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# Student satisfaction and self-confidence in realistic simulation and the experience of knowledge perpetuation

*Satisfação e autoconfiança de estudantes na simulação realística e a experiência de perpetuação do saber*

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## ABSTRACT

**Introduction:** The structure of educational methods is frequently renewed, using different available tools, according to the National Curriculum Guidelines. One of these, the realistic simulation (RS) methodology, is used to create proximity between the student and the real everyday life in a monitored environment, which provides room for error, but not with an actual patient. However, measuring meaningful learning is a complex task and support scales can be used. Based on this challenge, can the perpetuation of knowledge among students from different semesters using the RS tool add knowledge?

**Objectives:** To explain the use of RS among medical students; to compare satisfaction and self-confidence indices in relation to RS using a scale, specifically in CPR (Cardiopulmonary Resuscitation), before and after the learning intervention among students from different semesters; to know the students' learning process through the in-person teaching post-performance questionnaire.

**Method:** This was a quasi-experimental study with 86 medical students from a private institution, with data collection was carried out in three stages, namely: study guidelines, scenario practice and perpetuation of knowledge to other students. Two questionnaires and an evaluation scale were used as tools and, for comparison, the relative and absolute frequencies, Cronbach's alpha and the non-parametric Mann-Whitney test were used.

**Results:** Cronbach's alpha was considered high and the nonparametric test resulted in values between 3.81 and 4.91, indicating agreement in satisfaction and self-confidence in learning, with a significant difference in the answers: I liked the way my teacher taught using the simulation; I am confident that I have mastered the content of the simulation activity to which my teacher introduced me and I know how to use simulation activities to learn skills. Regarding the perpetuation of learning, its fixation and its relevance in training, all students also agreed that 6% still did not consider themselves ready to perform CPR.

**Conclusion:** The study proposal proved to be effective in improving learning and perpetuating knowledge among students.

**Keywords:** Medical students; Simulation training; Teaching; Learning.

## RESUMO

**Introdução:** *O formato dos métodos educacionais renova-se frequentemente, lançando mão de diferentes ferramentas disponíveis, conforme as Diretrizes Curriculares Nacionais. Uma dessas ferramentas, a simulação realística (SR), é utilizada para criar proximidade entre o estudante e o dia a dia real em um ambiente monitorado, que propicia margem para erros, mas não com um paciente legítimo. Como mensurar o aprendizado significativo é um processo complexo, podem-se utilizar escalas de apoio. A partir desse desafio, perpetuar o saber entre estudantes de diferentes semestres utilizando a ferramenta da SR pode agregar conhecimento?*

**Objetivo:** *Este estudo teve como objetivos explanar o uso da SR entre estudantes de Medicina; comparar os índices de satisfação e autoconfiança em relação à SR por meio de escala, especificamente em ressuscitação cardiopulmonar (RCP), antes e depois da intervenção de aprendizagem entre estudantes de diferentes semestres; e conhecer o processo da aprendizagem dos estudantes por meio do questionário pós-execução do ensino presencial.*

**Método:** *Trata-se de estudo do tipo quase experimental com 86 estudantes de Medicina de instituição particular. A coleta de dados foi feita em três etapas, a saber: orientações do estudo, prática de cenário e perpetuação do saber a outros estudantes. Utilizaram-se como instrumentos dois questionários e uma escala de avaliação, e, para comparação, as frequências relativas e absolutas, o alfa de Cronbach e o teste não paramétrico de Mann-Whitney.*

**Resultado:** *O alfa de Cronbach foi considerado alto, e o teste não paramétrico resultou em valores entre 3,81 e 4,91, indicando concordância na satisfação e autoconfiança na aprendizagem, com diferença significativa nas respostas: "Eu gostei do modo como meu professor ensinou através da simulação", "Estou confiante de que domino o conteúdo da atividade de simulação que meu professor me apresentou" e "Eu sei como usar atividades de simulação para aprender habilidades". Referente à perpetuação e fixação do aprendizado e à relevância disso na formação, todos os estudantes concordaram ainda que 6% ainda não se consideraram aptos para um atendimento de RCP.*

**Conclusão:** *A proposta do estudo demonstrou-se eficaz no aprimoramento do aprendizado e perpetuação de saberes entre estudantes.*

**Palavras-chave:** *Estudantes de Medicina; Treinamento por Simulação; Ensino; Aprendizagem.*

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## INTRODUCTION

The tendency of health teaching scenarios in medical schools is to utilize active methodologies (AM)[1,2]. The AM are characterized by several tools that allow students to develop autonomy and a critical-reflexive posture, which leads them to be able to transform their surroundings[3], challenging the teacher to assume the role of tutor and the student to be a protagonist in their training, modifying the transmission of knowledge using vertical transfer[1,2].

