EFFECT OF SIMULATION FOR SIGNIFICANT LEARNING
EFEITO DA SIMULAÇÃO PARA A APRENDIZAGEM SIGNIFICATIVA
EFFECTO DE LA SIMULACIÓN PARA EL APRENDIZAJE SIGNIFICATIVO

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ABSTRACT

Objective: to investigate the effect of simulation on meaningful learning in scientific evidence. **Method:** this is a bibliographical study, type integrative review. Articles from 2013 to 2017 were searched in the MEDLINE, BDNF and LILACS Databases. For the evaluation of the studies, the integral reading of articles was carried out and a synthesis figure was used to present the results. **Results:** the sample consisted of 13 articles, the majority international (76.9%), observational (76.9%) quantitative and qualitative. The importance of the insertion of the simulation in the teaching-learning process as a tool capable of improving the critical, clinical and reflective reasoning of students in a meaningful way was verified. **Conclusion:** the integration of the simulation in the teaching process was positive for the acquisition of meaningful learning favoring the gain of different skills, the improvement of knowledge and the increase of the self-confidence of Nursing students. It should be emphasized that the simulation may have some advantage over other teaching methods, depending on the context of insertion, but at the same time, meaningful learning can be compromised by the risk of anxiety determined by this strategy. **Descriptors:** Simulation; Learning; Nursing; Education; Development of Personnel; Health education.

RESUMO

Objetivo: investigar o efeito da simulação sobre a aprendizagem significativa em evidências científicas. **Método:** trata-se de um estudo bibliográfico, tipo revisão integrativa. Buscaram-se os artigos de 2013 a 2017 nas Bases de Dados MEDLINE, BDNF e LILACS. Realizou-se, para a avaliação dos estudos, a leitura integral de artigos e se adotou, para apresentação dos resultados, figura síntese. **Resultados:** compôs-se a amostra de 13 artigos, a maioria internacional (76,9%), observacional (76,9%) quantitativa e qualitativa. Constatou-se a importância da inserção da simulação no processo de ensino-aprendizagem como ferramenta capaz de melhorar o raciocínio crítico, clínico e reflexivo de estudantes de forma significativa. **Conclusão:** revelou-se positivamente a integração da simulação no processo de ensino para a aquisição da aprendizagem significativa favorecendo o ganho de diferentes competências, o aprimoramento de conhecimentos e o aumento da autoconfiança dos estudantes de Enfermagem. Destaca-se que a simulação pode ter alguma vantagem sobre outros métodos de ensino, dependendo do contexto de inserção, mas, ao mesmo tempo, a aprendizagem significativa pode ser comprometida pelo risco da ansiedade determinada por essa estratégia. **Descritores:** Simulação; Aprendizagem; Enfermagem; Educação; Desenvolvimento de Pessoal; Educação em Saúde.

RESUMEN

Objetivo: investigar el efecto de la simulación sobre el aprendizaje significativo en evidencias científicas. **Método:** se trata de un estudio bibliográfico, tipo revisión integrativa. Se buscaron los artículos de 2013 a 2017 en las Bases de Datos MEDLINE, BDNF y LILACS. Se realizó, para la evaluación de los estudios, la lectura integral de artículos y se adoptó, para presentación de los resultados, figura síntesis. **Resultados:** se compuso la muestra de 13 artículos, la mayoría internacional (76,9%), observacional (76,9%) cuantitativa y cualitativa. Se constató la importancia de la inserción de la simulación en el proceso de enseñanza-aprendizaje como herramienta capaz de mejorar el raciocinio crítico, clínico y reflexivo de estudiantes de forma significativa. **Conclusión:** se reveló positivamente la integración de la simulación en el proceso de enseñanza para la adquisición del aprendizaje significativo favoreciendo la ganancia de diferentes competencias, el perfeccionamiento de conocimientos y el aumento de la autoconfianza de los estudiantes de Enfermería. Se destaca que la simulación puede tener alguna ventaja sobre otros métodos de enseñanza, dependiendo del contexto de inserción, pero al mismo tiempo, el aprendizaje significativo puede ser comprometido por el riesgo de la ansiedad determinada por esa estrategia. **Descritores:** Simulación; Aprendizaje; Enfermería; Educación; Desarrollo de Personal; Educación en Salud.

