Learning during a simulation training program: a conceptual replication

Aprendizaje durante un programa de formación en simulación: una replicación conceptual

Cristina Losey Pelayo [1], **Dr. Jimmie Leppink** [2, *], **Elena Rojo Santos** [3], **Marta González Anillo** [4],
Dr. Ignacio del Moral [5], **and Dr. José María Maestre** [6]

[1] Valdecilla virtual hospital; cristinaloseypelayo@gmail.com
[2] Valdecilla virtual hospital ; j.leppink@gmail.com , https://orcid.org/0000-0002-8713-1374
[3] Valdecilla virtual hospital, Marqués de Valdecilla University Hospital; erojo@hvvaldecilla.es ,
    https://orcid.org/0000-0002-0866-6005
[4] Valdecilla virtual hospital; mrtanillo@gmail.com
[5] Valdecilla virtual hospital, Marqués de Valdecilla University Hospital; idelmoral@hvvaldecilla.es ,
    https://orcid.org/0000-0002-4065-8304
[6] Valdecilla virtual hospital, Marqués de Valdecilla University Hospital; jmmaestre@hvvaldecilla.es ,
    https://orcid.org/0000-0003-1303-6240
* Correspondence: j.leppink@gmail.com

Summary: (1) *Introduction* : The widespread adoption of healthcare simulation as a teaching tool has led to a growth in training programs for simulation instructors. However, there are few studies documenting the effectiveness of these programs. The objective was to study the transformation experienced by participants in an *on-site edition* of a specific training program and compare the possible differences observed with an online edition of the same program, previously studied and published. (2) *Methods* . The program consisted of a 15-day *online* interactive module , 4 8-hour *on-site* days , and a one-on-one *online session* with one of the instructors. Each *on-site day* resulted in individual written reflections, which were categorized according to the learning themes described by Kolbe and Rudolph (2018). (3) *Results* : 25 subthemes were identified that group a total of 78 elements identified in the 38 responses of the participants, categorized according to five learning themes: notes for oneself, evaluations, metacognitions, application anticipations, and emotions. (4) *Conclusion* : A comparable professional development progression was identified between the in-person on- *site* (the current study) and *online* (the previously published study) format.

Keywords: learning; qualitative research; conceptual replication

Resumen: (1) Introducción: La adopción generalizada de la simulación en salud como herramienta docente ha dado lugar a un crecimiento de los programas de formación para instructores de simulación. Sin embargo, son escasos los estudios documentando la eficacia de estos programas. El objetivo fue estudiar la transformación experimentada por los participantes en una edición in situ de un programa de formación específico y comparar las posibles diferencias observadas con una edición online del mismo programa, estudiada y publicada anteriormente. (2) Métodos. El programa consistió en un módulo interactivo online de 15 días, 4 días in situ de 8 horas y una sesión individual online con uno de los instructores. Cada día in situ resultó en reflexiones escritas individuales, que se categorizaron según los temas de aprendizaje descritos por Kolbe y Rudolph (2018). (3) Resultados: Se identificaron 25 subtemas que agrupan un total de 78 elementos identificados en las 38 respuestas de los participantes, categorizadas según cinco temas de aprendizaje: notas para uno mismo, evaluaciones, metacogniciones, anticipaciones de aplicaciones, y emociones. (4) Conclusión: Se identificó una progresión del desarrollo profesional comparable entre el formato presencial in situ (el estudio actual) y online (el estudio publicado anteriormente).

Palabras clave: aprendizaje; investigación cualitativa; replicación conceptual

1. Introduction

In recent decades, health simulation has been widely used as a learning method in the education and evaluation of health personnel, as it offers the possibility of replicating clinical practice environments to achieve specific educational objectives (1). This tool allows participants to learn effectively (2), although it is important to use appropriate teaching methods and practices (3). In this sense, some scientific societies, such as the International Society of Nursing Simulation (INACSL), have created standards of good health simulation practices that include a list of characteristics that lead to effective learning (4-5). There are also accreditation programs for educational centers by the International Society for Simulation in Health (SSiH) or the American College of Surgeons (ACS). In addition, there is a growing offer of training programs for instructors that use simulation as a teaching tool in our surrounding countries. The objective of these programs is to give participants tools to use simulation according to the best available practices and thus generate a significant learning impact on students. However, this contrasts a paucity of studies evaluating the evaluation of participants who receive such training.

