TEXTO & CONTEXTO ENFERMAGEM
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SEMIO EM JOGO®: DEVELOPMENT AND EVALUATION OF A PLAYFUL-EDUCATIONAL TECHNOLOGY FOR NURSING EDUCATION

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ABSTRACT

Objective: to develop a playful-educational technology for learning Nursing Semiology and Semiotics, as well as to carry out the evaluation of its playability before and after implementing adjustments with undergraduate Nursing students.
Method: a methodological study that followed the planning, prototyping and production stages corresponding to the first playable version for development. For the playability evaluation, 62 students were divided into two groups: one for to evaluate the preliminary version and the other for after implementing adjustments; and, for this, the Friedman test was used, which allows detecting differences between medians of more than two paired samples, considering p-value below 5% as statistical significance.
Results: the game had three sequential phases: the first addressed vital signs; the second, biosafety measures; and the third, the physical examination. Referring to the playability evaluation, it was possible to observe that the "Concentration" and "Feedback" categories and the general median presented better evaluation scores after implementing adjustments.
Conclusion: the current study sought to develop a technology that would allow students attending Bachelor's degree courses in Nursing to sharpen their knowledge in Nursing Semiology and Semiotics. In addition to that, it was sought to evaluate the playability of *Semio em Jogo*®; thus, it was observed that the academic community considered the game satisfactory after the modifications as much as before implementing them.

DESCRIPTORS: Nursing. Education in nursing. Experimental games. Video games. Educational technology.

HOW CITED: Matias LDM, Celestino MNS, Carvalho MAP, Gouveia BLA, Ginú ILN, Costa MML, Andrade LL. Semio em Jogo®: development and evaluation of a playful-educational technology for nursing education. Texto Contexto Enferm [Internet]. 2023 [cited YEAR MONTH DAY];32:e20220324. Available from: https://doi.org/10.1590/1980-265X-TCE-2022-0324en

SEMIO EM JOGO®: DESENVOLVIMENTO E AVALIAÇÃO DE UMA TECNOLOGIA LÚDICO-EDUCATIVA PARA O ENSINO DE ENFERMAGEM

RESUMO

Objetivo: desenvolver uma tecnologia lúdico-educativa para a aprendizagem de semiologia e semiotécnica em enfermagem e realizar a avaliação da jogabilidade de uma tecnologia lúdico-educativa antes e após a implementação de ajustes com estudantes da graduação em enfermagem.
Método: estudo metodológico, seguindo as etapas de planejamento, prototipagem e produção da primeira versão jogável para o desenvolvimento. Para a avaliação da jogabilidade, contou-se com 62 estudantes divididos em dois grupos, um para a avaliação da versão preliminar e outro para após a implementação de ajustes, e, para tal, utilizou-se o teste de Friedman que permite detectar diferenças entre medianas de mais de duas amostras emparelhadas, considerando como significância estatística valores de p-valor menor que 5%.
Resultados: o jogo contou com três fases sequenciais: na primeira foram abordados os sinais vitais; na segunda, as medidas de biossegurança; e na terceira, o exame físico. Referente à avaliação da jogabilidade, foi possível observar que as categorias "concentração", "*feedback*" e mediana geral apresentaram melhor avaliação após a implementação de ajustes.
Conclusão: o presente estudo buscou desenvolver uma tecnologia que possibilitasse ao aluno de cursos de bacharel em enfermagem aguçar seus conhecimentos em semiologia e semiotécnica em enfermagem. Além disso, buscou-se avaliar a jogabilidade do Semio em Jogo®, assim, observou-se que a comunidade acadêmica considerou o jogo como satisfatório após as modificações tanto quanto antes delas.

DESCRITORES: Enfermagem. Educação em enfermagem. Jogos experimentais. Jogos de vídeo. Tecnologia educacional.