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INTRODUCTION

Through the search for the improvement of nurses, educators are encouraged to adopt different pedagogical approaches, and the growing interest in evidence-based education is a current reality based on the need for reflection and student involvement.¹ To envisage scenarios in which learning can be transformed into meaningful experience has become the target of many teachers who aim at the revitalization of the teaching-learning process.²

By means of the implementation of innovative educational strategies, isolated or combined, active and dynamic learning proposals³ are required to provide new and robust information, especially facilitated by the individual's own knowledge structure known as meaningful learning.⁴ It is also an imperative condition for its realization to reflection. On the other hand, it stimulates reflective reasoning during the implementation of a simulated strategy as an interface for the attainment of knowledge in order to extrapolate the mere exchange of psychomotor skills and competences. It is subsidized by the learning based on the simulation, the reach of different domains of learning and, therefore, it can be considered of multifactorial nature.⁵

The success of acquiring learning through simulated practice is mediated by the adoption of strategies that respect the educational level, the needs and the characteristics of the students.⁶ It fits the simulation as an active methodology to the contemporary needs of teaching and learning by subsidizing the progressive enrichment of knowledge. Increasingly, in pedagogical reformulations in higher education, new strategies aiming at better learning outcomes are demanded.⁷

OBJECTIVE

- To investigate the effect of simulation on meaningful learning in scientific evidence.

METHOD

The purpose of this integrative review was to respond to the research objective, based on previously defined inclusion and exclusion criteria, by synthesizing the data and interpreting the results.⁸

The steps of formulating the research question were followed to ensure the systematization of this review; selection of the most adequate databases to question the study; research in databases; pre-selection of articles through title and abstract analysis; reading in full the selected articles with the aid of a spreadsheet consisting of items that directed the answers of the objective; the extraction of the data of articles that constituted the final sample; the analysis and categorization of data.⁸

The databases MEDLINE (Medical Literature Analysis and Retrieval System Online), BDENF (Nursing Database) and LILACS (Latin American and Caribbean Literature in Health Sciences) databases were used for the review. Virtual Health Library (VHL) and the search was done using a combination of descriptors controlled in the DeCS (Descriptors in Health Sciences) and MESH (Medical Subject Headings) Learning AND Nursing and Non-Controlled Clinical Simulation. In this context, the Boolean operator AND.

The study was based on the PICO strategy (patient / problem (P), intervention (I), comparison (C) - not adopted and outcome (O)) represented by the expressions: "Students of the Nursing course P) "," Effect of simulation (I) ","Significant Learning (O). " The following question was formulated, adopting its principles: The integration of clinical simulation as an active teaching methodology can promote meaningful learning for Nursing students?

The studies that answered the guiding question in qualitative and / or quantitative version were included, published in Portuguese, Spanish or English during the last five years (2013 to 2017). Studies were excluded that did not have abstract and / or those not obtained in full even after the request by the interlibrary loan system, editorials, review articles, case reports, duplicate articles, dissertations and theses.

In the month of August 2017, the research in the databases was carried out. The articles selected for the complete reading were submitted to the data extraction process and, to this end, a spreadsheet with items for the evaluation of the articles was adopted in order to maintain a standardization in the process of searching and interpreting the data. The data convergence between peer-reviewed

articles was evaluated. It is added that the critical reading and the grouping of the data by similarity occurred after the selection of the articles and, in the sequence, the analysis was conducted.

For the critical evaluation of the methodological quality of the included studies, the recommendations of the Oxford Center for Evidence-based Medicine were used to classify and separate the scientific findings into levels of evidence.⁹

Figure 1 - Flowchart for the selection of articles analyzed. Brasília (DF), Brazil, 2018.

The analysis and interpretation of the data began with the exploratory reading of the studies whose purpose was to verify the relevance of the scientific material. Then, the selective reading for the composition of a theoretical framework that answered the guiding question and the objective of the study was carried out. This process was culminated in the extraction of the articles described in this study.

A synthesis was prepared on the bibliometric data of the selected studies and a table with the research data: name of the article, objective of the study, study design / level of evidence, results and conclusions.

The information contained in the sources is presented in an orderly and summarized form in order to enable answers to the research problem. The analysis allowed the grouping of articles into two categories: Simulation as a learning strategy and Acquisition and retention of knowledge and skills.

RESULTS

The search in the VHL was found in 171 articles and, after refinement by the search criteria, there were 13 articles presented in figure 2.