In the interest of promoting a culture of data collection in this field, Leppink et al. studied the learning experiences of simulation instructors who participated in an *online edition* of a training program (6). This study reveals a progressive transformation during the training program. The thoughts, feelings and dilemmas that professionals experience during the learning process identified by Kolbe and Rudolph (7) were used as a framework of reference, in five themes: evaluations of tools, anticipations of how these tools can be applicable in the professional environment, metacognitions about one's own learning process, notes for oneself, and emotions. In the *online program* , a stability of the same themes was seen (6).

One of the advantages of the *online modality* is that it offers flexibility and access from any location, which allows it to be better adapted to the individual circumstances and needs of the participants. While it is true that the scientific literature shows that *online learning* can be just as effective as *on-site learning* (8), there is a belief that face-to-face interaction in the *on-site modality* would facilitate the development of a more stimulating experience. , more immersive learning and therefore a greater learning impact (9). For learning in *on-site* and *online* formats to achieve a similar learning impact, it is necessary to highlight the importance of creating – in both formats – immersive and stimulating experiences because they favor the learning process in multiple ways (10). First of all, they guarantee greater attention and concentration. Secondly, they facilitate the retention of information by stimulating memory and strengthening cognitive connections. Thirdly, they strengthen motivation and commitment, since by feeling connected and emotionally involved with the learning experience, there is a greater willingness to actively participate and make additional efforts. Fourth, they facilitate the transfer of skills and knowledge to real-world situations.

Both *on-site* and *online formats* can provide meaningful learning opportunities. However, there are some challenges in the *online modality* that can influence learning. *On-site* training encourages social and collaborative learning by promoting interaction between participants who are in the same physical location, not only through group activities and face-to-face discussions during teaching activities, but also during rest and meal periods. . Although social interactions can occur through online tools in *online training, virtual nature can make it difficult to create solid social ties (11). Additionally, online*

training faces other challenges associated with technical difficulties, internet stability, and the less controlled physical environment (e.g., distractions caused by other household members) (12, 13) that disrupt attention and concentration. of the participants during the training. Another challenge that interferes with immersive learning during *online* training is a phenomenon that emerged during the era of virtual learning known as 'Zoom fatigue' (14) and is caused by (i.) excessive eye contact of close, (ii.) the search for non-verbal cues, (iii.) the reduction of habitual mobility, (iv.) the distractions when seeing one's own image that increases stress due to constant self-consciousness and (v.) excess cognitive load that prevents satisfactory information processing (15-16).

Considering this scenario, the interest arises in studying the possible differences in impact on the learning process in the participants in the same program taught in *online format* (6) and *in situ* (the current study). Thus, the objective of the present study is to investigate the transformation experienced by participants in an *on-site edition* , using the same frame of reference (6-7), and to compare the results with a previously published online edition of the same program (6), comparing the stability of learning themes that appear in both versions of the program with the work of Kolbe and Rudolph (7).

2. Methods

In this qualitative study, a narrative analysis of the longitudinal evolution of the experiences of participants in a program to facilitate their professional development was carried out.

Study context

The study took place at the Valdecilla virtual Hospital (HvV), Santander (Spain). The HvV is a center of innovation and high-performance training for health professionals. The program analyzed aims to develop health simulation instructors and is called 'Fundamentals of Health Simulation: design and *debriefing* ' (FSS, 17), which is developed in collaboration with the *Center for Medical Simulation* (CMS) of Boston (USA), offered both *on-site* and *online* , in English (CMS) and Spanish (HvV). The participants in this program are usually professionals from any health area who use simulation, such as doctors, nurses, psychologists, educators, engineers, etc. from hospitals, health centers and universities in Spain and Latin America, with varied experiences in the use of simulation. simulation in health, although they share a common interest in acquiring fundamental skills to effectively integrate simulation into their professional environment.