SEMIO EM JOGO®: DESARROLLO Y EVALUACIÓN DE UNA TECNOLOGIA LÚDICO-EDUCATIVA PARA LA CARRERA DE GRADO EN ENFERMERÍA

RESUMEN

Objetivos: desarrollar una tecnología lúdico-educativa para la enseñanza de Semiología y Semiotécnica en Enfermería; y evaluar la facilidad de juego de una tecnología lúdico-educativa antes y después de implementar ajustes con estudiantes de la carrera de grado en Enfermería.
Métodos: estudio metodológico que siguió las etapas de planificación, diseño del prototipo y producción de la primera versión apta para jugar para el desarrollo. A fin de evaluar la facilidad de juego se recurrió a 62 estudiantes divididos en dos grupos: uno para evaluar la versión preliminar y otro para luego de implementar los ajustes; y para ello se utilizó la prueba de Friedman, que permite detectar diferencias entre medianas de más de dos muestras emparejadas, considerando valores de p inferiores al 5% como significancia estadística.
Resultados: el juego estuvo compuesto por tres fases secuenciales: en la primera se abordaron los signos vitales; en la segunda, las medidas de bioseguridad; y en la tercera, el examen físico. En cuanto a la evaluación de la facilidad de juego, se pudo observar que las categorías "Concentración" y "*Feedback*" y la mediana general presentaron una mejor evaluación después de implementar ajustes.
Conclusión: el presente estudio pretendió desarrollar una tecnología que permitiese que los alumnos de la Licenciatura en Enfermería agudicen sus conocimientos de Semiología y Semiotécnica en Enfermería. También se buscó evaluar la facilidad de juego de *Semio em Jogo*®; de esta manera, se observó que la comunidad académica consideró que el juego alcanzó niveles satisfactorios tanto antes como después de las modificaciones.

DESCRIPTORES: Enfermería. Educación en enfermería. Juegos experimentales. Videojuegos. Tecnología educativa.

INTRODUCTION

The pandemic caused by the Coronavirus Disease (COVID-19) has imposed numerous changes on society, mainly with regard to contact and collective interaction; thus, each country has adapted to the virus based on its cultural, socioeconomic and political norms[1]. In the Brazilian education scenario, face-to-face classes were suspended as a result of the need and implementation of social distancing.

In view of this, Information and Communication Technologies (ICTs) were incorporated to bring teachers and students together, to promote social knowledge construction amid the chaos caused by the COVID-19 pandemic and to make educational practices viable in educational institutions[2].

Thus, ICT use, especially in Higher Education, can enable better accessibility to the current teaching standards, in addition to making classes more appealing, captivating and provocative, so that the students overcome barriers towards knowledge construction[3].

The digital connection itself contributes to making the individual feel closer to other people, which is a key factor in the acquisition of knowledge due to the easier and more momentary possibility of attaining knowledge. Moreover, in contemporary times, citizens, as well as students, tend to stay connected and in constant contact with each other from usual use of ICTs and, thus, they are familiar with obtaining information instantly[4]. In this way, ICTs can be considered in the academic environment as a means to ease the teaching-learning process.

Added to the elements herein presented, learning games emerge as a way to stimulate the development of new skills and knowledge or to reinforce already existing ones, as they stimulate the trigger to win, achieve objectives, collaborate, interact, explore, solve problems and outline strategies, which promotes an emotional reaction in the players[5].

In the health field, it is valid to note that using games encourages students, turning them into protagonists of the teaching-learning process. Thus, it is important to highlight their relevance for the training of Nursing students, as they are means that seek to address the educational needs of current students[6].

In this context, games are gaining more and more space with their purpose going beyond the participants' entertainment, and also the association of the playful form with reality, making it possible to contribute before, during and after patient care; this was what pointed out a study carried out with children diagnosed with cancer where they were presented with a board game[7].

In view of the importance of learning games in the education and health fields, it is crucial to evaluate playability of the product, which includes the evaluation of the players' experience during its execution, as well as usability of the product, its challenges and consistency, which, together, are important when it comes to motivating the participants to finish the game in due time so that they do not lose interest in its dynamics[8–9].

From an accurate search in the literature, it was observed that there is incipience in the construction and/or evaluation of these playful technologies, which favor the teaching-learning process in the Nursing area. In addition, a study whose objective was to map research studies for the elaboration and evaluation of online games pointed out that the culture of these tools for Nursing education is still not sufficiently disseminated[6].

