion criteria were: (a) public/institutional access; (b) explicit interface with EE, climate, and/or active methodologies/gamification; (c) validity/relevance to the period after 2010. The time frame was defined starting in 2010, considering the enactment of Law 12,305/2010, which established the Brazilian National Solid Waste Policy, and other legal frameworks related to EE, such as the Brazilian National Curricular Guidelines for Environmental Education (CNE/CP Resolution 2/2012). This framework allowed the inclusion of updated documents aligned with current guidelines on climate change and EE.

Documents not directly related to EE/climate or lacking pedagogical applicability were excluded. The search used the "environmental education" and "climate change" descriptors on the WHO, UN, MEC, and MMA portals.

Document screening was performed based on a full reading by the first author and most experienced researcher. An inductive thematic content analysis was conducted in three stages: (1) pre-analysis (coding protocol skimming, definition of objectives and construction); (2) material exploration (manual coding of recording units: textual excerpts that addressed EE, climate change and/or gamification; context unit: entire document); (3) treatment and inference (grouping into thematic categories and elaboration of interpretative syntheses).

Coding was initiated by the first author and subsequently audited by a senior researcher, and any disagreements were resolved by consensus. The final categories were discussed in light of

Activity Theory, with an emphasis on the mediating role of playful tools in educational activities.

These recording units were then manually coded and grouped into thematic categories. The grouping and coding processes followed an interpretative logic, ensuring that the categories accurately reflected the main ideas and relationships present in the documents analyzed and the topic under investigation.

Regarding the pedagogical strategy, a station rotation strategy was adopted, with four stations so that small groups could complete all the activities in the same meeting. The stations were defined based on learning objectives (EE and environmental health in the Amazon) and the Activity Theory framework (mediation by tools and signs).

The analysis was conducted in light of Activity Theory⁽¹¹⁾, focusing on the issue of mediation. Originating in Vygotsky's studies, this theory emphasizes that learning and human development occur through mediated activities, i.e., through interaction between subjects, instruments (tools, signs, and languages), and the social and cultural context in which they are inserted. Mediation is a central concept, emphasizing that an individual does not interact directly with the object of knowledge, but rather through cultural instruments and signs that facilitate and transform this relationship.

In this study, Activity Theory was used to understand how gamification acts as a mediating tool in the teaching-learning process in environmental health. Through mediation, gamification allows nursing students to acquire new knowledge and develop skills by interacting with simulated situations, promoting the collective construction of knowledge and bringing them closer to practical reality.

This study was not submitted to the Research Ethics Committee, in accordance with Resolution 510 of April 7, 2016, which exempts research conducted exclusively for educational, teaching, or training purposes. Furthermore, it was based on documentary analysis of open-access institutional reports.

RESULTS

The analyzed data resulted in a central category, "Gamification in teaching environmental

health and climate change in nursing education: strategies for skill development," from which two categories of analysis emerged: Intersection between environmental health, climate change, and nursing education; and Gamification as a pedagogical tool in environmental education. Ten nursing students participated in four meetings, each lasting an average of 60 minutes, structured in rotation by four learning stations (15-20 minutes each), under the supervision of extension faculty.

Category 1. Intersection between environmental health, climate change and nursing education

This thematic category focuses on the interrelationship between environmental health

education and climate change in the health curriculum. According to the records, the initial phase of the initiative was structured in two main phases: beginning with the search and analysis of documents conducted by nursing students, followed by the preliminary diagnostic phase, which identified knowledge gaps on the topic "Amazonian natural resources" among high school students, identified as the situational diagnostic subphase.

In the first phase, nursing students were instructed to consult and study international and national documents (Chart 1) that addressed climate change and EE to support the development of guiding questions for the preliminary diagnosis phase.

