

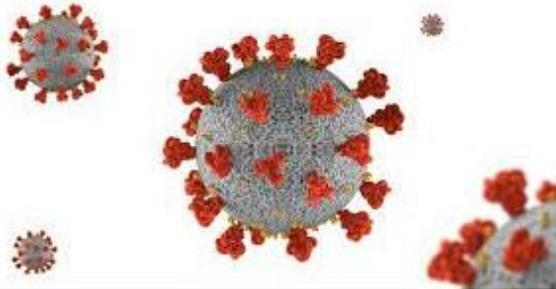
VIRTUAL PARADE GAME FOR LEAN TEACHING AND LEARNING IN STUDENTS FROM BRAZIL AND CHILE

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AGENDA

- Challenges and research aim
- Parade Game
- Research method
- Results and discussion
- Conclusions

CHALLENGES AND RESEARCH AIM



- At the onset of the crisis caused by COVID-19 in early 2020, the traditional educational model, based on masterclasses and linear teaching materials, required adaptation to the demands of society.
- It became necessary to use technology to address the challenges experienced by several universities, **from traditional learning to emergency remote teaching (ERT)**.
- In such circumstances, **five researchers** and academics from different institutions (Brazil, Chile, Ecuador, and Spain) decided to **create the Research Group YR4 AECI on May 29th, 2020**.



www.yr4aeci.org

CHALLENGES AND RESEARCH AIM

- One of those challenges was to find ways to adapt the **Parade Game back to the virtual environment without using computer simulations.**
- In this way, a version created by ASKM & Associates, LLC and Navilean LLC under copyright Creative Commons license - Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) was presented at IGLC 2020 during the lean construction gaming session.
- This paper aims to measure the students' learning of the **variability concept using the Parade Game version developed by ASKM & Associates.**



PARADE GAME

The game consists of the execution of **seven activities**, linear and sequential, that must occur on each floor of a **35-story building**.

The game has the following objectives:

1. to **understand the effect** of process **variability on the workflow** of dependent activities, distinguishing the production capacity of the teams;
2. to understand what **buffers** are and what they are for; and
3. to **interpret a flowline** of the game's activities.

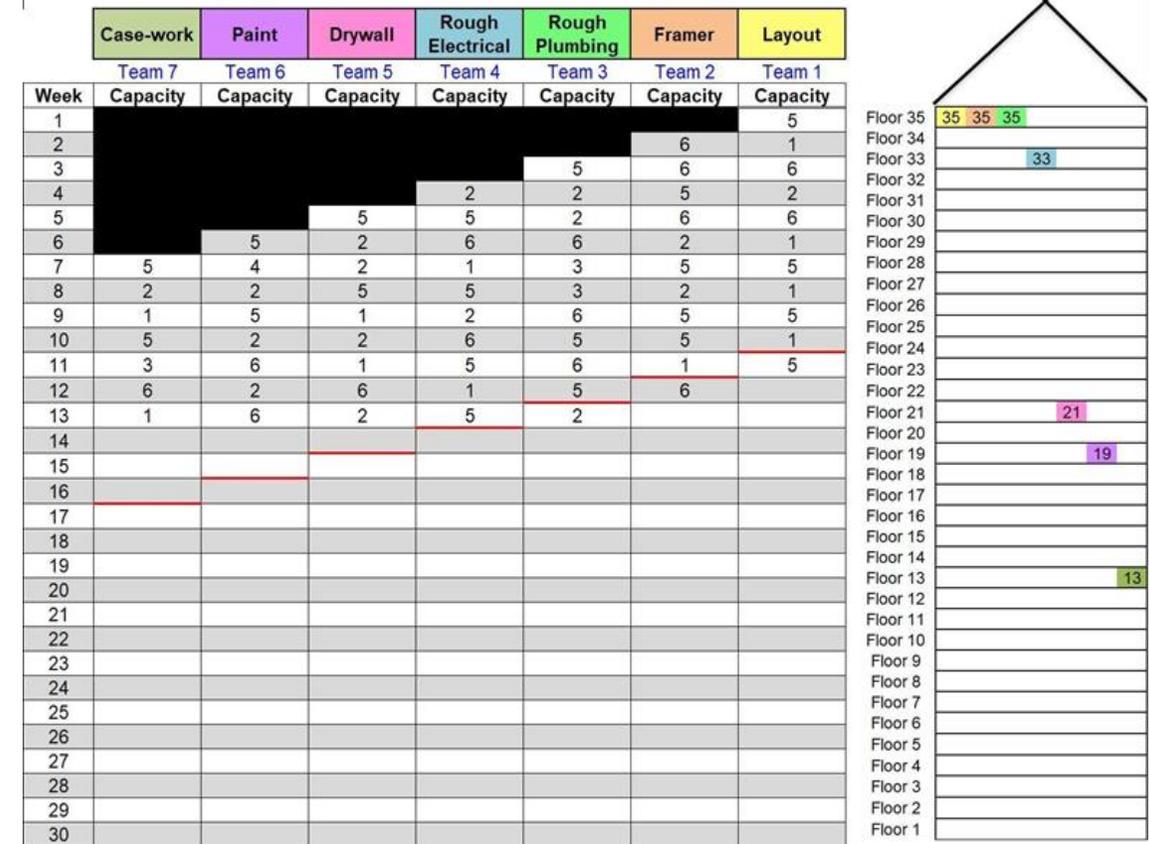


Figure 1. Game scenario (first-round): week 13 of the building process. Teams 4 to 7 have not yet finished their tasks