In Nursing courses, the curricular component of Semiology and Semiotics stands out, a fundamental academic discipline for the students' professional training, which proposes developing theoretical and technical skills necessary for the practical performance of the profession.

A number of studies evidence that there are deficits in the knowledge of both Nursing students and health professionals themselves about how to perform basic semiology procedures. A research study carried out with students associated with the Autonomous University of Madrid showed that they had little knowledge regarding the correct technique for measuring blood pressure;[10] this extends to

the professional clinical practice, where another survey developed in Egypt evidenced that Nursing professionals also have inadequate knowledge regarding the technique for checking blood pressure[11].

However, a study carried out in Turkey identified deficits in the biosafety field, as Nursing students, although they had presented positive perspectives on hand washing, did not properly perform the technique, showing that areas such as nail beds, interdigital spaces and tip of the fingers were not properly cleaned, evidencing failures in performing the technique[12].

In addition, the need to deepen on knowledge was verified, not only about vital signs and biosafety but also about the physical examination. A study carried out in Korea identified the importance of the physical examination for nursing students' diagnostic reasoning and pointed out the importance and need for new teaching strategies that improve proficiency in the physical examination by health professionals[13].

Far from the international perspective, a study carried out in Brazil identified that Nursing students attending from fifth to ninth periods had deficits in knowledge about blood pressure measurement and peripheral venipuncture, thus evidencing the weakness in learning basic procedures, which showed the need for improvements in the learning process in the (inter)national context[14].

In view of the above, it becomes necessary to evaluate the playability of a playful-educational technology, which involves general knowledge about the Nursing Semiology and Semiotics academic discipline. Thus, the current study is justified by contributing an appealing technological product through an online learning game, which can provide an experience with instruction and entertainment, enabling the teaching-learning process.

For this purpose, the following objectives were elaborated: to develop a playful-educational technology for learning Nursing Semiology and Semiotics; as well as to evaluate its playability before and after implementing adjustments with undergraduate Nursing students.

METHOD

This is a methodological study constituted in two moments, as illustrated in Figure 1.

For the development, the following tetrad was considered: mechanics, story, aesthetics and technology, followed by the stages of planning, prototyping and production of the first playable version[15].

In the planning, to subsidize elaboration the content, an integrative review was carried out in order to map the educational technologies used to support the teaching of Nursing Semiology and Semiotics[16]. Therefore, this review was conceptualized in six stages; where, in the first stage, it was sought to proceed with definition the theme and guiding question; in the second stage, the criteria for inclusion/exclusion of papers/sampling or search for scientific documents were determined; in the third stage, the data to be extracted were delimited and the selected documents were categorized; the fourth stage took place with an evaluation of the literature included in the review; in the fifth stage there was a critical analysis of the results found; and the sixth stage consisted in presenting the review and exegesis of the knowledge[17]. The research question was based on the PICo strategy (P - Population: Nursing students; I - Interest: Educational technologies; Co - Context: Semiology and Semiotics teaching during social distancing). The searches were performed based on the Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS), in English, which met the PICo strategy criteria, namely: "*Nursing students*", "*Students*", "*Educational technology*", "*Digital technology*", "*Simulation training*", "*Nursing education*", "*Teaching*", "*Education Nursing*"; used with the "OR" and "AND" Boolean operators in databases from the health and technology areas (MEDLINE - *Medical Literature Analysis and Retrievel System Online*; CINAHL - *Cumulative Index to Nursing and Allied Health Literature; SciVerse Scopus; Library, information Science & Technology Abstracts*), resulting in 1,158 articles. An export file for the EndNote™ reference manager was generated for each database, in order to remove duplicates. The material was selected by blindly reading of the titles and abstracts in charge of two independent researchers using the Rayyan Qatar