Overall, 76.9% of the articles were selected as quantitative and qualitative observational studies with a level of

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evidence 5. Only two (15.4%) randomized clinical trials were observed (level of evidence 2) and one (7.7%) quasi-experiment, but still the majority is international (76.9%)

In the analyzed studies, questionnaires (8 = 61.5%) were used as a data collection instrument for Nursing students. The

importance of integrating high-fidelity simulators in the education and training process was explained in at least nine (69.2%), and in two (15.4%) the importance of Nursing educators explore the simulation for the transfer and development of knowledge.

Name of study	Objective	Study design /Results level of evidence	Conclusion
Simulation for the development of clinical competence of risk assessment for pressure ulcer (10)	To analyze the perception of Nursing-undergraduates about the simulation strategy in the teaching-learning process for competence development and risk assessment for pressure ulcer. -	Descriptive study, qualitative analysis. Level of evidence: 5	The strategy was able to rescue the students' reasoning during the execution of the simulation scenario (action), the development of critical-reflexive thinking about competence, identification of learning gaps, promotion of student satisfaction and improvement of self-image professional.
High Fidelity Simulation Effectiveness Nursing Transfer of Learning (11)	Determine whether undergraduate-nursing students were able to transfer knowledge-learned in the classroom and simulated high fidelity scenarios to the clinical environment .	Observational, longitudinal study Level of evidence: 3	The results indicated that there was a significant difference (p = 0.000) in the learning transfer demonstrated over time .
A trial of e-simulation of sudden patient deterioration (FIRST2ACT WEB) student learning (12)	To investigate the theoretical and-applied learning of undergraduate-nursing students in response to the study onelectronic simulation program -FIRST2ACT WEBTM and to explore predictors of virtual clinical performance.	Quasi-experimental Level of evidence: 3	Of the 409 students who started the program, 367 undergraduate nursing students completed the web-based program in its entirety, virtual clinical performance, and self-rated achieving a completion rate of 89.7%; 38.1% of the students reached the clinical performance, passing in three scenarios the previous clinical knowledge and increased from pre-simulation from 78.15% to 91.6% in post-simulation.
High-fidelity simulation effects on CPR knowledge, skills, acquisition, and retention in nursing students (13)	To examine the effect of the use of-high fidelity simulators in the-acquisition of knowledge and skills and retention in university students .	Clinical trial Level of evidence: 2	The results showed significant differences in favor of the participants of the high fidelity simulation group in both acquisition and retention of knowledge and skills. However, there was a significant loss of knowledge and skills in cardiopulmonary resuscitation three months after training in both groups.
Learning clinical skills in the simulation suite: the lived experiences of student nurses involved in peer	Investigate the student's experience in-participating in a teaching initiative and peer evaluation to include the-perceptions of first-year nursing students and second- and third-year	Descriptive and qualitative study Level of evidence: 5	Perceived benefits included social learning experience, development of teaching skills, self-awareness, and the opportunity to communicate good and bad news . additional cardiopulmonary resuscitation training sessions to improve outcomes with patients on

teaching and peerparticipants. assessment (14)		cardiac arrest.
The pedagogy behindTo analyze the perception of Nursing- Action Research simulated clinicalstudents regarding the experience of- Level of experience: aclinical simulation with theevidence: 5 perception of nursingparticipation of actors . students (15)	In the proposal of the study, three categoriesemerged: clinical simulation with a simulated patient: an authentic experience; simulation with simulated patient: the development of critical reasoning through self-evaluation and simulation with simulated patient promotes experiential learning.	The teaching with simulated patient has great potential for the development of critical and reflexive thinking when used under a constructivist pedagogical theory .
Developing a multi-Understanding the learningExploratory and method approach tomechanisms of simulation-basedqualitative study insights . data collection andeducation, since contemporary- Level of analysis for explainingtheories of learning postulate thatevidence: 5 the learning duringlearning can be understood as the simulation ininteraction of individual identity with undergraduate nursecontext. education (16)	The focus group interviews provided furtherIt was concluded that to better understand how students learn in social and active learning strategies, dynamic data is needed and that researchers and participants clarify what is happening as an action unfolds.	
Nursing students'Explore students' perceptions of their- Qualitative perceptions of factorslearning environment in a laboratoryexploratory study influencing theirof clinical skills and increase the- Level of learning environmentknowledge base to improve learningevidence: 5 in a clinical skillsconditions by identifying the most laboratory: Aimportant environmental factors qualitative study (17) according to students.	The study documented students' experience ofthe physical factors (facilities, materialsmotivation, and providing resources for multiple equipment, learning tools, standardmethods and replications within clinical skills procedures), psychosocial (expectations,training are important for improving clinical feedback, relationships) and organizationallaboratory learning environments from the factors (faculty resources, course structure)student's perspective. affecting the learning environment clinical laboratory.	Creating an authentic environment, facilitating motivation, and providing resources for multiple methods and replications within clinical skills training are important for improving clinical laboratory learning environments from the student's perspective.
Impact of pre-briefingTo examine the intervention of the- Clinical trial on competencystructured debriefing and its effect on- Level of performance, clinicalthe performance of competences byevidence: 2 judgment andNursing students, the clinical judgment experience inand the perceived pre-briefing simulation: Anexperience . experimental study (19)	A statistically significant difference wasdemonstrated between the groups forperformance of competence (p <0.001),clinical judgment (p <0.001) and pre-pre-debriefing can enhance meaningful simulation information experience (p <0.001). Nolearning. relationship was found between the perception of pre-information experience and the performance of student simulation.	Structured pre-debriefing based on theory can affect the performance of Nursing student competency, clinical judgment and perceptions of information experience .
Correlations betweenTo test the correlations between theA descriptive and Clinical Judgment andachievements of the nursing studentcross-sectional Learning Styleteam in clinical judgment and thestudy	There were three significant correlationsbetween the team's achievement and students'the learning style preferences tested and the learning style preferences: the significantachievements of the clinical trial team in the	There were multiple complex interactions between the learning style preferences tested and the achievements of the clinical trial team in the