Chart 1. Key documents to assist in training students on climate change, 2024

N	Year/ institution	Document title	Main guidance
INTERNATIONAL			
1	2013 World Health Organization	Protecting Health from Climate Change: Vulnerability and Adaptation Assessment	Provides guidance on how to assess which populations are most vulnerable and how to effectively adapt the health sector to climate change.
2	2016 United Nations	The Paris Agreement	Establishes a global commitment to limit global warming and aims to encourage adaptation in the countries involved.
3	2020 United Nations	Human Cost of Disasters: An Overview of the Last 20 Years (2000-2019)	Examines the impact of climate change on natural disasters and their correlation with health.
4	2021 World Health Organization	WHO Health and Climate Change Global Survey Report	Analyzes how countries are preparing to face climate challenges in the health sector, focusing on the adaptive capacity of systems.
5	2021 World Health Organization	COP26 Special Report on Climate Change and Health: The Health Argument for Climate Action	Emphasizes proposed actions by the global health community in the face of climate change.
6	2022 United Nations	Global Environmental Outlook (GEO - 7)	Discusses the combined effects of environmental and climate change.
7	2022 United Nations	The Closing Window	Highlights how to achieve societal transformation across different sectors.
NATIONAL			
8	2010 Ministry of Health	Law 12,305/2010 – Brazilian National Solid Waste Policy	Related to environmental education and waste management, which may be relevant in the context of natural resource activities.
9	2024 Ministry of Health	Law 14,90/2024 – Brazilian National Climate Change Adaptation Plan	It aims to establish guidelines for addressing the adverse impacts of climate change, covering areas such as health, infrastructure, and the environment.

Fonte: United Nations, World Health Organization and Ministry of Health, 2024.

The documents highlighted in Chart 1 were used to support the gamification activities, providing a deeper understanding of climate change and its intersection with public health in the

Amazon. In addition to providing a theoretical foundation, these documents were invaluable in formulating the practical activities recorded in the next steps, as illustrated in Figure 1.

After analyzing the theoretical documents presented in Chart 1, students were able to identify

knowledge gaps, as summarized in the word cloud in Figure 1.



Figure 1. Activity with guiding questions that generated the word cloud with knowledge gaps
Source: the authors, 2024.

The word cloud generated in Figure 1 highlights the main knowledge gaps identified and also guided the interactive activities of the stations described in Figure 2. The gamification stations were organized to address the main topics

emerging from diagnosis. These insights served as the basis for structuring the gamified learning stations, described in detail in Figure 2. Each station explored specific aspects of Amazonian natural resources through interactive activities.



Figure 2. Station details
Source: the authors, 2024.

Each station addressed a specific aspect of the topics identified in the word cloud, providing students with the opportunity to explore these topics through interactive and educational activities. The activities carried out at each of the stations described in Figure 2 fostered the development of skills for understanding environmental challenges.

Category 2. Gamification as a pedagogical tool in environmental education

This category explores how gamification was used in the teaching-learning process to interactively and practically engage nursing students in the context of environmental health and

climate change. It is important to understand that each of the stations, detailed in Figure 2, supported the construction of the knowledge consolidated in the mind map in Figure 3, synthesizing the reflections and practical skills developed by students.

Category 2 therefore refers to the gamified

workshops (non-formal education) conducted within the scope of university extension, not traditional lectures. The workshops were planned and coordinated and took place at the organization's headquarters in the MRB, as indicated in the method described in Figure 3.

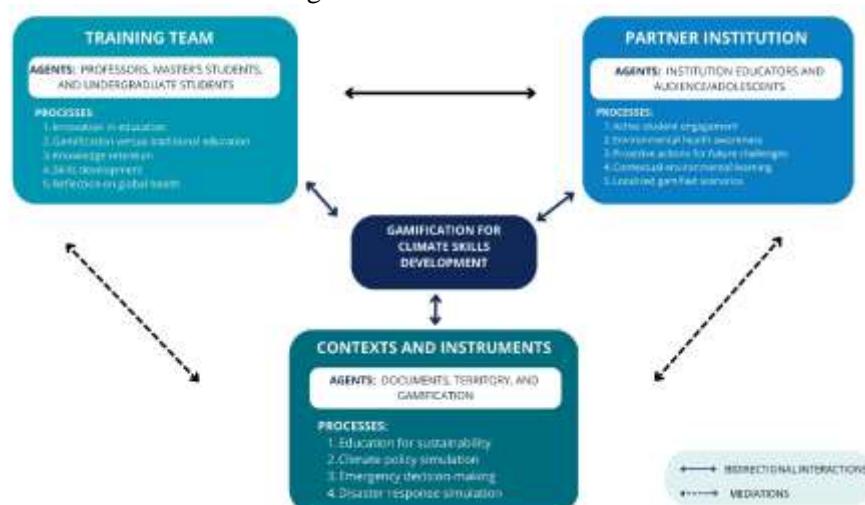


Figure 3. Mind map of gamified activities

Source: the authors, 2024.

The mind map represents the progression of student learning, beginning with the interactive activities at the stations in Figure 2. Each station provided support for knowledge consolidation, enabling a deeper understanding of the interconnections between environmental health,

climate change, and sustainable practices.

Figure 3 provides a consolidated view of the skills and learning developed throughout the gamified activities. As described in Chart 2, the stations allowed students to practice practical skills.