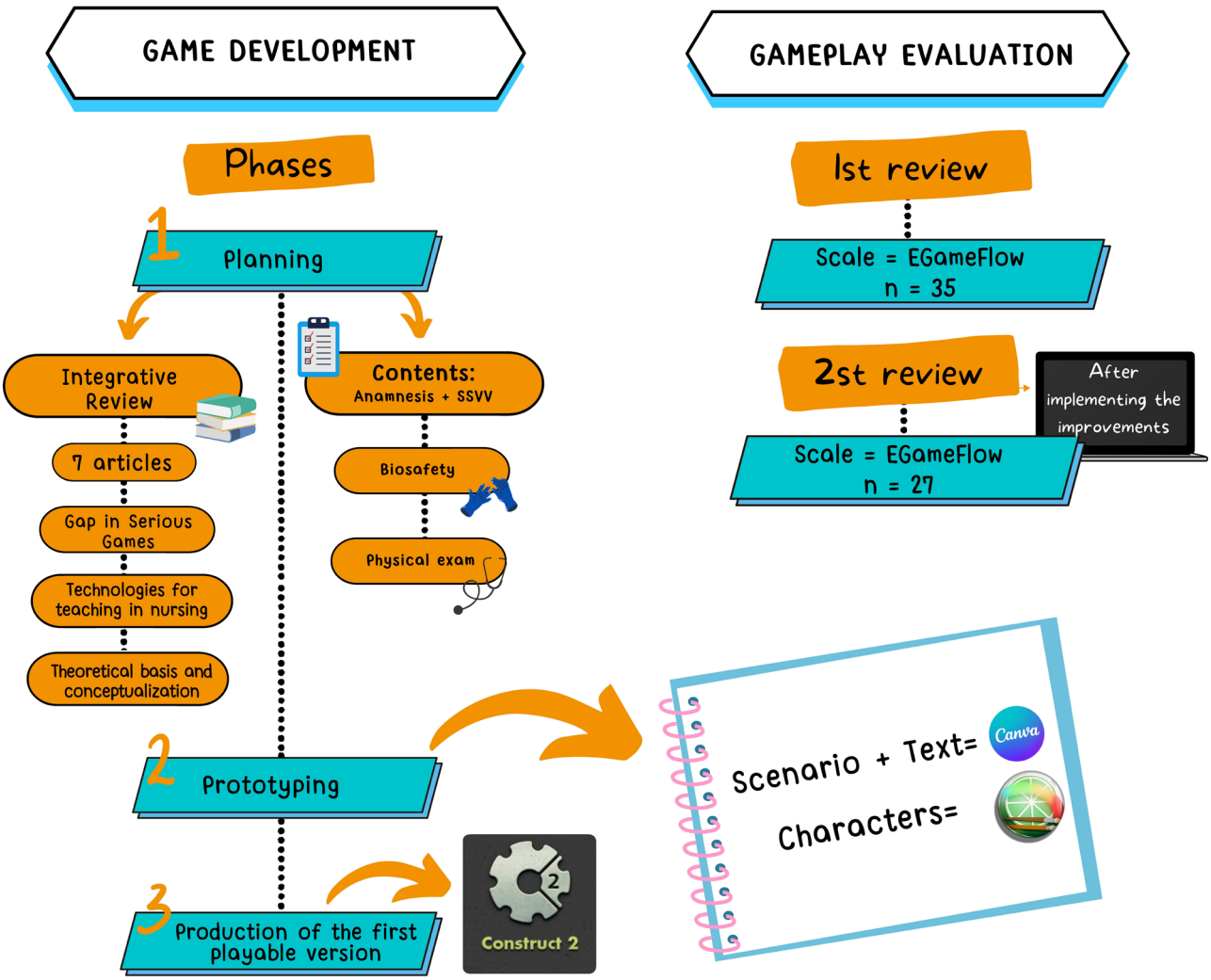

Figure 1 - Illustrative scheme of the study stages. Cuité, PB, Brazil, 2022.

Computing Research Institute (Rayyan QCRI) free web review program, which resulted in 1,123 articles for the first analysis stage. Subsequently, in the second analysis stage, a critical analysis of 33 articles was carried out in full and blindly by two independent researchers, once again using the Rayyan QCRI. Finally, seven articles were included, which signaled the types of technologies produced for teaching Nursing Semiology and Semiotics and the gap in technologies with "serious games."