Preferences of Nursing Students in the Simulation Room (20)	Preferences of emotional, sociological and physiological learning style .	Level evidence: 4	ofnegative correlation with "Structure" and "Kinesthetic" at the individual level and the positive correlation with the "Tactile" variable.	simulation room that provides important information for nurses in training.
Simulation as a strategy for learning in pediatrics (21)	To evaluate the use of clinical simulation in Pediatrics as a strategy for the learning of students of the Nursing course of the College of Ceilândia .	Cross-sectional study Level evidence: 4.	Regarding the students' evaluation of the realistic simulation and their influence on the learning process, 53.2% of the students agreed that the realistic simulation was productive; 61.7%, that the topics covered during the simulation are important; 42.6% agreed that it was possible to put into practice the content taught by the teacher in a theoretical class; 68.1%, that the simulation can be introduced in the class schedule of the discipline to increase self-confidence.	The students have relevant knowledge of the guidelines and stated that the simulation was productive and should be included in the course schedule, as well as in other subjects.
Exploring Content and Knowledge Transfer in Baccalaureate Nursing Students Using a Hybrid Mental Health Practice Experience (22)	To explore learned content and transferred knowledge in a hybrid clinical environment of clinical courses of health composed of simulated clinical configuration experiences .	Qualitative, interpretative and descriptive study. Level evidence: 5	The speeches of the participants were categorized into four major themes: (a) nursing professional behavior; (b) understanding the role of nursing in mental health; (c) confidence in interview skills and (d) unexpected learning.	Nursing educators should further explore the mix of simulation and clinical practice in terms of development and knowledge transfer in order to prepare students to work in the field of Mental Health Nursing.
Clinical Education in psychiatric health Overcoming challenges (23)	The objectives of the study were to evaluate the learning outcomes of a clinical stage of mental health nursing: current and to explore students' perceptions about clinical procedure .	This was a quantitative and qualitative method study. Level evidence: 5	The students reported improvement in empathy and self-efficacy related to the simulation after the clinical procedure, but no alterations were found regarding the prejudice to the mental illness	The improvement observed in learning the clinical procedure can be attributed to the unique contribution of each component of the clinical procedure and to the synergistic effect of these various components .

Figure 2. Distribution of publications about clinical simulation as an active methodology as a reflection strategy on meaningful learning, based on MEDLINE and BDENF (period from 2013 to 2017). Brasília (DF), Brazil, 2018.

DISCUSSION

By investigating the scientific production related to the effect of simulation on meaningful learning, an integrated approach between teaching and learning over time.