The program was offered in an *on-site format* between October 10 and November 12, 2022. The study was approved by the Clinical Research Ethics Committee (CEIC) of Cantabria (code: 2022.157). The program offered in *on-site mode* shares the same curriculum and the same teaching methodology, duration and the same facilitators as the program offered in *online mode* studied and published previously (6). Both are structured into three learning modules focused on the development of a project for your center or institution and their main characteristics are described below.

Module 1 (1st and 2nd week): Using an online platform (18), it serves to create a community of practice, prepare the project by each participant and offer teaching material for consultation.

Module 2 (3rd week): Its objectives are to develop the institutional project and integrate simulation to facilitate change in the organization. The *online* and *on-site* edition share the same content, objectives, agenda and resources (such as slides, interactive sessions with all

participants, groups to work on practical activities of between 4 and 5 people). Although in both modalities the participants care for simulated patients and clinical cases are carried out with the same objectives, in the *on-site edition* the team interacts in the HvV itself, in the *online edition* the team cares for patients who are with nurses and other clinicians in the HvV through a virtual environment (using the Zoom ®platform). Contact between participants in the *online program* is limited to the virtual space, while in the *on-site edition* there is also the possibility of interactions during meals and breaks.

Module 3 (4th or 5th week, depending on the participant's availability): Its objective is individual mentoring on the challenges of project implementation and, in both modalities, it is done online for one *hour* .

Participants

As in other editions of the program, doctors, nurses and other professional personnel interested in health simulation participated. Although within each edition the experience with simulation is to a certain degree variable, participants have in common their interest in using simulation in their work environment in the best possible way. The current edition of the study included eleven participants, which is more than enough for a qualitative study that aims to establish common themes in a relatively homogeneous group (6, 19).

Variables and data collection

The transformation experienced by participants during the training program was studied in relation to their knowledge, skills and perspectives as health simulation instructors, as well as their intention to incorporate and apply them in their future professional practice. For this, data was taken from two sources. On the one hand, quantitative questions about the learning experience (6, 20): (i.) *today's knowledge has been new* , (ii.) *the presentation of today's content has facilitated learning* , and (iii.) *I will be able to apply today's contents in the functions I perform in my job* . On the other hand, there was a fourth question: *please describe what you take away from today* , in line with the key question of Kolbe and Rudolph (6, 7), and with an exploratory and open approach that aims to access the subjective perspective and mental content of the participant at a specific moment. The data collection procedure and platform (21) coincide with those used in the previous study (6).

Analysis of data

The responses to the open question were analyzed independently by two of the authors of this article (CLP and MGA). The five themes of Kolbe and Rudolph (7) were used as a framework of reference, coding each element in each response as part of one of said themes, always considering the possibility that another theme might be necessary. This framework has been used in the previously published *online edition* of the same program (6), which allows studying the possible differences observed between both modalities or formats. Both previous studies resulted in the same key themes: self-notes, evaluations, metacognitions, application anticipations, and emotions.

Once this task was completed, the authors in charge of coding the responses individually (CLP and MGA) pooled their codings and discussed any differences in the presence of a third party, also the author of this study and responsible for refereeing the process (JL). Although this third step was not necessary in the previously published online *study because there were no differences in coding between authors that could not be resolved at the time, having the possibility of involving a referee provides more rigor to the data analysis.* The themes were then analyzed with emphasis to develop a sequence of change and learning, identifying key themes. The consensus resulting from this step was presented to the other authors of this article to verify the final result.

3. Results

In total, the eleven participants gave 38 responses: six participants on 4 days, four participants on 3 days, and one participant on 2 days; In this way, on the first day 8 responses were obtained, on the second day 10 responses, on the third day 11 responses, and on the fourth day 9 responses. This uneven loss of data does not facilitate the analysis of quantitative questions, but it does not make qualitative analysis difficult either.