In prototyping, the game content was organized in three phases, considering the contents of the Nursing Semiology and Semiotics discipline;[18] thus, in the first phase, emphasis was placed on approaching a patient in Primary Health Care, passing through anamnesis and verification of vital signs; subsequently, the patient was referred to secondary care, with an emphasis on biosafety principles; and, finally, hospitalization, whose focus was the physical examination of body systems. For such purpose, the player was introduced into a care context that was close to the reality of health systems.

In relation to the design, the Canva© graphic design software was used in the textual part. For the illustration of the characters, the Easy Paint Tool SAI© digital art software was used, which allowed vectorizing the characters previously drawn by hand. It is noted that cold color tones were selected, such as blue, turquoise, cyan and violet, for the figures that referred to Nursing professionals and students, as darker tones denote intelligence, confidence, importance and wisdom; regarding the patient's color, warm color tones were used, such as yellow and orange, which mean joy, prosperity, nervousness and anxiety.

Subsequently, in order to materialize the first playable version of the playful-educational technology, the Construct© engine (version 2) was used, whose function is to edit games in two dimensions (2D), based on Hyper Text Markup Language (HTML), in addition to allowing quick creation of games in the drag-and-drop style.

Finally, it was hosted at an electronic address under the "itch.io" domain, which makes it possible to host games of up to one gigabyte for free, to make them accessible and playable, simply by using the access link on a personal computer.

It is noted that *Semio em Jogo*® had its registration certificate issued on March 3rd, 2022, from the deposit previously established under the software category on the National Institute of Industrial Property (*Instituto Nacional da Propriedade Industrial*, INPI), corresponding to process Nº. BR512022000398-8.

With regard to the evaluation stage corresponding to playability of the playful-educational technology, the preliminary version was evaluated from February to March 2022 and between July to August 2022 after implementing adjustments by two independent groups of undergraduate Nursing students, where one group evaluated the preliminary version and the other, the version after implementing adjustments in a Higher Education Institution located in Curimataú, Paraíba, Brazil. These students had already attended or were attending the Nursing Semiology and Semiotics I academic discipline; with exclusion of the students who did not answer the invitation letter to participate in the study, those under 18 years of age, and those who had some visual impairment that would make it impossible for them to see the game screens.

In order to delimit the population, information was requested from the course coordination, which consulted the individual registration report in the academic control, indicating a total of 169 qualified Nursing students regarding the inclusion criteria. Sample calculation was performed using the OpenEpi public domain program, version 3.01, considering a 95% confidence level, 10% sampling error and a minimum expected proportion of 50%, obtaining a sample size of 62 students.

The search for students took place through simple random probability sampling; subsequently, the students were contacted through an invitation letter (via email), in which the research objectives were explained, as well as the importance of the contribution in the evaluation process and the topics covered in such process. Those who indicated and agreed to participate in the study received the following via Google Forms: the Free and Informed Consent Form, the playable version of the playful-educational technology and the evaluation questionnaire.

In the evaluation process, a data collection instrument containing two parts was used: the first one contained sociodemographic data; and the second consisted of a semi-structured questionnaire based on the EGameFlow method for evaluating educational games, an adaptation for educational games derived from the GameFlow method, which focuses on evaluating games[19]. This questionnaire is divided into seven categories, namely: Concentration; Challenges; Autonomy; Clarity of the objectives; Feedback; Immersion; and Knowledge improvement. The instrument's evaluation items varied from 1 to 7, with 1 considered "weak" and 7 representing "strong." The descriptive data were presented through absolute and relative frequencies for the qualitative variables, and through the median and 25th and 75th quartiles for the quantitative variables, considering their asymmetry through the Shapiro-Wilk test. To relate the playability evaluation of the playful-educational technology at two moments, evaluation of the preliminary version and after implementing adjustments, the Friedman test was used, which allows detecting differences between medians of more than two paired samples, considering p-value below 5% as statistical significance. In data analysis, the criterion of medians below six was considered as items to be rethought for improvement in the final version of the game[19]. The data were processed using the IBM Statistical Package for the Social Sciences (SPSS®) software, version 22.0.