The National Curriculum Guidelines (DCN, *Diretrizes Curriculares Nacionais*) for medical schools, created in 2001 and reformulated in 2014, reinforce the use of AM, enabling the training of a generalist, problem-solving professional who knows how to act in three competencies: comprehensive health care, health education and health management[4]. For this purpose, technological support is a key element, approximating students to their future profession[5].

Realistic simulation (RS), an AM tool, started with flight simulators for pilot training, when, in 1929, the flight sensations were reproduced[2]. In 1960, Ausmund Laerdal developed a dummy for the health area aimed at the training of cardiopulmonary resuscitation (CPR)[2].

The RS aims to recreate the real world[2], in a situation of student practice, and must be faced with realism, in a safe environment that allows making mistakes[6], preserving patient safety in combat, preventing possible damages[2]. It also allows the training of rare but no less important situations in daily practice[7].

The RS can be of low, medium or high complexity[8] from a structural point of view, from the size to the furniture and equipment, and/or from the point of view of the competencies to be attained, related to behaviors and actions[8]. When high-fidelity mannequins are used, they resemble a person and interact[8], making it possible to observe the positive or negative actions taken by the students[2], improve emotional stress control[9] and improve self-confidence and satisfaction[6], making the student more mature in the spheres of knowledge, skills and attitudes, of which practice makes perfect. It provides engagement, creativity and involvement with learning[1].

In Brazil, the use of RS in undergraduate courses is still relatively recent, both because of the high investment[8] and the teacher training[9] it involves, which require special preparation[6] depending on the objective to be achieved[9].

The Simulation Center of the university assessed in this study has environments that provide a real-life setting of the practice, such as instruments, materials and robots divided into levels of fidelity. The chosen topic was CPR, an unusual situation in the daily lives of most health workers, but when it occurs, it needs to be managed immediately and with quality, as the victim's life depends on this management, with higher levels of professional self-confidence being decisive for a satisfactory intervention[10].

The student's evaluation when using AM must be distinctive, so they can understand their points of improvement[3], and it must be a formative and summative process[4].

Assessing how much the student has learned with AM remains an emblematic challenge. The Student Satisfaction and Self-Confidence in Learning (SSSCL) created in 2003 by the National League for Nursing, in the USA, measures, based on the students themselves, how significant learning was, aiming at identifying how much students are satisfied with the RS and how much they feel self-confident with the content studied at the time.

Satisfaction is a favorable response to the students' expectation or experience[6], which improves their performance and professional training[10], whereas self-confidence is obtained when there is a positive perception of oneself, considering oneself as capable of accomplishing something[6]. These aspects also reflect the quality of the lived experience[6].

Considering the magnitude of the teaching and learning process, where teaching is a complex action that requires the mobilization of several aspects, such as the organization of the environment and the activity, defining the objectives and seeking prior knowledge on the subject[5], in addition to attitudes of dialogue, respect, apprehension of reality, reflection on the practice and acceptance of the new, as Paulo Freire[11] recalls, exchanging experiences within the scope of RS can be a beneficial learning experience. It makes the student aware of the responsibility of teaching and learning, with their particular way of approaching the classmate, as while teaching, one reinforces previous knowledge and repeats the practice[12]. Therefore, would the perpetuation of knowledge be beneficial among medical students from different semesters?

Thus, the objectives of this study were to demonstrate the applicability of high-complexity RS among medical students and to compare the students' satisfaction and self-confidence indices in relation to the RS, specifically in CPR, before and after the learning intervention, with a group of students having the role of perpetuating knowledge.

## METHODS

Aiming to assess the applicability of RS in relation to students' satisfaction and self-confidence, it is asked whether this relationship would have occurred, or would have been the same, if there was no RS. For this purpose, it is necessary to isolate this effect and observe these same indicators in a similar group that did not benefit from RS.

