Development of clinical competence in nursing in simulation: the perspective of Bloom’s taxonomy

Desenvolvimento de competência clínica em enfermagem na simulação: perspectiva da taxonomia de Bloom
Desarrollo de la competencia clínica en enfermería por simulación: perspectiva de la taxonomía de Bloom

ABSTRACT
Objectives: to investigate the scientific evidence on the use of Bloom’s taxonomy for developing competence in nursing professionals and students in clinical simulation. Methods: integrative review of the National Library of Medicine (NLM), National Institutes of Health (NIH), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Literature in Health Sciences (LILACS), Web of Science and SCOPUS databases, using the Rayyan application. Results: a total of 871 studies were identified; four composed the sample. The development of clinical competence occurred through the coordination of knowledge, skills, and attitudes. To develop the cognitive domain, the objectives of knowledge and comprehension of Bloom’s taxonomy were mobilized. The psychomotor domain required development of the skills demanded by the proposed clinical care. The affective domain was developed through will and motivation to learn. Conclusions: it is possible to develop clinical competence in nursing by adopting Bloom’s taxonomy in each phase of clinical simulation.

Descriptors: Education, Nursing; Simulation Training; Clinical Competence; Learning; Classification.

RESUMO

Descriptores: Educação em Enfermagem; Treinamento por Simulação; Competência Clínica; Aprendizagem; Classificação.

RESUMEN
Objetivos: investigar las evidencias científicas existentes sobre la utilización de la taxonomía de Bloom para el desarrollo de competencias en profesionales y estudiantes de enfermería usando la simulación clínica. Métodos: revisión integrativa en las bases National Library of Medicine (NLM), National Institutes of Health (NIH), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS), Web of Science y SCOPUS con el apoyo del aplicativo Rayyan. Resultados: se identificaron 871 estudios, cuatro hicieron parte de la muestra. El desarrollo de competencia clínica se consiguió articulando conocimientos, habilidades y actitudes. Para desarrollar el dominio cognitivo, fueron movilizados los objetivos conocer y comprender de la taxonomía de Bloom. Para contemplar el dominio psicomotor, fue necesario desarrollar las habilidades determinadas en la atención clínica propuesta. El dominio afectivo fue desarrollado por el deseo y motivación para aprender. Conclusiones: es posible desarrollar competencia clínica en enfermería adoptando la taxonomía de Bloom en cada etapa de la simulación.

Descriptores: Educación en Enfermería; Entrenamiento Simulado; Competencia Clínica; Aprendizaje; Clasificación.
INTRODUCTION

In the process of teaching and learning in nursing, some tasks are easier to accomplish than others, and the mechanism chosen to facilitate them is the key to overcoming this challenge. Thus, the nursing professor should become a mentor, and not only a knowledge provider.

The adoption of educational methodologies that aim to reduce the distance between what is taught and what, in fact, occurs in practice, is encouraged. This can be facilitated by improving the clinical competence of nurses and nursing students.

The development of clinical competence is not a new theme in nursing. It has been presented under different meanings, focusing on different educational discussions, particularly in the international context. The concept and assessment mechanisms of clinical competence are the protagonists of this discussion.

To be competent is to have a set of knowledge, skills, and attitudes that is characteristic of the human being. When focused on the individual's education and professional experiences, to be competent is to be able to act responsibly and be recognized by others. This includes mobilizing, integrating, and transferring knowledge, resources, and skills to a certain professional context.

Clinical competence in nursing is knowledge supported by a combination of cognitive, psychomotor, and affective/attitudinal skills, properly applied to a given situation.

The Taxonomy of Educational Objectives was published in 1956, with the aim of aligning the attributes necessary for the development of competence in professionals. It was characterized by a structure of hierarchical organization of educational objectives, resulting from the work of a multidisciplinary committee of experts from different universities in the United States, led by Benjamin Samuel Bloom, and popularized as Bloom's taxonomy.

The classification proposed by Bloom divided learning into three major domains: cognitive, encompassing intellectual learning; psychomotor, involving the skills of performing tasks by means of the motor system; and affective, relating to aspects of awareness and gradation of values.