Table **1** presents the 25 subthemes that group a total of 78 elements identified in the 38 responses and how they fit with the key themes (6, 7) mentioned above.

Table 1. Subthemes identified in this study and their fit with the five key themes of two previous studies (6-7).

Topics	Subthemes of the current study	Examples of participant items
Evaluations	Positive assessment of the instructor's skills and performance	"The patience of the instructors"
	Recognize the usefulness of *debriefing* and simulation	"Simulation is a very powerful tool for learning"
	Course rating	"A great course"
	Positive assessment of the resources used in the course	"The *debriefing* of the *debriefing* seemed key to me"
	Identification of improvements in the course	"More practices and simulations"
	Positive evaluation of the tools provided	"I like the non-punitive approach"
	Positive evaluation of the contents	"Everything learned is basic to apply the contents"
Grades	Recognize the importance of structuring	"The importance of structuring training"
	Recognize the importance of exploring mental models	"Behind an action there is always a reason"
	Recognize the importance of language and words	"How to start a question"
	Recognize the importance of practice	"Practice to do it fluidly and naturally"
	Recognize the importance of active listening	"Active listening"
	Recognize the importance of emotions	"The importance of investigating emotions and facing them"
	Recognize the importance of *debriefing* with good judgment	"The appropriateness of *debriefing* with good judgment, with the premise of respect"
	Recognize the importance of linking learning to the needs of the organization	"Identify what I want my team to be prepared for and what skills they need to do so"
	Recognize the importance of defining the preparation plan	"Clarity of objectives serves as a guide during the *debriefing* "
Metacognitions	Reviews or reflections of one's own learning process	"Abstract concepts that we are not used to handling"
	Identify what helps me in the learning process	"Putting into practice what I have learned helps me understand the process"
	Identify what I need to improve or	"Change things you did and

	learn	improve day by day"
	Identify the challenges that arise in the learning process	"It is easy to fall into learned behaviors"
Anticipations	Future applicability of concepts, ideas and tools	"I take away ideas and tools for my initial project and others to come"
	Future applicability in different contexts	"Applicability in daily practice"
Emotions	positive feelings	"Feeling that it was worth it"
	Psychological safety	"Sense of tranquility in practices"
	Positively value sharing the course with colleagues	"I like to do *debriefings* with colleagues"

The five key themes stated above (6-7) can explain all the information shared by participants in the current study.

Table **2** presents the percentage of unique elements shared by each following participant, starting with the participant who has shared the most elements, followed by the participant who adds the most elements given the elements already shared, and so on until reaching the participant who shares the fewest new elements. .

Table 2. The percentage of unique items shared by each following participant.

Participant	Unique elements	% only	cumulative %
i.	16	20.5%	20.5%
ii.	14	17.9%	38.5%
iii.	13	16.7%	55.1%
iv.	9	11.5%	66.7%
v.	7	9.0%	75.6%
vi.	6	7.7%	83.3%
vii.	5	6.4%	89.7%
viii.	3	3.8%	93.6%
ix.	3	3.8%	97.4%
x.	1	1.3%	98.7%
xi.	1	1.3%	100.0%

The first six participants share 80% of the elements shared in the current study, which is not to say that the other participants have not mentioned any element in this 80% but rather that they contribute 20% of the remaining elements. Ultimately, thematic saturation is indicated by the fact that each subsequent participant contributes fewer unique elements and the last participant has less than 5% unique elements (19). Furthermore, it should be noted that to identify the five key themes presented in table 1 (6-7) a single participant could have been sufficient.

The impact of the program on the participants as educators can be extracted from the analysis of the different themes carried out below.