In this sense, the quasi-experimental approach emerges as a natural alternative and allows progressing in terms of identifying the real contributions of RS in relation to student satisfaction and self-confidence.

The study was carried out in September and October of 2020, in the city of Piracicaba, in the interior of the state of São Paulo, with students from the medical course. The course started in August 2018, and in the capital of São Paulo (place of origin), it has existed for 12 years. The duration of the course comprises 12 semesters.

## Participants

Student selection was based on the convenience criterion, with the available subjects being selected, representing the study population[13], considering a total of 220 students, and of these, 86 students divided into two groups, A and B, with the fourth and fifth semesters being assigned to group A and the second semester to group B.

Those who had not been monitors of the discipline where the practical CPR class is performed and who agreed to participate by signing the Free and Informed Consent Term after the study objectives and methods were clarified, were included in the study.

## Data collection

Data collection took place at the RS Center of the campus. The study took place in three stages, as follows:

**Stage 1 –** Students in group A received information that the topic of the simulation scenario would be CPR and the American Heart Association guideline[14] on basic life care was made available; they were informed that the second stage would be carried out after 15 days. Due to restrictions on access to the campus due to the Covid-19 pandemic, the deadline for this stage was extended by 5 months. The guideline was then sent by email to the students and at that moment, they had no follow-up;

**Step 2 –** After this interval and with the authorization to return and the filling out of the informed consent, the students in group A filled out the characterization questionnaire. Afterwards, they participated in a simulation scenario, where everyone followed the briefing – a moment of contextualization of the scenario and the environment where it would be developed, and the participating students could act according to prior knowledge and training. At the end, the researcher conducted the debriefing based on the checklist used for CPR care described in the scenario, highlighting details of care in an in-hospital environment and using the plus-delta strategy for conduction – a model that provides student self-assessment[15]. After this moment, the students filled out the SSSCL and were asked to wait for stage 3.

**Stage 3** - After 20 days, the students from group A replicated their knowledge to the students from group B. For this purpose, the students used the low-fidelity dummy, emphasizing that in this stage, the high complexity refers to the action of teaching the classmate and not to the materials themselves. They were organized in pairs or trios respecting social distancing and it was highlighted that students from group B had no knowledge on CPR. Finally, the students from group A completed the questionnaire after performing the in-person teaching and again the SSSCL. Aiming to prevent any disadvantage to the students from group B, who only participated in this stage, they had a curricular class related to the topic with the discipline teachers after data collection.

## Data analysis

Initially, a descriptive analysis of the study variables was performed, which were presented as absolute and relative frequencies. The nonparametric Mann-Whitney test was performed to compare students' satisfaction and self-confidence indices in relation to RS, specifically in CPR, before and after the learning intervention.

The internal reliability of the SSSCL scale was obtained by calculating Cronbach's alpha, with values ≥ 0.7 being good indicators of reliability.

## Ethical aspects

The study registered under the Certificate of Presentation for Ethical Assessment (CAAE) number 290807720.0.00005492 was approved by the Research Ethics Committee of the University with Opinion number 3.840.023. The study was carried out according to the Brazilian norms for research involving human beings[16].

# RESULTS

Of the 220 students, 86 participated in the study, being distributed in groups A and B in stages 2 and 3. Thus, of group A, 45 (31.46%) and 33 students (23%) participated in stages 2 and 3, respectively. Group B in stage 3 consisted of 41 (53.24%) students.

Stage 2 took place on 12 different dates and stage 3, on 4 different dates within the 2-month period, according to the students' availability. The average duration of stage 2 was 35 minutes and of stage 3, 20 minutes.

Group A, consisting of 45 students, was represented by 68.9 females, with a predominance of 80% aged between 17 and 22 years and 40% and 60% that started university in 2018 and 2019, respectively.

Regarding the characterization questionnaire of the study population and the students' previous knowledge on the

CPR topic and safety when providing care, 73.3% had already completed a training or course, 66.7% considered that they were able to perform the care, 4.4% had already collaborated in a service and 2.2% had experience in performing CPR.

Students who reported having completed training or courses considered the practical class they had in the first semester.