Chart 2 – Proposal for feedback on learning objectives and skills in environmental health

Station	Learning objective	Guiding question	Expected practical skill
1	Identify the relationship between the sustainable use of Amazonian natural resources and public health.	How does the degradation of a natural resource directly affect riverside populations' health?	1. Participatory mapping of local environmental risks; 2. Assessment of specific population vulnerabilities; 3. Development of integrated health-environment indicators; 4. Development of collaborative situational diagnoses.
2	Explore strategies for conserving the Amazon's natural resources.	What are the main barriers to natural resource conservation in the Amazon, and how can we overcome them in everyday practices?	1. Development of participatory community action plans; 2. Conflict mediation techniques; 3. Development of contextualized educational materials; 4. Intersectoral coordination (health, environment, and education); 5. Preparation for real-life situations: simulated workshops with different target audiences.

3	Assess composting and biodegradability practices as sustainable alternatives to reduce environmental impact.	How can we apply composting practices to improve the health and environment of riverside communities?	<ol style="list-style-type: none"> 1. Organic composting techniques for local use; 2. Organization of selective collection and disposal; 3. Safe methods for non-recyclable materials; 4. Training in reduction, reuse, and recycling practices.
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Source: the authors, 2024.

It is important to emphasize that interactive learning can be connected to station activities, through which students passively absorb knowledge and interact with content in a practical and collaborative way. This skill is evident in group dynamics, discussion circles, and the implementation of gamified activities, where the exchange of experiences and active engagement among students are essential to consolidate learning.

DISCUSSION

The application of gamification and its pedagogical implications in the training of nursing students in environmental health and climate change must address socio-environmental vulnerabilities and contemporary educational challenges^(13,14). This includes addressing regional peculiarities and limitations related to environmental issues at different levels of training.

In this regard, gamification as a transformative strategy^(6,7), which questions and reframes the relationships between theory and practice, education, and local reality, allows a break with the traditional linearity of nursing education, being opportune for scenarios with unique challenges such as that of the Amazon. This happens by introducing an immersive and participatory learning process^(6,7) that aligns with the complexity of environmental and public health problems⁽⁴⁾.

By consolidating the development of the learning process, from an investigation phase, a solid theoretical basis is provided for understanding climate change and environmental health education⁽¹⁾, as the documents studied make it possible to highlight climate challenges⁽⁴⁾. Documents like the Paris Agreement allow students to reflect on global commitments to mitigate climate change at the local level. The COP26 Report provides an opportunity for dialogue on the urgent actions needed to adapt healthcare systems to the new realities imposed by

the climate crisis⁽⁴⁾.

The Brazilian National Solid Waste Policy influences practical strategies in the training of students in order to raise their awareness about proper waste management, and the importance of reduction and recycling as sustainable practices for environmental health, as provided for in the legislation⁽¹⁾. This policy is essential for students to develop skills that inspire reflection on reducing environmental impacts, relationships with vector-borne diseases, and hospital waste management and sustainable practices^(4,5).

Identifying key gaps in knowledge about Amazonian natural resources and the proposed interaction provided indicators for personalizing gamified activities and directing learning. This process also highlighted problems in training, particularly regarding youth education and environmental health⁽⁶⁾. It also reveals structural deficiencies in basic education on environmental issues and indicates an insufficient or fragmented approach, in addition to revealing a superficial understanding of environmental problems⁽¹⁴⁾.

This reinforces the importance of methodologies, such as gamification^(6,14), capable of identifying gaps and overcoming them through interactive and reflective practices, promoting critical learning about sustainability and environmental health⁽¹⁾. As a result, the development of essential skills in natural resource management and environmental health⁽¹⁵⁾ can be explored based on topics, inserted in the stations, such as composting and conservation practices observed in the local reality, associating them with unpredictable and highly vulnerable environmental scenarios, in order to promote reflections on similar scenarios.

By incorporating these interactive dynamics, gamification breaks with traditional curricula^(6,7,16) that do not account for the plurality of socio-environmental and cultural contexts that influence public health⁽¹⁷⁾. This occurs when it is inserted

into activities that simulate real scenarios, based on the cultural and environmental specificities of communities, such as solid waste management in urban and rural areas, water management in riverside communities, combating disease vectors such as malaria and dengue in endemic areas, EE practice in schools in vulnerable regions, and the response to natural disasters, such as floods and droughts, which affect the health and quality of life of local populations⁽⁴⁾.