The research followed the ethical principles governed by Resolution No. 466/2012 of the National Health Council (*Conselho Nacional de Saúde*, CNS); therefore, it was operationalized after the project was assessed by the Research Ethics Committee. In addition, the principles governed by Circular Letter Nº. 02/2021 were considered, which provides guidelines for procedures in research studies with any stage in a virtual environment.

RESULTS

Semio em Jogo® starts with an introductory part, in which the player is introduced to two main characters, namely: Nurse Florence, who is the main intercommunication link with the player or student in the game, in the form of a teacher or advisor; and patient Mrs. Violeta, main character of the Nursing care process.

Consequently, Mrs. Violeta attends the Basic Health Unit (BHU) environment complaining about wet cough, tiredness, headache, excessive thirst and weight loss. Thus, some information about the history of Mrs. Violeta is presented, collected based on the anamnesis carried out by the Nurse Florence, highlighting the character's age, behavioral habits, presence of chronic diseases, her living conditions and her understanding about the health-disease process.

In the first phase of the game, which synthesizes elements related to vital signs, Nurse Florence invites the player to check Mrs. Violeta's vital signs, working with multiple-choice questions and filling in the words that best match the written description, having as a tip the number of letters; for each wrong letter, a part of the hanged man's body is drawn.

After finishing the first phase, Nurse Florence points out the need to refer Mrs. Violeta to a secondary-level health care service, from where the second phase of *Semio em Jogo*® is initiated. In this phase, the focus corresponds to the biosafety measures. Questions are pointed out in which the player must select in the correct sequence the steps to carry out simple hand washing, and each time he/she gets it right, a figure appears on the screen exemplifying each step. In case of any error in the choice, a sound is reproduced to let the player know that he/she has just made a mistake in selecting the correct steps.

In the following question, a memory game involving common terms while learning the biosafety measures is used. And, after the user finishes this part, the meanings of all the terms present are shown for learning reinforcement. This is the end of the second phase of *Semio em Jogo*®.

In the third phase, with Mrs. Violeta's hospitalization in the Medical Clinic inpatient unit, the focus was on the physical examination of the cardiovascular and respiratory systems. This phase begins with an adaptation to the Super Mario game, when Nurse Florence needs to overcome obstacles, such as viruses and bacteria present in the scenario and collect the materials required to perform the physical examination.

Subsequently, the player is invited to train anterior chest respiratory auscultation. Thus, when clicking on the auscultation focus points, there is an association between the normal respiratory auscultation sounds and adventitious noises, and the player should indicate the type of sound auscultated.

In the following questions, the player is invited to indicate the proper places of the cardiac auscultation focus points. Subsequently, he/she has to aim the cannon at the alternative that best represents the classification of edema in the lower limbs based on data from the Godet sign made on Mrs. Violeta.

After the last question of *Semio em Jogo*®, Nurse Florence indicates some considerations regarding completion of the physical examination, such as recomposing the patient, discarding the materials used in their proper places and thanking the patient for allowing the Nursing professionals to take care of his/her health, referring to the interventions carried out. Thus, Nurse Florence congratulates the player for having finished the game, as this proves that he/she has the technical and scientific

knowledge required to provide excellent care, in addition to making use of captivating messages, so that the user continues to seek knowledge to become an excellent professional. Figure 2 shows some of the *Semio em Jogo*® scenes.

With regard to the playability evaluation, considering the sociodemographic and academic characterization data, there were 62 students, of whom 35 (56.5%) participated in the evaluation of the preliminary version and 27 (43.5%) did so after implementing adjustments. In the first group there were 6 (17.1%) men and 29 (82.9%) women, whereas 5 (18.5%) men and 22 (81.5%) women were observed in the second group.

Figure 2 - Some scenes from *Semio em Jogo*®. Cuité, PB, Brazil, 2022.

As the evaluation was carried out by two independent groups of students, the statistical difference was calculated using the Friedman test for the age and period that the students were attending.

Therefore, it was verified that the median (25th and 75th quartiles) of the age corresponding to the group that evaluated the game in the preliminary version (before the adjustments) was 22 (21-24) and, after the adjustments, it was 21 (20-22), obtaining a p-value of 0.088. In relation the academic period they were attending, it was found that the median (25th and 75th quartiles) of the group that evaluated the game in the preliminary version (before adjustments) was 6 (4-9) and that, after the adjustments, it was 4 (3-6), resulting in a p-value of 0.102. It was concluded that there was no difference between the groups; consequently, it is possible to perform the evaluation process.