The cognitive domain is associated with learning and mastering knowledge. In this domain, the objective was grouped into six categories, presented as a hierarchy of complexity, from the simplest to the most complex. Ascending to a new category requires adequate performance in the previous one. The categories of this domain are: knowledge, comprehension, application, analysis, synthesis, and evaluation. The psychomotor domain is about doing, that is, what is related to manual or physical abilities. The categories of this domain are: perception, set, guided response, mechanism, complex responses, adaptation, and organization. The affective dominion is about the feeling facing an object, person, or situation, including relationships, postures, feelings, attitudes, responsibilities, and satisfaction. The categories of this process include: receptivity, response, valuing, organization, and internalization of values.

From this perspective, clinical simulation is an active and innovative strategy of teaching and learning, which enables the articulation of the cognitive, psychomotor, and affective domains. It can be supported by Bloom's taxonomy, as a pedagogic mechanism for the development of nursing competence. Greater scientific depth is required, given the lack of studies that approach such a relationship, and the difficulty of identifying well delineated studies that explore the development of nursing competence, approaching the assessment of the triad of knowledge, skills and attitudes from a global perspective.

This review was motivated by the intent of understanding the development of clinical competence in nursing professionals and students during simulation, using Bloom's taxonomy, based on the articulation of cognitive, psychomotor, and affective domains and the stages of this teaching and learning strategy.

OBJECTIVES

To investigate the scientific evidence on the use of Bloom's taxonomy for development of competence in nursing professionals and students during clinical simulation.

METHODS

Study type

This was an integrative literature review. This method enables a comprehensive exploration of the subject of the study, and contributes to the organization of a knowledge framework for practice, based on scientific evidence in health.

Methodological procedures

The following steps were accomplished: identification of the subject and formulation of a guiding research question; definition of inclusion and exclusion criteria for studies; definition of information to be extracted from selected articles; evaluation of studies included in the integrative review; interpretation of results; and, presentation of the knowledge synthesis.

Data collection and organization

After defining the research theme, the guiding question was developed using the patient-intervention-outcomes (PIO) strategy. The correspondent to the acronym “P” was established as students and health professionals; to the “I,” the use of Bloom's taxonomy in clinical simulation; and to the “O,” the development of competence.

The following question was raised: What evidence is available in the literature on the use of Bloom's taxonomy for the development of clinical competence in health professionals and students during clinical simulation?

Primary studies that satisfied the guiding question, published in scientific journals, electronically available were established as inclusion criteria for the sample definition. There were no limits on language or year of publication. Literature reviews, case studies, dissertations, theses, monographs, and abstracts published in event annals were excluded.

The search for studies was conducted between August and October of 2019, in the following databases: National Library of Medicine (NL), National Institutes of Health (NIH), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Literature in Health Sciences (LILACS), Web of Science, and SCOPUS. In order to give more specificity and drive the search strategy exactly to the intended object of study,
the term “Bloom’s Taxonomy” was used as keyword. The search strategy included limits specific to each database, and validated by a librarian; the descriptors and keywords are shown in Chart 1.

Chart 1 - Characteristics of the process for searching for studies that composed the sample of this integrative review, São Paulo, São Paulo, Brazil, 2019

<table>
<thead>
<tr>
<th>Database</th>
<th>Descriptors and keywords</th>
<th>Search strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed® and SCOPUS</td>
<td>MeSH “Nursing”; “Simulation Training”; “Clinical Competence”; keywords: “Bloom taxonomy”</td>
<td>(Nursing OR Nurses AND “Simulation Training” OR “Training, Simulation” OR “Interactive Learning” OR “Learning, Interactive” AND “Bloom taxonomy” AND “Clinical Competence” OR “Competency, Clinical” OR “Competency, Clinical” OR “Clinical Competence” OR “Clinical Competencies” OR “Competencies, Clinical” OR “Clinical Skill” OR “Skill, Clinical” OR “Skills, Clinical” OR “Clinical Skills”)</td>
</tr>
<tr>
<td>CINAHL</td>
<td>“Students, Nursing”; Nurses; Simulations; “Clinical Competence” keywords: “Bloom Taxonomy”</td>
<td>“Students, Nursing” AND Nurses AND Simulations AND “Bloom Taxonomy” AND “Clinical Competence” OR “Nursing Skills”</td>
</tr>
<tr>
<td>Web of Science</td>
<td>Nursing; “Simulation Training”; “Clinical Competence”; keywords: “Bloom Taxonomy”</td>
<td>TS=(Nursing AND Simulation* Training* OR Bloom* Taxonomy* AND “Clinical Competence”*)</td>
</tr>
</tbody>
</table>

Note: MESH – Medical Subject Headings; DeCS – Health Sciences Descriptors; CINAHL – Cumulative Index to Nursing and Allied Health Literature; LILACS – Latin American and Caribbean Health Sciences Literature.