This approach is crucial, particularly in areas of extreme vulnerability^(17,18). In these regions, riverside and indigenous populations are affected⁽²⁾, as they depend on natural resources for their subsistence and face challenges such as deforestation, soil degradation, and water pollution^(2,4). Documents such as the WHO Health and Climate Change Global Survey Report and The Paris Agreement reinforce the need for adaptation in vulnerable regions, emphasizing how climate change exacerbates inequalities and disproportionately affects the most marginalized populations⁽⁴⁾.

In this sense, gamification enables students to become agents of change⁽¹⁵⁾ through training that promotes a critical and integrated understanding of the interrelationships⁽⁴⁾ between health and the environment. This occurs through the absorption of this knowledge, which fosters students' ability to identify and question the political and economic dynamics that perpetuate environmental degradation, especially in unique contexts such as the Amazon. Furthermore, gamification provides opportunities for connections with the determinants of health and dialogues based on health problems and events, regardless of the educational level of those involved.

In the epistemological sense⁽⁶⁾, learning stations enable a shift from passivity to protagonism, whose theory merges with action in a concrete context, aligning theory and practice^(6,16). This aspect highlights the benefits of active participation in the development of social and cognitive skills⁽⁶⁾, which occurs due to the integration between different areas of knowledge based on the mediation⁽¹¹⁾ proposed by the instrument. Nursing students, when constructing this scenario, put the underlying studies into practice, which contributes to the development of skills.

The seven branches observed in the map address different aspects of gamified activities⁽⁶⁾,

while competency development refers to the acquisition of skills necessary to deal with the challenges and opportunities to apply theoretical concepts in practical situations, such as solid waste management⁽¹⁹⁾.

The sustainability item in environmental health can be integrated into the development of technical skills such as: implementation of technologies, environmental sanitation and efficient resource management; cognitive skills such as critical thinking, the ability to make evidence-based decisions and the ability to implement solutions that consider socioeconomic and environmental impacts; development of evidence-based policies⁽¹⁶⁾; and social skills related to community engagement, teamwork and health education.

Preparation for real-life situations involves students' ability to face concrete challenges in the professional environment, essentially in scenarios of high environmental vulnerability^(15,16). In this sense, the simulation of environmental crises can be applied as a pedagogical resource, helping students develop the ability to make practical and immediate decisions, preparing them to act in crisis situations, such as natural disasters or public health emergencies related to the environment⁽²⁰⁾.

Interactive learning facilitates the exchange of knowledge in a dynamic way, promoting collaboration, discussion of cases and reflection concerning solutions to the environmental problems presented. Environmental health awareness refers to the understanding of the interrelationships between the populations' environment and health, allowing them to internalize concepts and reflect on the importance of environmental preservation for health promotion⁽¹⁸⁾, in order to build skills and reasoning to confront complex phenomena, such as environmental and climate issues⁽²⁰⁾.

Active student engagement refers to effective and motivated participation in learning activities, resulting in considerable knowledge retention and practical application^(6,7). It is promoted when students are challenged to solve problems in simulated situations and make decisions based on acquired knowledge, in which motivation is observed. In turn, innovation involves the introduction of active methodologies, due to the gamified experience⁽¹⁶⁾, making the process more dynamic and student-centered.

Such aspects pave the way for reflections

concerning the role of nursing in environmental and health crises⁽¹⁵⁾, which expand to the construction of critical thinking regarding the intersections between environment and health^(2,4). They also foster social responsibility and ethical engagement among students^(15,21,22), since, when constructing practical examples during the activities, students were confronted with the need to propose solutions throughout the proposed dynamics so that they respected the technical regulations and the cultural and social contexts of local communities, observing cultural diversity⁽⁸⁾.

Considering the above, it appears that, for nursing students, these practices are opportunities^(19,20) to apply the theoretical concepts, provided by the documents analyzed and applied in practical activities at the stations. In addition to demonstrating the importance of translating theoretical knowledge into sustainable practices, the need for interdisciplinary training capable of integrating knowledge from environmental sciences, sociology and public policies⁽¹⁵⁾ is highlighted, including approaches that involve the impacts of multiple human activities on the environment⁽²²⁾, with the opportunity to discuss participatory approaches⁽²³⁾, decision-making and equity in environmental health^(15,24).

However, there are implementation challenges in carrying out collaborative activities^(8,9), especially in identifying objectives and barriers in other educational contexts and in different health areas. Furthermore, the need to permanently integrate gamification into the nursing curriculum is highlighted, especially in components focused on environmental health and climate change, and it can be extended to students at other educational levels.

