Acquiring University Teaching Competences with Clinical Simulation in Health Sciences Education

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Abstract

Background: Clinical simulation exercises provide students with the opportunity to engage in role-playing and to reenact a professional situation. They can thus practice treating patients in simulation labs that replicate real-life scenarios that can be complicated, stressful, or even conflictive. The aim of this study was to determine the degree of satisfaction of a group of postgraduate students enrolled in the Masters in Teaching at the University of Granada (Spain) with this teaching technique.

Methods: We conducted a longitudinal study over the 4-year period. To ascertain the students' satisfaction with quality of the clinical simulation lab, they were asked to fill out a survey. The sample population of this study consisted of 108 students in the four groups of the Master's program. During the 4-year study period, students were required to design and prepare a clinical case study, with a set of objectives and a topic related to their degree or specialization. The presentation, which had a duration of fifteen minutes, was given in a simulation lab.

Results: The 100% of the Master's students either agreed or strongly agreed that simulation was a useful teaching method and that the simulation scenarios envisaged were realistic. Of the sample, 77.8% affirmed that the simulation experience had improved their use of new technologies. All of the students agreed or strongly agreed that the simulation helped to develop their capacity for critical reasoning and decision-making.

Conclusions. The results obtained confirmed that the students valued this technique and regarded it as an innovative strategy that fosters immersive learning, and which has great potential for the development of clinical competence. Not only did it boost their self-confidence, but they claimed that it also opened new professional doors for them and trained them for a possible future as a university lecturer.

Background

In the world today, teaching has changed dramatically. Classes today bear little or no resemblance to how they used to be five to ten years ago. Gone are the days when the professors were only expected give lectures while the students hurriedly scribbled notes in an effort to capture every word. Also gone are the days when the latest technology involved using an overhead projector to beam a static image onto a blank screen. Today there are countless electronic gadgets and digital media that can be used in the classroom to enhance the learning process. These include tablets, flat screens, mobile phones, social networks, virtual classes, whiteboards, interactive touchscreens, etc.

Unfortunately, despite the availability of these devices, many teachers have not been able to integrate them into their teaching plan because they lack the time to do so. Their heavy workload (e.g. long class hours, organization of postgraduate studies, administrative duties, research projects, etc.) is an insurmountable obstacle to getting acquainted with such devices and effectively integrating them into the new type of classroom dynamics that they entail. All too often, university teachers do not have

sufficient time to recycle, practice new skills, and redesign their classes in order to incorporate new technologies.

In fact, teaching has become a great challenge in a world where students have a decided preference for digital media and seem to learn faster when they are engaging in activities outside the classroom. The question is how to compete with different types of computer application and tutorials on social networks. Precisely for this reason, a growing trend in universities is to focus on teaching strategies based on student learning outcomes, which incorporate problem-solving, decision-making, communication, creativity, teamwork, and leadership (1). Universities are thus expected to organize and offer courses that can enhance these skills in their students.

Accordingly, current teaching strategies in university education identify a set of basic components that facilitate expected learning outcomes. In this sense, they place the focus on active learning strategies that introduce students to problem-based teaching, play-based learning and simulation, case study and resolution, and student participation in projects and presentations, as well as online tutorials with the teacher (2). In contrast to more traditional approaches, these active-learning techniques require students to participate and even take charge of their education and learning.

However, this is not always easy because students have increasingly less time to devote to their studies. For example, many of them work as well as study because of the economic crisis. This part-time dedication to academic studies often reduces students' motivation and makes them less willing to take on the additional commitment required by active learning approaches. Nevertheless, it is undeniable that students can derive greater benefit from such environments (Roberts 2008), given that the desired outcomes in university courses are more likely to be achieved when the teaching style involves the active participation and interaction of students (3).

The issue is how teachers can successfully incorporate this type of methodology in the classroom in order to motivate students and maintain their interest. Currently in Spanish universities, there are a plethora of courses and masters programs, which help teachers to become familiar with innovative teaching methods that are more in consonance with the requirements, needs, and expectations of students in the 21st century. In healthcare fields such as Nursing, Physiotherapy, Medicine, Pharmacy, and Odontology, the impact of continuous changes, medical advances, and modernization requires training and capacity development in an extremely specialized environment.

In this regard, clinical simulation techniques are excellent tools that can be used to make teaching more dynamic, especially since they incorporate new technologies such as tablets, computers, mobile phones, audio-video equipment, specialized patient-care mannequins, etc. Simulation is defined as a teaching method that immerses students in a controlled clinical scenario that resembles a real-life situation (4). Today it has become one of the techniques of choice in the training of healthcare professionals since it best enables them to go out and successfully treat patients in a wide range of possible scenarios. In this sense, medical schools are using simulation at all levels of training (5). Clinical simulation facilitates

critical thinking. It also enhances skills, foments self-reflection and provides students with valuable experience that they will be able to use in their future role as healthcare professionals (6).