Data analysis

A total of 883 studies were identified and submitted to the first selection stage, by applying the defined inclusion and exclusion criteria. The studies were selected by two professionals, independently, who read titles and abstracts, applied the Rayyan review, which eliminates duplicate articles and facilitates triage, and used a reliable semi-automation process, which incorporates a high level of usability and effectiveness in the selection process[11].

The nine studies that generated divergence among the researchers were sent to a third individual, who evaluated the inclusion or exclusion. A complete reading of the article was completed to define the final sample. Due to the incipience of studies that used Bloom’s Taxonomy for development of competence in health professionals and students in clinical simulation, an analysis of the references of the included articles was performed. However, no new reference was added for the final analysis. Thus, of the 883 studies identified a priori, four composed the final sample.

The data collected from the articles, using a validated instrument[12], included the following items: identification of the article with title, authors, country, language, and year of publication; objectives; methodological design; results; and, classification of the level of evidence[13]. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[14] recommendations, configured by a 27-item checklist and a four-step flowchart, was adopted for this research, with the intention of improving the integrative literature review and pondering the quality of each article[14]. Therefore, the selection of studies was demonstrated according to PRISMA[14] (Figure 1).

RESULTS

Four primary studies were considered eligible for the final sample of this integrative review, and are presented in Chart 2. Chart 3 demonstrates the phases of clinical simulation and the relationship with Bloom’s taxonomy to develop nursing competence, by means of the distribution of each action, corresponding to the three domains of the proposed taxonomy.
Chart 2 - Characterization of the studies included in the integrative review, São Paulo, São Paulo, Brazil, 2019

<table>
<thead>
<tr>
<th>Reference and language</th>
<th>Objectives</th>
<th>Method</th>
<th>Results/Conclusion/Level of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negri et al.[15]</td>
<td>To create and validate a high-fidelity clinical simulation scenario on nursing care for patients with a colostomy, using Bloom's taxonomy.</td>
<td>A descriptive study on creating and establishing face and content validity of a high-fidelity clinical simulation scenario for nursing care of colostomy patients. The scenario was constructed based on Bloom's taxonomy and, after it was structured, it was tested by a group of third- and fourth-year nursing students in a clinical simulation laboratory of a public university.</td>
<td>The clinical simulation scenario was properly validated and was able to identify relevant contributions to adjust the simulated activity and to test the debriefing, with the support of a checklist. The results show that Bloom's taxonomy contributes to the success in the development of knowledge, skills, and attitudes in nursing. Level of evidence 6.</td>
</tr>
<tr>
<td>Founds et al.[16]</td>
<td>To develop simulated high-fidelity clinical experiences for nursing students on prepartum obstetric scenarios, using Bloom's taxonomy.</td>
<td>A descriptive study, conducted at the University of Pittsburgh School of Nursing. A group of professors developed a protocol with several scenarios for clinical simulation using Bloom's taxonomy.</td>
<td>Nursing professors developed and evaluated the execution protocol for clinical simulation using Bloom's taxonomy for the development of cognitive, psychomotor, and affective skills of the students, considered elements for the development of clinical competence in nursing. It was concluded that this model can facilitate the process for other people who wish to explore simulation as an educational method in nursing. Level of evidence 6.</td>
</tr>
<tr>
<td>Simkins et al.[17]</td>
<td>To develop a teaching strategy to prepare nursing students for professional practice, by means of clinical simulation using Bloom's taxonomy.</td>
<td>Quasi-experimental study conducted in an American nursing university with second-year undergraduate students. Two groups were formed: the first participated in a simulation scenario with a patient with gastrointestinal bleeding; the second had a scenario with a patient with peritonitis.</td>
<td>Both groups developed clinical competence in the proposed scenarios. The students reached the highest-level objectives contained in Bloom's taxonomy, which proved to be a valuable tool for the teaching and learning process. Furthermore, students were satisfied with the simulation. Level of evidence 3.</td>
</tr>
<tr>
<td>Krautscheid[18]</td>
<td>To develop and implement, using Bloom's taxonomy, a high-fidelity simulation to solve ethical dilemmas related to nursing.</td>
<td>A descriptive, quantitative study conducted in a nursing school course at an American university.</td>
<td>The students reported that the educational strategy used increased confidence in ethical decision making and the overcoming of fears. Thus, the simulation assisted by Bloom's taxonomy goes beyond the improvement of the cognitive and psychomotor domains, also improving the affective ability of the students. Level of evidence 6.</td>
</tr>
</tbody>
</table>