Evaluations

In tool evaluations, simulation becomes seen as not only a " *very powerful tool for learning* ," but also " *a methodology to resolve a problematic situation* ." In this way, the

participants' own vision as facilitators of learning is transformed to also identify themselves as facilitators of change in the organization. In addition, they recognize that they can apply "tools for *debriefing* in conversations in daily work." In relation to this, they conceptualize the importance of starting by understanding " *what needs my team has* " and that " *we have to make a sociogram to see what alliances I need* ." In this sense, the importance of using, on the one hand, tools that allow giving structure and guiding the " *complete design of a training action* " is highlighted, such as " *the different zones* " (simulation) (22) and, on the other hand, , tools that facilitate implementation, such as the creation of stimulating learning environments and the application of *debriefing* through " *a non-punitive approach, always thinking about good intentions* " and " *carrying out the simulation with good judgment* " (23-24).

In relation to the evaluation of the sessions, the participants positively value the opportunity to " *put into practice what they have learned* " in a stimulating and participatory context by highlighting " *the patience of the instructors while we try* " and point out the importance of receiving *feedback* from facilitators . " *with a lot of experience and who give us their advice* ", especially in the area of *debriefing* ('the *debriefing* of the *debriefing* ').

Metacognitions
They reflect how people with experience in the field of simulation face new perspectives (" *a completely new world* ") that are not in harmony with their usual practices (" *abstract concepts that we are not used to handling* ") and allow them to " *name it.* " to *activities that I did without thinking about it* ." Thus, they identify gaps in their usual practice (for example, " *it is easy to fall into learned behaviors* ") and new challenges arise, such as " *it is difficult mentally to change a way of thinking that has been culturally instilled in us for a long time* ." Given this approach, reflections are observed on the contents learned in the learning process from a meta-level, through which possible challenges are anticipated to " *present the basic principle* " or learn to " *frame, argue and investigate the theme* " for " *the identification of mental models* " (23). With all this, the advances regarding " *the design of my simulation project* " and its " *teaching and application* " predominate, such as " *I am clearer about the* (simulation) area *in which I am going to move* ", " *I take a new approach to debriefing* " and " *I have learned its 4 phases* ". Another aspect to highlight is the awareness of what facilitates learning to close the gaps identified in the usual practice (" *the practice has helped me understand the process much more* " and what needs to be improved or learned, where the importance of " *repeating and repeating to integrate it and consider it learned* " and the need for " *a change of outlook, analyzing situations without prejudice and with sincere interest* " to become reflective professionals and continue " *always learning* " (23, 24) .

Grades
They also express the progressive transformation of the participants. In this sense, learning is understood not as a specific event, but as a longitudinal process with activities of increasing complexity (" *the existence of a continuum in learning that involves a progressive approach to teaching and simulation* "), which there is to adapt to the needs of the participants (" *it is important to know what I want my team to be prepared to do in a given situation and to know what skills they need to have for it* " and thus " *generate my own projects* ").

From the perspective of change agents, the importance of " *considering your project taking into account the needs of the organization* " is highlighted. Thus, in addition to individual and team learning, it is important to influence the work system so that what has been learned can be implemented ("there are *many factors that influence the success of a project* " and the " *importance of structuring training to improve the system taking into account*

its complexity and needs . As educators, they become aware of the importance of understanding learning as a relational event, where it is necessary to include principles of respect (" *the basic principle of respect and the importance of verbalizing it* "), " *transparency* " and " *active listening* " because " *Behind an action there is always a reason* ." Thus, " *the importance of investigating the emotions of the participants, and facing them* ", " *of investigating the mental model* " and to carry it out with " *the appropriateness of debriefing with good judgment* " are highlighted .

Anticipations

It can be observed that the participants identify the applicability of the skills acquired in the course and show great motivation to " integrate these new tools *into their projects* ", specifically " *the simulation zones* ", " *good judgment* " and " *the structure of debriefing* ". Furthermore, it is worth highlighting the transformation of the participants' own vision, as they state that they see themselves not only as teachers, but also as " *agents of change to enhance the learning of potential participants in our projects* ."