Regarding the response related to the capacity to perform CPR, 33.3% did not consider themselves able to do it, even though this is not a new topic.

Regarding the experience of having collaborated or participated in CPR at a service, in an informal report to the researcher, a student commented that the experience of providing care in a hospital environment was not pleasant, that the situation involved several people and was highly tense.

Table 1 describes the data obtained from the SSSCL completed at the end of the debriefing of step 2, with the letter S - Satisfaction and the letters SC - Self-confidence, numbered according to the order in which the question appears in the original scale:

As for the averages, item 3 of Satisfaction had the highest average, being "I liked the way my teacher taught through simulation" (4.89). For the Self-confidence dimension, item 1, "I am confident that I mastered the content of the simulation activity that my teacher presented to me" had the lowest average (3.81).

When evaluating the standard deviation for Satisfaction, the lowest value was in question 3, "I liked the way my teacher taught through the simulation" (0,319) and the highest standard deviation was in question 2, "The simulation provided me with a variety of teaching materials and activities to further my learning of the medical-surgical curriculum" (0,632). The data indicate a good analysis in relation to the teacher's conduct, but greater deviation on the variety of teaching materials and activities.

Regarding Self-Confidence, the lowest standard deviation was in question 4, "My teacher used useful resources to teach the simulation" (0,422) and the highest standard deviation was in question 8, "It is the teacher's responsibility to tell me what I need to learn in the topic developed in the simulation during the class" (0,849). Regarding this item, the

**Table 1.** Student satisfaction and self-confidence in learning after the debriefing of step 2. (n=45). Piracicaba, SP, 2020

| Item | Mean | Standard deviation | Item-total correlation | Cronbach's α if item is excluded |
|---|---|---|---|---|
| The teaching methods used in this simulation were useful and effective (S1) | 4.86 | 0.351 | .504 | .788 |
| The simulation provided me with a variety of teaching materials and activities to further my learning of the medical-surgical curriculum (S2) | 4.67 | 0.632 | .616 | .771 |
| I liked the way my teacher taught through simulation (S3) | 4.89 | 0.319 | .390 | .795 |
| The teaching materials used in this simulation were motivating and helped me learn (S4) | 4.81 | 0.577 | .528 | .780 |
| The way my teacher taught through simulation was adequate for the way I learn (S5) | 4.81 | 0.401 | .480 | .788 |
| I am confident that I mastered the content of the simulation activity that my teacher presented to me (SC1) | 3.81 | 0.786 | .193 | .815 |
| I am confident that this simulation included the content required to master the medical-surgical curriculum (SC2) | 4.47 | 0.736 | .392 | .793 |
| I am confident that I am developing skills and gaining the necessary knowledge from this simulation to perform the necessary procedures in a clinical setting (SC3) | 4.5 | 0.811 | .550 | .777 |
| My teacher used useful resources to teach the simulation (SC4) | 4.78 | 0.422 | .677 | .776 |
| It is my responsibility as the student to learn what I need to know through the simulation activity (SC5) | 4.67 | 0.586 | .597 | .774 |
| I know how to get help when I don't understand the concepts covered in the simulation (SC6) | 4.39 | 0.599 | .519 | .781 |
| I know how to use simulation activities to learn skills (SC7) | 4.33 | 0.676 | .625 | .769 |
| It is the teacher's responsibility to tell me what I need to learn in the topic developed in the simulation during the class (SC8) | 4.28 | 0.849 | .090 | .829 |

Mean, Standard Deviation, Item-total correlation coefficient and Alpha Cronbach if the item is excluded for stage 2 (n = 45).
Source: Prepared by the authors.

fact that it is the teacher's responsibility to be the one who conducts what the student must learn may indicate that, for some, they understand that this process permeates the teacher's instruction, but this is not the main responsible for the learning. This boosts student autonomy and protagonism, which must be improved by the teacher. For other students, the way of teaching still seems to be directed by the teacher.

In the analysis of the instrument's internal consistency, the result of Cronbach's Alpha for Stage 2 was 0.801, evidencing that there is no need for improvement in the 13 items, being considered of high reliability.

For stage 3, of the 45 students, 12 were not present. Among the justifications, it was highlighted not being able to attend on the agreed date and time and feeling insecure to teach the other classmate.