Chart 3 - Clinical simulation phases and articulation with Bloom's taxonomy to develop nursing competence, São Paulo, São Paulo, Brazil, 2019

<table>
<thead>
<tr>
<th>Clinical simulation phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloom's taxonomy domains</td>
</tr>
<tr>
<td>Cognitive domain: actions in a hierarchical order, from minor to major complexity for learning: knowledge, comprehension, application, analysis, synthesis, and evaluation.</td>
</tr>
<tr>
<td>Pre-simulation:</td>
</tr>
<tr>
<td>(1) Knowledge: memorize the contents previously received;</td>
</tr>
<tr>
<td>(2) Comprehension: print the meaning of the contents; interpret the knowledge acquired on the subject of simulation. Prebriefing/briefing:</td>
</tr>
<tr>
<td>(1) Knowledge: memorize the contents previously sent;</td>
</tr>
<tr>
<td>(2) Comprehension: print meaning to the contents, interpret the knowledge acquired[15-18].</td>
</tr>
<tr>
<td>Second phase - Participation (execution of the simulated scenario)</td>
</tr>
<tr>
<td>(1) Comprehension: print meaning, interpret knowledge;</td>
</tr>
<tr>
<td>(2) Application: use the learning in the scenario;</td>
</tr>
<tr>
<td>(3) Analysis: analyze the elements, facts, events, and postures[15-18].</td>
</tr>
<tr>
<td>Third phase - Debriefing (reflection of the experience)</td>
</tr>
<tr>
<td>(1) Knowledge: memorizing and retaining of knowledge;</td>
</tr>
<tr>
<td>(2) Comprehension: printing, meaning, interpreting knowledge;</td>
</tr>
<tr>
<td>(3) Synthesis: articulating with the adopted theoretical reference;</td>
</tr>
<tr>
<td>(4) Application: transferring knowledge to real situations;</td>
</tr>
<tr>
<td>(5) Analysis: analyzing elements, facts, events, and postures;</td>
</tr>
<tr>
<td>(6) Evaluating: evaluating weak and strong points, what is taken to practice[15].</td>
</tr>
</tbody>
</table>

(To be continued)
The authors concluded that the use of the educational objectives of Bloom’s taxonomy, investigated its use for the development and assessment of clinical competence in students. The authors concluded that the use of Bloom’s taxonomy is a valuable pedagogical resource to develop knowledge, skills, and attitudes, in addition to solving simple and complex problems, in all social fields.

The development of cognitive knowledge will continue, during the phase of participation in clinical simulation, as long as the following actions are involved, as described by Bloom’s taxonomy: comprehension, application, and analysis. The participant of the simulation understands, during the course of the experience, how to act when confronted with the situation, applies his knowledge to solve it in the most pertinent manner possible, and analyzes whether his knowledge is sufficient to perform that clinical care.

Debriefing, in turn, addresses all aspects of the cognitive domain in Bloom’s taxonomy, as this reflection process leads to knowledge retention, comprehending the context, articulating theory and practice, synthesizing and evaluating learning, configuring itself as a powerful tool to assist in the development of nursing knowledge.

The psychomotor domain, the second component in the triad of nursing clinical competence, massively contributes to the participation phase in the simulation, during the experience in the specific scenario. In this phase, the participant is able to perceive the abilities necessary for completing the scenario, practicing his motor skills, improvising, and organizing his attitudes: objectives proposed by Bloom’s taxonomy.