Emotions

A fundamental experience in personal transformation that is the " *sense of tranquility* ". Although facing new perspectives can generate discomfort and frustration, the participants say they are " *happy with the design of the project* " and with " the feeling that the effort made *has been worth it* ."

4. Discussion

The current study is an example of a conceptual replication of previously published qualitative research (6-7) with the interest of investigating and establishing the stability of key themes in the experience and learning of participants in a training program.

A study of the transformation experienced in the same program was previously carried out when the format was in-person online (6). Both formats reflect the importance of creating spaces that encourage reflection within teaching practices and personal change. These *metacognitions* , although they can occur spontaneously in moments of relaxation and calm, are promoted by creating spaces in the teaching design that allow for deliberate reflection. These opportunities generate a large number of ideas and allow the teaching practice to be broken down into executable steps, as demonstrated by the *notes to oneself (for example, for debriefing* practices it is " *important to investigate the mental model with good judgment* "). These allow instructors to name tacit knowledge about their daily practice and transform it into personal improvement goals. The work of Kolbe and Rudolph (7) shares with both studies the importance of understanding the other person's perspective as a teacher to facilitate learning and/or improve their performance in the future. Likewise, in both formats, participants anticipated the application of their new skills in the future. Furthermore, the *emotions* described by participants in both formats suggest that instructor development is not simply a cognitive process, but involves a wide range of emotions (positive or negative). Both in the *online program* and *on site* , the need to feel safe was highlighted. However, there was greater reference to emotions in its *in situ version* . A possible explanation for this event is that in this format there is more interaction time during breaks and lunch times and, therefore, more opportunities to express them, which could be reflected in the results of the surveys. In short, no significant differences were observed between the transformation and professional development experienced by the participants of the *on-site edition* and those of the *online edition* . No other comparative studies have been found in terms of the curriculum, the learning methods, the duration and the instructors who taught the program were the same.

In relation to the learning topics, a difference that is observed in the *evaluation* of the sessions or tools in the *online group* compared to the study by Kolbe and Rudolph (7) is that in the current study a new systematic vision is introduced about the usefulness of simulation, since it is no longer the focus of attention and becomes a tool to help resolve the needs detected in the organization. However, the *in situ group* shares with both studies the interest of the participants in practicing what they have learned and receiving *feedback* , especially in the area of *debriefing* . The fact that the current study shares the same themes with Kolbe and Rudolph's study (7) and the previous study on an *online edition* (6) provides empirical support for the stability of the themes.

The main implication of these findings for future practice is that a training program can be carried out either in face-to-face online *or* on *-site format* with the same impact to develop health simulation instructors, when the rest of the components of the teaching design remain stable. . The data suggests that although experiential learning may seem more challenging to achieve in *online training* (25), it is possible to integrate it. This is because the *online format* also allows for the incorporation of practical activities, interactive simulations and case studies based on real problems, based on experiential theory (16). This format enables face-to-face communication even at a distance, and also facilitates the building of relationships and human connection, promoting a greater sense of community and belonging (26). Even though online training may seem more individual, there is still the possibility of social learning.

Another implication for future practice resulting from analyzing the issues related to *anticipations* is that it highlights the importance of including in teacher development programs the active role of participants in 'preventing relapses'. It is necessary to provide them with tools that allow them to identify, maintain and improve their skills (for example, seeking opportunities for *feedback* on their practices as instructors), especially when they are faced with new perspectives that are not in harmony with their usual practices.

The appearance of multiple and diverse *emotions during the learning process* underlines the importance in both formats of creating a stimulating context that allows participants to process different emotional states. In the literature, this aspect is known as psychological safety and is necessary for the participant to show effective learning behaviors, such as asking doubts and asking questions, exposing different perspectives to instructors or other classmates, and exposing themselves during simulated practices (24 , 27).

One of the limitations of this study is the lack of information on the application of what has been learned in the context of regular work, since awareness of the usefulness of what has been learned and the intention to apply it does not guarantee that it will be done in daily practice. . Another limitation is the lack of information to be able to affirm that the greater reference to emotions in the *in situ edition* is an effect of the format or a cohort effect.