It is also an opportunity to implement the curricularization of extension. Extension projects⁽⁹⁾,

when linked to curricular activities or with their own workload, allow for the assessment of skill development in a practical way, going beyond the university walls and contributing to citizenship development^(8,21,22) and with a view to educational processes that consider strategies focused on health education⁽²⁵⁾.

It is important to mention that the study was limited to analyzing project documents, so it may not represent the depth of the impact of gamification on training, requiring assessment studies in replication in another scenario.

FINAL CONSIDERATIONS

From data analysis, it was observed that gamification offers an interactive and dynamic environment that provides the opportunity to develop practical, cognitive and social skills, which are essential to prepare future healthcare professionals for environmental and public health challenges. The use of gamified stations fostered critical learning about the intersection between environmental health and climate change, proving to be an effective methodology for interdisciplinary training and simulating real-life situations. This contributed to the development of essential skills in students, such as evidence-based decision-making, the implementation of sustainable solutions, and engagement with local communities.

Regarding future research opportunities, we recommend studies that address how gamification operates in tackling neglected tropical diseases, in education for the prevention of environmental crises, in the long-term impact of gamification on the development of professional skills, and in its effectiveness in promoting sustainable social and environmental transformations.

SAÚDE AMBIENTAL E MUDANÇAS CLIMÁTICAS NA FORMAÇÃO DE ESTUDANTES DE ENFERMAGEM: APRENDIZAGEM PELA GAMIFICAÇÃO

Objetivo: analisar o uso da gamificação no processo de ensino-aprendizagem relacionado à saúde ambiental e mudanças climáticas na formação de estudantes de enfermagem. **Método:** pesquisa qualitativa, descritiva-exploratória, documental. O cenário foi programa de extensão universitária de uma universidade federal e uma organização não governamental, ambos da região Norte. As fontes utilizadas incluíram documentos de organizações internacionais e nacionais, além dos relatórios produzidos pelo próprio projeto. A pesquisa foi realizada entre novembro de 2023 e julho de 2024. **Resultados:** foram identificadas três fases: investigação, na qual se verificaram documentos que embasaram teoricamente os estudantes; diagnóstico, na qual os estudantes de enfermagem aplicaram o diagnóstico prévio com base nas lacunas de conhecimento identificadas nos estudantes secundaristas; e gamificação, cuja gincana organizada em estações reflete a aplicação da metodologia gamificada. **Considerações finais:** a gamificação oferece um ambiente interativo e dinâmico que favorece o desenvolvimento de habilidades práticas, cognitivas e sociais, imprescindíveis para preparar os

futuros profissionais de saúde para os desafios ambientais e de saúde pública e eficazes para formação interdisciplinar.

Palavras-chave: Mudanças Climáticas. Saúde Ambiental. Educação em Saúde Ambiental. Estudantes de Enfermagem. Gamificação.

SALUD AMBIENTAL Y CAMBIOS CLIMÁTICOS EN LA FORMACIÓN DE ESTUDIANTES DE ENFERMERÍA: APRENDIZAJE POR GAMIFICACIÓN

RESUMEN

Objetivo: analizar el uso de la gamificación en el proceso de enseñanza-aprendizaje relacionado con la salud ambiental y los cambios climáticos en la formación de estudiantes de Enfermería. **Método:** investigación cualitativa, descriptiva-exploratoria, documental. El escenario fue un Programa de Extensión Universitaria de una universidad Federal y una Organización no Gubernamental, ambos de la región Norte. Las fuentes utilizadas incluyeron documentos de organizaciones internacionales y nacionales, además de los informes producidos por el propio proyecto. La investigación se llevó a cabo entre noviembre de 2023 y julio de 2024. **Resultados:** se identificaron tres fases: de investigación, en la que se verificaron documentos que apoyaban teóricamente a los estudiantes; de diagnóstico, en la que los estudiantes de Enfermería aplicaron el diagnóstico previo basado en las lagunas de conocimiento identificadas en los estudiantes de secundaria; y de gamificación, cuya yincana organizada en estaciones refleja la aplicación de la metodología gamificada. **Consideraciones finales:** la gamificación ofrece un ambiente interactivo y dinámico que favorece el desarrollo de habilidades prácticas, cognitivas y sociales, imprescindibles para preparar a los futuros profesionales de la salud para los desafíos ambientales y de salud pública y eficaz para la formación interdisciplinaria.

Palabras clave: Cambio climático. Salud ambiental. Educación en Salud ambiental. Estudiantes de Enfermería. Gamificación.

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