Table 2 shows the data obtained from the SSSCL completed at the end of stage 3, with the letter S - Satisfaction and the letters SC - Self-confidence, numbered according to the order that they appear in the original scale:

Regarding the averages, it is observed that item 1 of Satisfaction with learning had the highest average, being "The teaching methods used in this simulation were useful and effective" (4.91). For the dimension Self-confidence in learning, item 8 – "It is the teacher's responsibility to tell me what I need to learn in the topic developed in the simulation during the class" had the lowest average (4.24).

When evaluating the standard deviation for Satisfaction with learning, the lowest value was in item 1, "The teaching methods used in this simulation were useful and effective" (.292) and the highest standard deviation was in item 3, "I liked the way my teacher taught through simulation" (,663). It is interesting that the student has taken up the role of the teacher, perpetuating knowledge, and this may indicate an improvement in this role. To get ready and help a classmate, one student prepared slides and two other students prepared scripts with the CPR steps.

Regarding Self-Confidence, the lowest standard deviation was in question 3, "I am confident that I am developing skills and gaining the necessary knowledge from this simulation to perform the necessary procedures in a clinical setting" (.467) and the highest standard deviation was in question 8, "It is the teacher's responsibility to tell me what I need to learn in the topic developed in the simulation during the class" (,849). The lowest deviation indicates a high level of self-confidence in the proposed activity and, once again, the highest deviation in relation to the teacher's role highlights the student's autonomy and co-responsibility to learn.

In the analysis of the instrument's internal consistency, the Cronbach's α result of Stage 3 was 0.803, showing that there is no need for improvement regarding the 13 items. Correlation values ranged from 0.77 to 0.82, which are considered high.

The comparison between the results of the two stages are shown in Table 3.

**Table 2.** Student satisfaction and self-confidence in the learning of stage 3 (n=33). Piracicaba, SP, 2020

| Item | Mean | Standard deviation | Item-total correlation | Cronbach's α if item is excluded |
|---|---|---|---|---|
| S1 | 4.91 | 0.292 | .444 | .795 |
| S2 | 4.48 | 0.566 | .490 | .786 |
| S3 | 4.58 | 0.663 | .466 | .788 |
| S4 | 4.73 | 0.517 | .497 | .786 |
| S5 | 4.64 | 0.603 | .506 | .784 |
| SC1 | 4.42 | 0.708 | .530 | .781 |
| SC2 | 4.52 | 0.755 | .476 | .787 |
| SC3 | 4.7 | 0.467 | .668 | .775 |
| SC4 | 4.79 | 0.485 | .465 | .789 |
| SC5 | 4.64 | 0.549 | .040 | .820 |
| SC6 | 4.61 | 0.496 | .436 | .791 |
| SC7 | 4.64 | 0.549 | .555 | .781 |
| SC8 | 4.24 | 0.867 | .346 | .806 |

Mean, Standard Deviation, Item-Total Correlation Coefficient, and Cronbach's α if the item is excluded for stage 3 (n=33).
Source: Prepared by the authors.

The data show that there was a significant difference between stages 2 and 3 regarding satisfaction with learning in the category "I agree" (p=0.002). However, there was no statistical difference for the others.

For the perception of self-confidence in learning, the data show a significant association for the categories "I neither agree nor disagree" (p=0.006) and "I strongly agree" (p=0.0010) with the stages of the study (for these categories, there is statistical dependence of the stages).

In all items, the average perception was between 3.81 and 4.91, indicating that there is an agreement between the participants for the items of satisfaction and self-confidence in learning in both stages, showing that positive perceptions appear in both stages.

When comparing the answers from stage 2 with stage 3, the non-parametric Mann-Whitney test described in Table 4 was applied, with a significant difference found for the answers:

S3: I liked the way my teacher taught through simulation;

SC1: I am confident that I have mastered the content of the simulation activity that my teacher presented to me; and