To understand any changes in the participants' professional environment, other types of information and studies are needed in the future, such as the testimony of the colleagues or residents with whom they work. The stability found in the learning themes implies that this framework could be useful in future studies on the progression and impact of training on learning.

In conclusion, the results of this study reflect a parallelism in the learning of participants in a program for instructors in health simulation when it is taught in *online* or *on-site format* , and the rest of the elements of the teaching design remain stable. In

addition, the conceptual replication of the previously identified themes (6, 7) is shown on the reflections of the participants during the learning process, also reflected in the online edition, *which* supports the stability of the themes. In this sense, both approaches can offer significant learning opportunities and intention to apply it in future practice, despite the challenges that may appear during *online training* . However, immersion in training and the impact on learning will depend in both cases on the quality of the teaching design and the ability of the instructors to stimulate and motivate participants.

5. Conclusions

- A comparable professional development progression was identified between the previously published *online* and *on-site face-to-face format* in the current study .
- A training program can be carried out either in face-to-face format online *or* on *site* with the same impact.
- The current study is an example of a conceptual replication of previously published qualitative research with the interest of investigating and establishing the stability of key themes in the experience and learning of participants in a training program.

Conflict of interest statement: HvV is a CMS Ambassador and both are non-profit educational institutions that offer tuition-based clinical training and instructor education programs.

Author contributions : Cristina Losey Pelayo and Dr. Jimmie Leppink wrote the first version; Elena Rojo Santos, Marta González Anillo, Dr. Ignacio del Moral and Dr. José Maestre contributed to the second version, and the six authors together prepared the final version.

References

1. Cook DA. How much evidence does it take? A cumulative meta-analysis of outcomes of simulation-based education. *Med Educ* , *2014* , *48* (8), 750-760. https://doi.org/10.1111/medu.12473
2. Armijo-Rivera S, Machuca-Contreras F, Raul N, de Oliveira SN, Mendoza IB, Miyasato HS, et al. Characterization of simulation centers and programs in Latin America according to the ASPIRE and SSH quality criteria. *Adv Sim* , *2021* , *6* , 41. https://doi.org/10.1186/s41077-021-00188-8
3. Opazo EI, Rojo E, Maestre JM. Modalities for training instructors in clinical simulation: The role of a stay or internship. *Educ Méd* , *2017* , *18* (1), 22-29. https://doi.org/10.1016/j.edumed.2016.07.008
4. Issenberg SB, McGaghie WC, Petrusa ER, Lee Gordon D, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: A BEME systematic review. *Med Teach* , *2005* , *27* , 10-28. https://doi.org/10.1080/01421590500046924
5. Cook DA, Hamstra SJ, Brydges R, Zendejas B, Szostek JH, Wang AT, et al. Comparative effectiveness of instructional design features in simulation-based education: Systematic review and meta-analysis. *Med Teach* , *2013* , *35* , e867-98. https://doi.org/10.3109/0142159X.2012.714886
6. Leppink J, Losey C, Rojo E, Del Moral I, Maestre JM. What do you take with you for your professional practice? Key topics of a simulation instructor training program. *Sim Clín* , *2023* , *5* (1), 38-46. https://doi.org/10.35366/110988
7. Kolbe M, Rudolph JW. What's the headline on your mind right now? How reflection guides simulation-based faculty development in a master class. *BMJ STEL* , *2018* , *0* , 1-7. https://doi.org/10.1136/bmjstel-2017-000247
8. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions: a meta-analysis. *JAMA*, *2008*, *100*(10),181-1196. https://doi.org/10.1001/jama.300.10.1181

9. Anzelin I, Marín-Gutiérrez A, & Chocontá J. Relationship between emotion and teaching-learning processes. *Sophia* , *2020* , *16* (1), 48-64. https://doi.org/10.18634/sophiaj.16v.1i.1007

10. Torres CET, Rodríguez JC. Immersive learning environments and teaching cyber-generations. *Educ Pesq* , *2019* , *45* , e187369. https://doi.org/10.1590/s1678-4634201945187369