The aim of this study was to measure the degree of satisfaction of a group of master's students with a teaching unit on healthcare processes. This unit focused on the development of the students' teaching capacity by means of exercises based on the simulation of actual clinical situations that could arise in professional practice

Methods

Study design and sample population

The study protocol was approved by the Ethics Committee of Center of Granada (CEI-GRANADA).

A descriptive transversal study was carried out. The sample population was composed of 108 students, 20 men and 88 women, 22 – 50 years of age (Table 1). All of the subjects were healthcare professionals with degrees in Nursing, Physiotherapy, Medicine, Pharmacy, Odontology, Nutrition and Dietetics, and Occupational Therapy.

Methods of measurement.

During the 4-year study period, students were required to design and prepare a clinical case study, with a set of objectives and a topic related to their degree or specialization. The presentation, which had a duration of fifteen minutes, was given in a simulation lab. The simulation lab mimicked a specific clinical area, and had the material and technology necessary for the resolution of clinical cases. This technology included a simulator with its hardware, a patient-care mannequin and a one-patient clinical sim room. There was also a control room, from where the clinic was run. This facilitated the evaluation of the student's aptitude and ability to control or direct actions. In addition, the simulation lab included a separate debriefing room where students could watch and analyze the videos, followed by an analysis and discussion of cases.

After the students had completed the Master's program, they were asked to fill out a questionnaire. They were informed that their participation in the survey was voluntary. The purpose of the questionnaire was to measure their satisfaction with the clinical simulation lab. The questionnaire had 19 items (see Annex 1), which the respondents evaluated on the following five-point Likert scale: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree. A separate item was also included for observations. The questionnaire has an original single-factor design. Its content was validated by a panel of experts though no psychometric tests were applied. The questionnaire was initially piloted with 4,000 students, whose observations permitted the adaptation of this instrument to the cultural context in Spain (7). The answers of the respondents were evaluated by adding up the number of points corresponding to their level of agreement with each item. A maximum number of 95 indicated the highest degree of satisfaction whereas a minimum of 19 indicated the lowest degree of satisfaction.

This questionnaire had two dimensions. The first dimension, Teaching Methodology and Perception encompassed items 1, 3, 4, 5, 6, 7, 8, 13, 14 and 19. It focused on the students' opinions and their perceptions of the usefulness of the methodology and its implementation in the simulation lab. This dimension also focused on the degree to which students believed that the use of this type of immersive teaching strategy would facilitate and enhance their future professional development. The second dimension, Clinical Simulation Method as an Educational Technique, was composed of items 2, 9, 10, 11, 12, 15, 16, 17, and 18. This dimension measured the satisfaction of the students with the practical and theoretical knowledge acquired in the hands-on simulation scenarios reproduced in the clinical sim lab rooms.

The statistical analyses were performed with the SPSS 20 software package and Prism 8.0 (GraphPad Prism, San Diego, California, USA). The results were expressed as frequencies, percentages, and mean values $\pm$ standard deviation, ($X \pm SD$).

Results

The sample population had a higher percentage of female students (81.5%) than male students (18.5%). The majority of the subjects were between 20 and 30 years old (91.7%) with a mean age of 26.6. Of the sample, 66.7% had a degree in Nursing, whereas 7.4% had a degree in Pharmacy, Dentistry or Nutrition, followed by those with a degree in Medicine, Physiotherapy or Occupational Therapy (3.7% (Table 1).

Table 2 shows that 100% of the Master's students either agreed or strongly agreed that simulation was a useful teaching method and that the simulation scenarios envisaged were realistic. Of the sample, 77.8% affirmed that the simulation experience had improved their use of new technologies. All of the students agreed or strongly agreed that the simulation helped to develop their capacity for critical reasoning and decision-making. Similarly, 88.9% stated that the simulated cases were adapted to their theoretical knowledge, and 74% confirmed that the experience with the simulator had increased their sense of self-reliance and self-confidence. It was also very significant that 81.4% of the subjects were of the opinion that the simulation had helped them to integrate theory and practice, whereas 92.6% thought that it would be useful to view recordings of their simulations. According to 81.5%, the duration of the clinical case was appropriate, and all students affirmed that this type of teacher training was suitable.