♦ Simulation as a learning strategy

The value of the simulation is translated by the gain of experience of the learner or professional and, as a strategy, the development of clinical, reflexive and critical skills and competences that, isolated or combined, provide meaningful learning.^{10-12,15,19-23} It is pointed out in the health area, in particular, that the simulation allows to experience different cases or situations that, perhaps, were limited or impossible in real and daily clinical practice.¹⁸ The simulation was adopted, as an example of Australia, as an educational strategy in the area of complementary nursing, but not a substitute for clinical practice, including the management of severe patients, considering that the recognition of these patients imposes the need for clinical skills, in addition to the qualified and individualized management of the care to reach the international goals of patient safety.¹⁸

It was observed in scientific evidence that teaching through a simulated patient has great potential for the expansion of competencies related to the development and consolidation of critical and reflexive reasoning,¹⁸ as well as the evidences identified in this study.^{13,15,17} These findings reveal the importance of an authentic and reproduced experience through the simulation strategy. It is possible, through the reflection and integration of situations that mimic reality when coexisting, as well as identified in the studies, meaningful learning.^{4-5,7-8,10-14} Through the simulation, the students identified the importance of meaningful education, a strategy that walks in a paradoxical way to those that use fragmented methods, but which are still used in some educational institutions.¹⁸

Sometimes, in the context of the simulation, learning in the midst of group activities is based on a dynamic interaction between the peers, a situation also found in some studies.^{20,23} It is pointed out that scientific evidence, with the objective of exploring the facilities provided by the simulation on learning in the Nursing undergraduate curriculum, through a multi-

method approach, enabled the interaction between different actors, as well as reflection through the projection of videos, a fact that stimulated and allowed the dynamic discussion in group and, consequently, the acquisition of different experiences and knowledge.²⁰

It is necessary that Nursing students reconcile theoretical learning with clinical practice. It is pointed out that, in this area, developing teaching and learning approaches has become the target of many educators in Nursing and for this, it should facilitate the acquisition of knowledge and skill through the application of theoretical content in practice.^{19,22} It shows the use of softwares of virtual patients adapted to stimulate learning in the educational process as an incentive to the development of clinical reasoning of Nursing students with the integration of technology, anchored by learning theories, favoring the constructive alignment of learning.²¹

It is described in scientific evidence that the use of the simulation accelerates the learning process because it is an integration factor, systemic and orderly that must be linked to the educational plan and to the learner and also to adapt to the needs and curricular requirements.²² It is possible, in programs that include the simulation, the combination of previous knowledge and learning experiences for the development of cognitive competences through reflection, pre-action and conceptual mapping for the acquisition of significant learning experiences.¹⁸ It is believed above all that it is no longer sustainable to assume that all adult students in a class learn in the same way. It is emphasized, however, that students with different learning styles and clinical judgment skills, in situations of simulation, when influenced by different factors, will build their own knowledge.²³

♦ Acquisition and retention of knowledge and skills

In some studies, the effectiveness of the use of high-fidelity simulators in the acquisition and retention of students' knowledge and skills is highlighted.^{4,5} Through the high fidelity scenario, when properly implemented, the benefits of learning are made meaningful and students' skills can be expanded. It has been deeply impacted by the evolution of information and communication technologies in educational reforms that, in turn, aim to

expand the teaching and learning process to new directions. In this perspective, it is suggested the integration of high fidelity simulation as an active methodology, which can contribute as an alternative method to overcome challenges in the educational process.^{11, 24}

It is possible to mediate and allow, in an organizational environment such as the laboratory, through its resources, be they material and human, the best management of educational proposals with or without the presence of the teacher, considering that students can exchange experiences among themselves, which favors the development of autonomy and self-confidence making the learning authentic and meaningful,¹⁷ a finding also identified in some selected studies.^{12,17-23}

It is stimulated by the creation of a hybrid environment composed of simulated experiences, the acquisition of vast experience by the students. It is fundamental for Nursing educators, given the increasing introduction of combined simulation to traditional teaching, to explore the conditions that may favor the transfer of skills from real to simulated scenarios and vice versa.²³

Participation in simulated learning experiences was revealed as a relevant element to Nursing practice, confirming the student's role and responsibility in the search for knowledge retention.^{15,17,22} This strategy is therefore focused on how educators since in extracting values from the simulated experiences, they will be able to elaborate better proposals of care.²³

It favors, against the big picture, the availability of simulation labs, the acquisition of skills and the reinforcement of pre-existing knowledge through resources such as those of high fidelity that, when combined with the traditional strategy, extend the degree of realism by promoting meaningful learning.¹¹

CONCLUSION

It is concluded that the integration of the simulation in the teaching process contributed positively to the significant learning and favored the gain of different skills, the improvement of knowledge and the increase of the self-confidence of the students of Nursing. It should be noted in this study that the simulation may have some advantage over other teaching

methods, depending on the context of insertion, but at the same time, meaningful learning can be compromised by the risk of anxiety determined by this strategy.

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