11. Pérez Alcalá MDS. Communication and interaction in virtual learning contexts. *Apert* , *2009* , *1* (1), 34-37. Available online (accessed September 20, 2023): https://www.redalyc.org/articulo.oa?id=68820815003

12. Mahmood S. Instructional strategies for online teaching in COVID-19 pandemic. *Hum Behav Emerg Technol* , *2021* , *3* (1), 199–203. https://doi.org/10.1002/hbe2.218

13. Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. *Cureus* , *2020* , *12* , e8966–e8966. https://doi.org/10.7759/cureus.8966

14. Bennett AA, Campion ED, Keeler KR, Keener SK. Videoconference fatigue? Exploring changes in fatigue after videoconference meetings during COVID-19. *J Appl Psychol*, *2021*, *106* (3), 330-344. https://doi.org/10.1037/apl0000906

15. Shockley KM, Gabriel AS, Robertson D, Rosen CC, Chawla N, Ganster ML, Ezerins ME. The fatiguing effects of camera use in virtual meetings: A within-person field experiment. *J Appl Psychol* , *2021* , *106* (8), 1137-1155. https://doi.org/10.1037/apl0000948

16. Andrade-Lotero LA. Cognitive load theory, multimedia design and learning: a state of the art Magis. *Rev Int Invest Educ* , *2012* , *5* (10), 75-92. https://doi.org/10.11144/Javeriana.m5-10.tccd

17. Valdecilla virtual hospital. Simulation instructor training offered by the Institute for Medical Simulation (IMS). Available online (visited on September 20, 2023): https://www.hvvaldecilla.es/entrenamiento-de-instructores-cursos-ifms

18. Instructure Inc. You. The power of the Canvas learning management platform. Available online (accessed September 20, 2023): https://www.instructure.com/es-es/canvas

19. Guest G, Namey E, Chen M. A simple method to assess and report thematic saturation in qualitative research. *PLoS ONE* , *2020* , *15* , e0232076. https://doi.org/10.1371/journal.pone.0232076

20. Leppink J, Paas F, Van der Vleuten CPM, Van Gog T, Van Merriënboer JJG. Development of an instrument for measuring different types of cognitive load. *Behav Res Met*, *2013*, *45*, 1058-72. https://doi.org/10.3758/s13428-013-0334-1

21. Formstack. Automate work, innovate faster. Available online (accessed September 20, 2023): https://www.formstack.com

22. Roussin CJ, Weinstock P. SimZones: An organizational innovation for simulation programs and centers. *Acad Med* , *2017* , *92* , 1114-1120. https://doi.org/10.1097/ACM.0000000000001746

23. Maestre JM, Rudolph JW. Theories and styles of debriefing: The method with good judgment as a formative evaluation tool in health. *Rev Esp Card*, *2015*, *68*, 282-285. https://doi.org/10.1016/j.recesp.2014.05.018

24. Rudolph JW, Raemer DB, Simon R. Establishing a safe container for learning in simulation: The role of the presimulation briefing. *Simul Healthc*, *2014*, *9* (6), 339-349. https://doi.org/10.1097/SIH.0000000000000047

25. Angel CJ, Valdes JC, Guzman T. Limits, challenges and opportunities for teaching in virtual worlds. I *nnov Educ* , *2017* , *17* (75), 149-168. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1665-26732017000300149&lng=es&tlng=es

26. Pizarro MS. Influence of non-verbal communication on interpersonal relationships. *Science Lat Rev Cient Multidisc* , 2021, *5* (4), 3881-3894. https://doi.org/10.37811/cl_rcm.v5i4.591

27. Rudolph JW, Simon R, Dufresne RL, Raemer DB. There's no such thing as "nonjudgmental" debriefing: A theory and method for debriefing with good judgment. *Sim Health*, *2006*, *1* (1), 49-55. https://doi.org/10.1097/01266021-200600110-00006 .