Of those surveyed, 74% affirmed that the clinical simulation had helped them to prioritize nursing actions and that the simulation classroom was equipped with sufficient material resources. Moreover, it was the belief of 88.8% of the students that interaction with the simulation would improve their clinical competence and that clinical simulation enhanced teamwork. All of the students agreed that the role of the leader in the simulation promoted teamwork and that clinical simulation encouraged communication between team members. The same applied to the debriefing, where 92.5% stated that it provided them with useful feedback and constructive criticism. Generally speaking, there was an extremely high approval rate since 96.3% of the respondents agreed or strongly agreed that the experience with clinical simulation had been extremely satisfactory.

As previously mentioned, the survey had two dimensions: (1) Teaching Methodology and Perception (items 1,3,4,5,6,7,8,13,14, and 19); (2) Clinical Simulation Method as an Educational Technique (items 2,9,10,11,12,15,16,17 and 18). Regarding the first dimension (Fig. 1) and the competences acquired, there was a difference in the improvement levels of technical skills and clinical competences. The level of self-reliance and self-confidence had the same percentage. As for the adaptation of the clinical cases to theoretical knowledge, despite the difference in the integration of theory and practice, the students also evaluated this item very positively with a similar percentage. Based on the answers of the respondents, clinical simulation allowed students to develop critical reasoning and decision-making as well as to prioritize their actions and motivate their learning. Generally speaking, their responses showed that simulation was a very effective teaching method, which they were very satisfied with.

The mean values of the responses in Fig. 2 show that the items that received the highest evaluations were 1, 4, 14, and 19. In other words, the students liked simulation, since it helped them to develop their critical reasoning and decision-making capacity, which allowed them to improve their clinical skills. In line with this, the students were very satisfied with simulations because they were a source of motivation that helped them to learn as well as to integrate theory and practice.

As for the second dimension, which focused on the students' satisfaction with clinical simulation as a teaching technique, Fig. 3 shows that according to the students, this technique promoted teamwork and communication, and that they considered leadership to be crucial. However the same did not occur with the item pertaining to the scenarios and resources in the simulation room, which were regarded as merely adequate. The quality of teacher training received a positive evaluation as well as the debriefing sessions. The item that received the lowest evaluation was the duration of the clinical case. The fact that the simulations were recorded was something that the students especially appreciated.

As reflected in the mean values of the responses to the questions (Fig. 4), it is evident that satisfaction with the clinical case was very high. In contrast what the students were less satisfied with was the duration of the clinical case (item 10) and the resources in the simulation classroom (item 12).

Discussion

Simulation provides students in different healthcare fields with the opportunity to practice clinical skills. For this reason, simulations based on clinical cases are frequently integrated into undergraduate and graduate studies in health sciences as an active learning strategy. This teaching method is perceived by students as more authentic and realistic because the didactic techniques selected are a vivid reflection of reality and encourage students to actively participate in their own learning (8). Simulation-based learning is the product of this teaching method, which engages and motivates students. The results of our study showed the degree to which students appreciated this technique since it heightened their personal engagement and commitment to learning. Their degree of satisfaction is reflected in the positive results of the survey.

Another very important aspect regarding the use of simulation in the education of health professionals is its potential to increase their sense of self-reliance and self-confidence since it allows students to practice and make mistakes in a controlled environment. In relation to this, (9) notes that committing errors is also an important part of the learning process. When students do something wrong, they remember their error, which they can thus avoid in their future work.

Simulation-based learning clearly provides opportunities for repetition, error diagnosis and correction, and interactive practice. This can be observed in the first dimension of the survey, where the students said that they felt more self-reliant and confident in themselves while developing their clinical case. This increased their motivation to learn, and fomented their critical thinking ability in the clinical scenario where students assumed different healthcare roles as if caring for a live patient.

Certain studies have suggested that students in the educational environment do not always take advantage of learning opportunities since many of them are afraid of making mistakes, and of thus becoming an object of ridicule (10). In this study, however, the simulation gave students the opportunity to practice without endangering the patient, to apply medical procedures, and to learn from their errors. It also taught them how to prioritize actions and feel comfortable and at ease within the simulation lab. The fact that various cameras were filming them as they took part in the simulation of the clinical case did not appear to make them self-conscious or to bother them at all. In fact, the vast majority of students said they felt relaxed and confident as they participated in the role-play.

As for the second dimension, point out that learning consists of conferring legitimacy to newcomers in a certain community by allowing them to have access to community practices and experiences (11–12). When they can directly observe and simulate the practices of experts, they gain a better understanding of the broader context and are able to grow within the community and eventually become experts themselves. Rather than by means of formal teaching, much of the learning that takes place in a community is through relationships between members of a group. This means that control does not lie with the teacher but rather in the organization of the community of practice of which the teacher is a member. The results of this study indicate how teamwork, communication and leadership have been promoted as basic capacities within the simulation exercises. These are capacities that students will have to use very frequently in their work because healthcare professionals are generally part of multidisciplinary teams.