Table 1 presents the results of the items referring to the playability evaluation by the group that evaluated the game in the preliminary version (before the adjustments) and by the group that evaluated its playability after implementing the adjustments, considering the categories: Concentration; Challenges; Autonomy; Clarity of the objectives; Feedback; Immersion; and Knowledge improvement.

It was possible to observe that the "Concentration" and "Feedback" categories and the general median presented better evaluation scores after implementing adjustments, even if the p-value did not present statistical significance. In addition, it is to be noted that all the medians pointed to values equal to or greater than six, which corresponds to a good playability criterion[19].

Table 1 - Distribution of answers by playability evaluation categories before (preliminary version) and after implementing adjustments. Cuité, PB, Brazil, 2022. (n=62).

Categories	Evaluation of the preliminary version		After implementing adjustments		p-value*
	Median	Q_{25}-Q_{75}	Median	Q_{25}-Q_{75}	
Concentration	6.0	6.0-7.0	7.0	6.0-7.0	0.405
Challenges	7.0	6.0-7.0	7.0	6.0-7.0	1.000
Autonomy	6.0	4.0-7.0	6.0	5.0-7.0	1.000
Clarity of the objectives	7.0	6.0-7.0	7.0	7.0-7.0	0.527
Feedback	6.5	5.5-7.0	7.0	6.0-7.0	0.346
Immersion	6.0	5.0-7.0	6.0	5.5-7.0	0.532
Knowledge improvement	7.0	6.0-7.0	7.0	7.0-7.0	0.096
General	6.5	6.0-7.0	7.0	6.0-7.0	0.819

*Friedman's test

DISCUSSION

Most of the studies on educational games available followed similar methodological paths in terms of bibliographic review, planning and prototyping, which include the formulation of images, dialogues, scheduling and finalization of the playable version[20]. However, some papers differ in terms of the evaluation of playability, interface and communication, among other aspects[21–22].

Therefore, there is no pre-established order in the literature for performing the validation with regard to the sample comprised by students and specialists. Some games such as "Injure Care Simulator" have been validated both by students and by health and technology professionals; on the other hand, other products such as educational games on Type 1 Diabetes Mellitus and the iDO serious game, developed for formal and informal caregivers of people with dementia, were only evaluated from the perspective of the target audience[21–23].

In addition, some authors seek to initiate the evaluation process by the panorama of technology specialists, such as the developers of the educational game about Human Papillomavirus infection;

however, although the studies do not follow any specific evaluation scheme, most of the researchers seek double validation, which contributes to improving the product[24].

Regarding the benefits of playability, a study pointed out that an educational game designed for children with cancer enabled more effective communication between children and Nursing professionals, with this evaluation received after their participation in the game. Therefore, the importance of including playability in the health field is obvious, considering the advantages it implies[7].

So that, in this way, this playful-educational technology can contribute to better professional training of Nursing students, as it presents a simulation of what they may encounter in their professional practice, in addition to providing the opportunity to further sharpen their experiences. Even rendering learning more interesting based on a product that generates immersion and enthusiasm, thus fixing the contents more easily in the students' mind.

Learning in Nursing can be corroborated in studies that indicate these new methodologies as tools capable of taking students out of a state of "non-reflection and passivity", providing active and meaningful learning, boosting the teaching-learning process and providing good quality care[21].

However, it is believed that, for being a simulation, it is not a substitute for practical experience in the professional work environment, as it can only provide students with all the necessary tools to train a qualified professional with technical and scientific skills.

With regard to the playability evaluation carried out in this study, although the p-values did not show a statistically significant difference, the median of the Concentration and Feedback categories were higher after the changes implemented in the game. Similarly, a study on the evaluation of "The Book of Knowledge" game presented similar results to those obtained in this research, as the Concentration, Objectives and Feedback categories presented positive results, which suggests that the formulation of clear objectives favors and draws the player's attention[25]. However, other elements can influence the concentration levels, such as graphic quality, engaging scenes and workload compatible with the players' abilities[26].