This statement is confirmed by a descriptive, exploratory study developed at a public Brazilian university, which aimed to identify the development of psychomotor skills in 17 nursing students, by means of clinical simulation. When a simulation is properly planned, and the educational objectives are valued, the students felt supported and safe to develop their skills and acquire the clinical practice.

Regarding the affective domain, the third and final component of the triad for competence training in nursing, it is necessary to develop the will and motivation to learn, using the actions of receiving and responding, already during the stages of pre-simulation, pre-briefing/briefing, and participation, as indicated by Bloom’s taxonomy.

A study conducted at an American university intended to identify gaps and weaknesses in the development of nursing students’ affective domains for trust, decision-making, and health care for patients. Bloom’s taxonomy was used to plan and support the clinical simulation strategy, as a mechanism of competence development. The students obtained an increase in their...
confidence and satisfaction, and the simulation associated with Bloom's taxonomy can go beyond the acquisition of the cognitive and psychomotor domains, producing congruence between knowledge, the act, and the feeling in the nursing student\(^{(18)}\).

The debriefing phase is fundamental to developing the affective domain in a clinical simulation participant, as it involves all the actions determined by Bloom's taxonomy (receive, respond, value, organize, and internalize), which demonstrates the importance of debriefing for the development of clinical nursing competence\(^{(31)}\).

Debriefing, integrated into the educational objectives in a clinical simulation, is helpful in the development of the affective domain in students and professionals, by valuing their emotions in three aspects: their role in teamwork and decision making; their function during the implementation of health care, aiming at emotional competence; and the sensitization of the individuals' own emotions. These aspects are facilitated when debriefing instructors; teachers and facilitators are usually trained to value the emotions of participants during debriefing\(^{(32)}\).

Bloom's taxonomy can be used as a facilitating mechanism and theoretical-methodological framework in nursing simulation, to obtain the development of clinical competence in its participants. It encompasses the cognitive, psychomotor, and affective criteria, demonstrated by a set of educational objectives. This contributes to planning the clinical simulation and development of instruments that aim to evaluate whether the participant, in this pedagogical strategy, developed clinical competence in nursing\(^{(33)}\).

**Study limitations**

The main limitation identified in this study was the scarcity of articles on the development of clinical nursing competence in clinical simulation, using Bloom's taxonomy. This made it difficult to understand and expose the scientific evidence regarding the proposed objective, which reinforces the need for further studies in this context for nursing.

**Contributions to the nursing area**

This research contributes to teaching, research, and nursing care, especially because the results present the combination of the clinical simulation stages and the objectives or actions relevant to each domain of Bloom's taxonomy. This facilitates the use of this theoretical-methodological reference for teachers, researchers, and nurses who aim to develop clinical competence in nursing students and professionals. As it is still a theme of limited exploration, this integrative review addresses a valuable knowledge framework, to support the development of clinical simulation as a strategy for the teaching and learning process in nursing, for competence development.

**CONCLUSIONS**

Scientific studies that address the relationship between Bloom's taxonomy and the development of clinical competence in nursing clinical simulation were identified. The distribution of the educational objectives of each domain of the taxonomy was defined, to enable the development of competence in nursing simulation.

In order to develop the cognitive domain, the objectives must be known and understood, at the stage of preparing clinical simulation; the objectives must be understood, applied, and analyzed, at the stage of participation. The debriefing included all the objectives proposed by Bloom's taxonomy to develop knowledge in nursing, which are: knowledge, comprehension, application, analysis, synthesis, and evaluation.

To improve the psychomotor domain, the participation phase of the clinical simulation has a great contribution, enabling the participant to perceive the skills necessary for performing the scenario. It enables them to train, improvise, and organize their actions and attitudes, in a pertinent and skillful way, for the scenario experienced in the simulation.

The affective domain is developed in the first stages of the clinical simulation, when the determination and motivation to learn from the individual are valued and intensified during debriefing, which involves all the actions determined by Bloom's taxonomy during the reflective process. This justifies the importance of debriefing for the development of clinical competence in nursing.

The competency clinic in nursing can be developed by adopting Bloom's taxonomy and appropriately using its educational objectives, in each phase of the clinical simulation, facilitating the improvement of nursing knowledge, skills, and attitudes. Further research, methodologically well designed, using Bloom's taxonomy for development of nursing competence in clinical simulation is needed.

### REFERENCES