Different studies have shown that in clinical simulation methodology, discussion through debriefing is not only a very important element, but quite possibly, the most important element. In debriefing sessions, the teacher facilitates reflection among students so that they can evaluate their decisions and actions (13–14). These sessions are where students can evaluate the context and feedback of their own performance and actions as a way of fomenting discussion and critical thinking in the classroom. As such, they become a gateway to other educational perspectives (15).

Simulated environments are becoming more widespread. However, educational resources are limited and students are usually numerous. The students who were surveyed in this study stated that the main

drawback was that there was insufficient time devoted to this type of practice. Moreover, the resources of the simulation lab were regarded as insufficient despite its complete set of high-fidelity simulation equipment, such as human patient simulators, audio-video equipment, bedside computers, headwalls, etc. In all likelihood, even though they were all healthcare practitioners working in some type of healthcare service, they felt more secure when performing the simulation technique. Understandably, they would have liked to have more time to practice.

In this sense, research is beginning to report positive educational results when practicing healthcare professionals are also able to participate in simulations. Some studies obtained important qualitative data when the traditional clinical model was complemented by offering 25% of the pediatric clinical rotation with the simulation lab (16). After four days of simulations, nursing students were asked to evaluate the experience. The faculty members were also asked to comment on the authenticity of simulation and to evaluate the students' performance at the end of the entire simulation experience. Another study compared the effectiveness of simulation to clinical experience for nursing students and found that simulation led to a significant increase in student confidence in their performance, although the clinical performance results were not entirely conclusive (17–18).

Conclusions

In conclusion, the students highly valued the opportunity that they were given to assume healthcare roles and respond to different scenarios. This permitted them to develop clinical expertise in a safe environment without the responsibility of treating a real patient in an actual clinical setting with all that this entails. In addition, the students showed an objective and critical understanding of the benefits derived from active learning. This experience intensified their motivation to further expand their knowledge because they were able to work in a controlled simulated environment that replicated clinical situations that they might encounter in their work.

They also acknowledged that actually dealing with clinical cases instead of merely reading about them helped to retain learning. They felt more self-assured and were able to gain a clearer perception of their competences, thanks to simulation-based learning that permitted them to actively apply their knowledge and skills in the Master's Program in Teaching. This also showed them how this technique could be used in a university teaching environment, as reflected in their high level of satisfaction with the two dimensions analyzed in our study.

Finally, given the current workload of most healthcare practitioners, the acquisition of skills in simulation environments is not easy because of lack of time, not to mention the cost involved. A possible solution can be found in masters programs and specialized courses on simulation as a teaching technique. Nevertheless it is important to also bear in mind that a clinical sim lab with high-fidelity simulation equipment and resources can only provide one portion of the learning experience. Simulation of whatever type can never replace the time spent on real patient care in an actual healthcare setting. Nevertheless,

when simulation has a solid theoretical foundation, it is a valuable complement for real clinical experience.

Abbreviations

Not applicable

Declarations

Author Contributions

RFC conceived paper, oversaw data collection, conducted data analysis, wrote manuscript and approved final version. RGP an ALG participated in study design, data analysis and interpretation, critically revised manuscript and approved final version. FJG participated in study design, data analysis, and interpretation of data and revision of manuscript and approved final version. RFC participated in study design, interpretation of data and revision of manuscript and approved final version.

Ethics approval and consent to participate:

The study protocol was approved by the Ethics Committees of the Center of Granada (CEI-GRANADA). and all participants provided written informed consent.

Consent for publication

Not applicable.

Competing interests

No competing interests.

Availability of data and materials

Not applicable

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Figures

Figure 1

First dimensión. Teaching Methodology and Perception. The percentage corresponds to the total number of students who have answered questions 4 (Agree) and 5 (Strongly agree).

Figure 1

First dimensión. Teaching Methodology and Perception. The percentage corresponds to the total number of students who have answered questions 4 (Agree) and 5 (Strongly agree).

Figure 2

First dimensión. Teaching Methodology and Perception: Mean Value by answers

Figure 2

First dimensión. Teaching Methodology and Perception: Mean Value by answers

Figure 3

Second dimensión. Clinical Simulation Method as an Educational Technique. The percentage corresponds to the total number of students who have answered questions 4 (Agree) and 5 (Strongly agree).

Figure 3

Second dimensión. Clinical Simulation Method as an Educational Technique. The percentage corresponds to the total number of students who have answered questions 4 (Agree) and 5 (Strongly agree).

Figure 4

Second dimension. Clinical Simulation Method as an Educational Technique: Mean Value by answers

Figure 4

Second dimension. Clinical Simulation Method as an Educational Technique: Mean Value by answers