SC7: I know how to use simulation activities to learn skills

**Table 3.** Comparison between ESEAA steps 2 and 3. Piracicaba, SP, 2020

| | I strongly disagree (1) | | I disagree (2) | | I neither agree nor disagree (3) | | I agree (4) | | I strongly agree (5) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Stage 2 | Stage 3 | Stage 2 | Stage 3 | Stage 2 | Stage 3 | Stage 2 | Stage 3 | Stage 2 | Stage 3 |
| *Item* | | | | | *Satisfaction with learning* | | | | | |
| S1 | | | | | | | 17.8 | 9,1 | 82,2 | 90,9 |
| S2 | | | 2.2 | - | - | 3 | 24.4 | 45,5 | 73,3 | 51,5 |
| S3 | | | | | - | 9.1 | 8.9 | 24,2 | 91,1 | 66,7 |
| S4 | | | 2.2 | | | 3 | 11.1 | 42,4 | 86,7 | 51,5 |
| S5 | | | | | | 6.1 | 17.8 | 24,2 | 82,2 | 69,7 |
| | | | | | | | | P = 0.002 | | P = 0.085 |
| | | | | | *Self-confidence in learning* | | | | | |
| AC1 | - | - | 8.9 | 3 | 13.3 | 3 | 64.4 | 42,5 | 13,3 | 51,5 |
| AC2 | - | - | 4.4 | 3 | 4.4 | 6.1 | 33.3 | 27,3 | 57,8 | 63,6 |
| AC3 | 2,2 | - | - | - | 2.2 | - | 35.6 | 30,3 | 60 | 69,7 |
| AC4 | - | - | - | - | - | 3 | 20 | 15,2 | 80 | 81,8 |
| AC5 | - | - | - | - | 6.7 | 3 | 20 | 30,3 | 73,3 | 66,7 |
| AC6 | - | - | - | - | 6.6 | - | 46.7 | 39,4 | 46,7 | 60,6 |
| AC7 | - | - | - | - | 8.9 | 3 | 46.7 | 30,3 | 44,4 | 66,7 |
| AC8 | | | 4.4 | 6.1 | 6.7 | 9.1 | 42.2 | 39,4 | 46,7 | 45,5 |
| | | | | | | P = 0.006 | | P = 0.4186 | | P = 0.0010 |

Mann-Whitney nonparametric test, the author, 2021.
Source: Prepared by the authors.

**Table 4.** Comparison between SSSCL stages 2 and 3. Piracicaba, SP, 2020

| | Group A (n = 45) | | | | Group B (n = 33) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Question | Mean | SD | Min | Max | Mean | SD | Min | Max | p |
| S1 | 4,8 | 0,4 | 4,0 | 5,0 | 4,9 | 0,3 | 4,0 | 5,0 | 0,279 |
| S2 | 4.7 | 0.6 | 2.0 | 5.0 | 4.5 | 0.6 | 3.0 | 5.0 | 0.054 |
| S3 | 4.9 | 0.3 | 4.0 | 5.0 | 4.6 | 0.7 | 3.0 | 5.0 | 0.006 |
| S4 | 4.8 | 0.5 | 2.0 | 5.0 | 4.7 | 0.5 | 3.0 | 5.0 | 0.228 |
| S5 | 4.8 | 0.4 | 4.0 | 5.0 | 4.6 | 0.6 | 3.0 | 5.0 | 0.163 |

Continues...

**Table 4.** Continuation

| | Group A (n = 45) | | | | Group B (n = 33) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Question | Mean | SD | Min | Max | Mean | SD | Min | Max | p |
| SC1 | 3.8 | 0.8 | 2.0 | 5.0 | 4.4 | 0.7 | 2.0 | 5.0 | 0.000 |
| SC2 | 4.4 | 0.8 | 2.0 | 5.0 | 4.5 | 0.8 | 2.0 | 5.0 | 0.641 |
| SC3 | 4.5 | 0.8 | 1.0 | 5.0 | 4.7 | 0.5 | 4.0 | 5.0 | 0.321 |
| SC4 | 4.8 | 0.4 | 4.0 | 5.0 | 4.8 | 0.5 | 3.0 | 5.0 | 0.894 |
| SC5 | 4.7 | 0.6 | 3.0 | 5.0 | 4.6 | 0.5 | 3.0 | 5.0 | 0.621 |
| SC6 | 4.4 | 0.6 | 3.0 | 5.0 | 4.6 | 0.5 | 4.0 | 5.0 | 0.157 |
| SC7 | 4.4 | 0.6 | 3.0 | 5.0 | 4.6 | 0.5 | 3.0 | 5.0 | 0.046 |
| SC8 | 4.3 | 0.8 | 2.0 | 5.0 | 4.2 | 0.9 | 2.0 | 5.0 | 0.790 |

SD= standard deviation. Mann-Whitney test.
Source: Prepared by the authors.