In addition, the Feedback category obtained a satisfactory result, thus allowing the participants to recognize their correct answers and fix their mistakes, solidifying the learning process. Immediate feedback to the player generally provides high-involvement learning, which enhances or can replace traditional training and summative evaluation processes[27].

It is also noted that the population characteristics of the groups involved are divergent, which did not tend to influence the increase in medians in the Concentration, Feedback and General score categories, according to statistical similarity in the p-values. However, when there are statistically significant differences pointed out by the p-values, the evaluation results can be tendentious when compared. And linked to this, a study that aimed at evaluating the playability of a game focused on the theme of violence against women is pointed out, which evidenced a statistical difference between some participating groups[28].

With this, the p-values can be justified by the fact that, in general, the medians have shown values above the good playability threshold (considered as 6 by the authors of EGameFlow), both before and after the changes[19], thus implying that the game is considered satisfactory based on research with the academic community, and being better evaluated after some improvements.

Thus, in a systematic review that sought to map directions for the development and application of games in Nursing education, it was suggested that using games contributes to knowledge and to better logical reasoning in the performance of Nursing students and nurses[29].

Although the evaluation by the target audience was positive, it is believed that improvements need to be implemented, mainly when considering the Feedback category, to establish scores and game execution time, in order to estimate the classification among the players. In addition to that, an

executable version without the need for Internet access must be implemented, considering that use of this technology is exclusively conditioned to a computer connected to the network.

As a study limitation, it is pointed out that the current technology will also be submitted to content and face validation by specialists in the Nursing Semiology and Semiotics area, considering that this research presents the elaboration of a playful technology aimed at learning the Semiology and Semiotics academic discipline, as well as the evaluation of its playability by students attending a Bachelor's degree in Nursing.

CONCLUSION

In view of the above, it is concluded that the current study sought to develop a technology that would allow students attending Bachelor's degree courses in Nursing to sharpen their knowledge in Nursing Semiology and Semiotics. For this purpose, the game was developed in three stages: planning; prototyping; and production of the first playable version, considering four basic premises, namely: mechanics; aesthetics; story; and technology.

In addition to that, it was sought to evaluate the playability of *Semio em Jogo*® and, thus, it was noticed that the academic community considered the game as satisfactory, both after before the changes. In this way, this technology has shown its usefulness in satisfying the students' needs, as they will also have the opportunity to acquire new skills common to Nursing professionals while using it.

However, it is also worth noting the need to submit such technology to the appreciation of specialists in the Nursing Semiology and Semiotics area, so that the effectiveness of *Semio em Jogo*® can be observed regarding the nature of all the knowledge presented, which must be legitimate and applicable to the professional routine as recommended by the literature and practices based on scientific evidence.

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NOTES

ORIGIN OF THE ARTICLE

Extracted from Course Conclusion Paper - "*Semio em Jogo*®: Development of a playful-educational technology for undergraduate Nursing students", presented at *Universidade Federal de Campina Grande*, in 2022

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ACKNOWLEDGMENT

The authors would like to thank the support provided by *Universidade Federal de Campina Grande*, which enabled the development of the *Semio em Jogo*® technology, based on a paper that is "anchored" under the Institutional Program of Initiation Scholarships in Technological Development and Innovation (*Programa Institucional de Bolsas de Iniciação em Desenvolvimento Tecnológico e Inovação*, PIBITI/CNPq-UFCG). As well as to professionals Anderson André Mendonça dos Santos, Anderson Lucas Xavier Fernandes, Melissa de Oliveira Lima and Diego Dominy Zeferino de Santana, for having embraced the game's design project.

APPROVAL OF ETHICS COMMITTEE IN RESEARCH

Approved in the Research Ethics Committee of the Health and Education Center of *Universidade Federal de Campina Grande*, opinion No.4,994,054/2021 and Certificate of Presentation for Ethical Appraisal No. 49825221.3.0000.0154.

CONFLICT OF INTEREST

There is no conflict of interest.

HISTORICAL

Received: December 22, 2022.
Approved: March 22, 2023.

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