When evaluating the in-person teaching post-performance questionnaire, the answers are shown in Table 5.

Table 5 shows that 91% of the students prepared themselves and that consulting the material used in the first semester, when they had the CPR class, was the most frequently used material. Most of the students used more than one tool. Regarding feeling prepared with their study, 9% did not agree with it.

All of them considered that perpetuating the learning to other students helps to fixate the learning and that this tool is relevant for their training.

As for the CPR technique, 6% do not consider themselves fit to perform it, even though they participated in this study.

## DISCUSSION

In relation to CPR, 66.7% of the students consider themselves capable of performing it. In a study on the retention of CPR skills with medical students[17], where the skills were checked after a course and six months after it, retention showed a reduced value at the second moment. Considering a time interval of approximately one year between having learned the skills in the first semester curricular class and participating in this study, the number of students who feel capable is also small. This reinforces the importance of returning to CPR and other important topics throughout the training.

In a study using the SSSCL with 38 Nursing students[18], when the scale was applied after two different scenarios, comparing with the data of this study in stage 3 with 33 students, the obtained results showed that 89% agree or strongly agree that the simulation was useful and effective *versus* 100% in this study; 92% liked the way the teacher taught through simulation *versus* 100% in this study; 82% felt confident they had mastered the content *versus* 94% in this study; and 87% were confident in the skill development from the simulation *versus* 100% in this study. Considering satisfactory levels above 80%, both studies demonstrate a good experience in the simulation, in the teacher's performance, with self-confidence and in the development of skills.

Still based on the abovementioned study[18], a prominent result was that 27 students (71%) reported that it is the teacher's responsibility to say what they need to learn in the simulation. In this study, 85% of the students agreed with this statement in stage 2 and 89% in stage 3. In RS, one of the teacher's participation is to prepare the scenario and its learning objective(s)[19]. A good scenario considers the complexity, addressing the cognitive, psychomotor and affective aspects[19].

In stage 3, the answer about the teacher's responsibility to say what the students need to learn in the simulation activity had the highest standard deviation. This fact reinforces that learning needs to be meaningful, with students being co-responsible for their learning[19]. The teacher must create and stimulate the educational environment[18] and be motivating[19], with the RS being an aid tool[20].

Learning takes place through the relationship between students and between the teacher and the student. Being an affective relationship, this enhances the interest in learning, interpreting affection as an action of giving attention and making oneself available to clarify doubts[21].

> *"The teacher must develop imagination, creativity, cooperation, respect and solidarity in the student. Taking advantage of the students' experiences, the teacher will be able to contribute so that they have an interaction with their classmates and, from this interaction, they will be able to express their opinions in a natural way"*[11].

In the two stages of this study and in the study with

**Table 5.** Questionnaire after the implementation of in-person teaching. Piracicaba, SP, 2020

| Variable | Levels | N | % |
|---|---|---|---|
| Have you prepared yourself in any way to participate in this phase 2 of the research? | Yes | 30 | 91 |
| | No | 3 | 9 |
| If you did, which tool did you use? | MFS + G | 2 | 6 |
| | MFS + G + B | 1 | 3 |
| | MFS + B | 1 | 3 |
| | MFS + O | 1 | 3 |
| | MFS | 11 | 33 |
| | MFS + V | 2 | 6 |
| | MFS + V + O | 1 | 3 |
| | MFS + G + O | 1 | 3 |
| | G + V | 1 | 3 |
| | MFS + V + G | 1 | 3 |
| | N/A | 3 | 9 |
| | O | 3 | 9 |
| | V | 3 | 9 |
| | V + B | 2 | 6 |
| How many times have you studied using any of these tools? | 0 | 3 | 9 |
| | 1 | 13 | 39 |
| | 2 | 11 | 33 |
| | 3 | 2 | 6 |
| | 4 | 2 | 6 |
| | More than 4 | 2 | 6 |
| Was your previous study enough to make you feel prepared? | Yes | 27 | 82 |
| | No | 3 | 9 |
| | N/A | 3 | 9 |
| Does the fact of perpetuating the learning to other students help to fixate the learning? | Yes | 33 | 100 |
| | No | 0 | 0 |
| Do you consider the action of perpetuating learning relevant to your training? | Yes | 33 | 100 |
| | No | 0 | 0 |
| Do you consider yourself able to perform CPR? | Yes | 31 | 94 |
| | No | 2 | 6 |

MFS: material from the first semester; G: guideline; B: book; O: others; V: video on the internet; N/A: not applicable.
Source: Prepared by the authors.

Nursing students[18], they were satisfied with the learning and confident with the simulation. RS triggers critical and reflective reasoning, aiming at the development of several skills[22], and can be considered multifactorial, encompassing decision-making[22], which allows analyzing one's own conduct[15].

When comparing stages 2 and 3, evaluating the answers with a significant difference, answer S3 emphasizes the importance of the teacher, in the role of conductor, applying an AM activity; answer SC1 shows that the content was learned from the proposed activity and answer SC7 that the simulation is a good learning tool for skills.

Considering self-confidence, the simulation minimizes feelings of fear and anxiety regarding the future profession and can interfere with the performance of patient care[18], with these being general training objectives that were improved in this study.

In the question regarding the perpetuation of learning to other classmates and whether this helps to fixate the learning and about its relevance for training, the students were

unanimous to agree with it. The strategy is active, dynamic and considers prior knowledge[22]. The exchange of experiences develops autonomy and self-confidence, making learning authentic and meaningful[22].

This important relationship between learning and teaching and the need to find ways to make this process effective is recalled by Paulo Freire[11]: "*Those who teach learn by teaching and those who learn teach by learning. Teaching does not exist without learning, and vice-versa*".

The use of simulated patients reproduces high psychological fidelity through a more realistic interaction[15], as in stage 3. In an informal report, even without knowing each other, when a classmate is teaching, it is different from the teacher, being more informal, including the language used, which increases the accessibility to clarify doubts.

The answers to the in-person teaching post-performance questionnaire show that 9% of the students did not prepared themselves for stage 3 and 9% did not feel prepared to be with their classmates. Even so, it is valid to maintain the stimulus to the students, so that they can develop and build knowledge in other situations of interaction[20].

Despite participating in both stages, two students self-declared as not being ready to perform CPR. Even with the benefits of simulation as a learning tool, not all people learn in the same way[20,22]. Two possible justifications are the difficulty in seeing the RS as a real-life and not as a make-believe situation with the dummy or the scenario and using the tool while associating it with evaluations, which generates feelings of pressure and concern[7].

### Study limitations

The moment of data collection took place during a critical pandemic context. This condition limited the number of students who did not feel comfortable going to campus or who lived with people who belonged to the risk group or were out of town. At this stage, the vaccination had not yet been started.

As for the methodological approach, it was decided not to identify the students individually, allowing their analysis between two groups. This measure was adopted aiming at not intimidating them and to obtain reliable answers. Thus, it was not possible to compare the responses individually at each stage.

## CONCLUSION

This study allowed us to emphasize the importance of RS as an effective AM tool that develops learning and can be used in all undergraduate periods. The SSSCL helps to measure satisfaction and self-confidence and points out the quality of the scenario and the teacher's performance, being useful for teaching improvement.

Through the proposal to perpetuate knowledge, the students agree with this practice and that it helps to fixate learning, being important in their training. The interval between stages 2 and 3 was considered adequate, taking into account that the topic is not a new subject for students in group A, who had contact with it in stage 2 and a 20-day interval until stage 3.

Therefore, the perpetuation of knowledge among students from different semesters can be used as an AM tool in the context of RS within the curricular components, building a learning environment and believing that this cycle is improved between students and teachers.

For future research, it would be interesting for this methodological approach to be used throughout the training and accompanied by a trained team, observing the challenges and benefits, and may include other courses in the health area.

## AUTHORS' CONTRIBUTION

Egly Priscila de Almeida Butafava participated in the study design, planning, organization, literature review, data collection, data analysis, writing and final review of the manuscript. Ana Paula Quilici participated in the study design, data analysis and final review of the manuscript. Raquel Aparecida de Oliveira participated in the study design, planning, organization, literature review, data analysis, writing and final review of the manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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