PARADE GAME

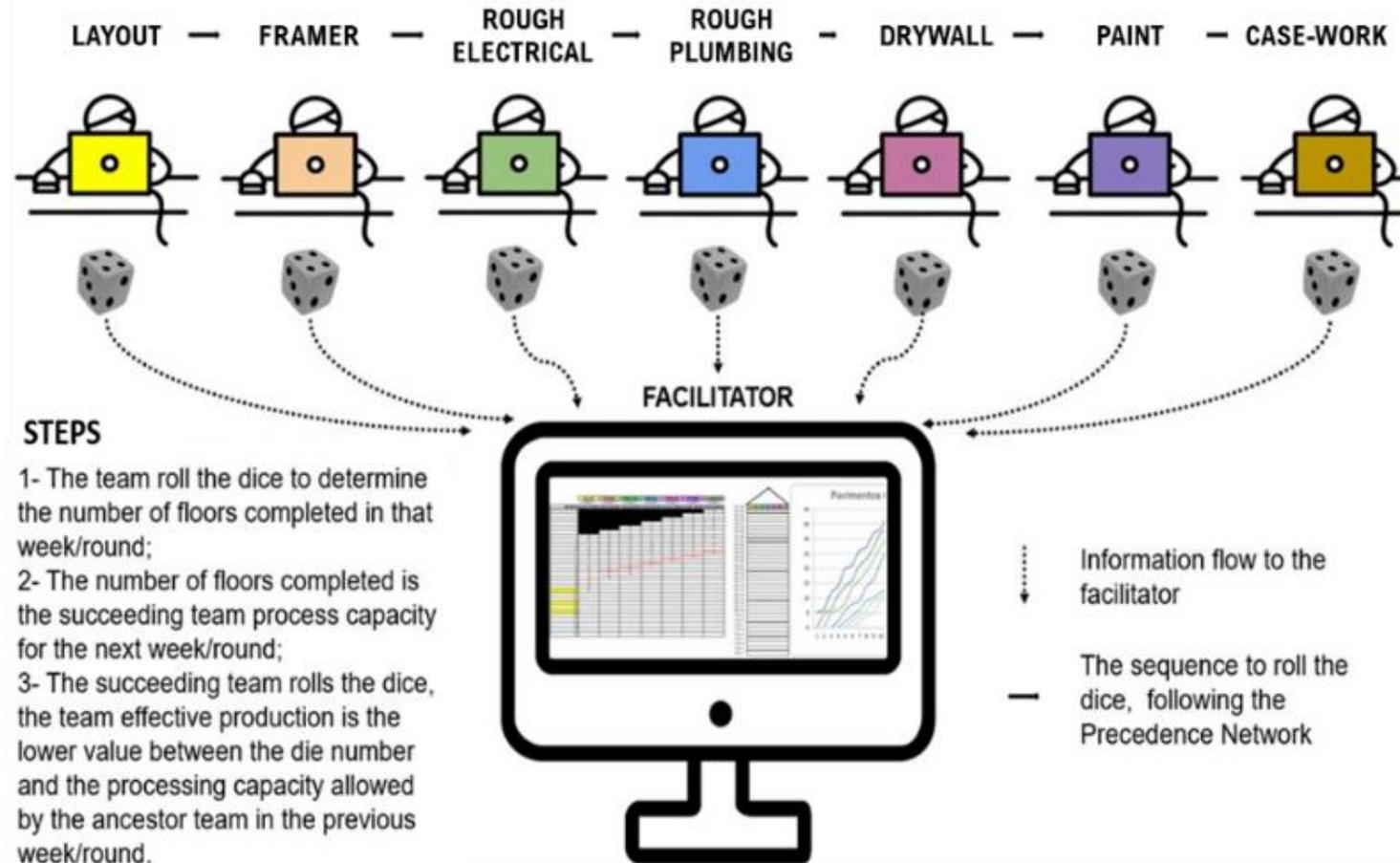


Figure 2. Parade Game version adopted in this work

RESEARCH METHOD

	Universidade Federal São Carlos (UFSCar)	Pontificia Universidad Católica de Valparaíso (PUCV)	Andres Bello University (UNAB)
Bachelor course	Civil Engineering	Civil Engineering	Civil Engineering
Name of the course	Planning and Control of Production	Planning and Control of Projects	Lean Construction
Application day	September 3 rd , 2020	October 14 th , 2020	October 15 th , 2020
Platform	Google Meet Platform	Zoom	Blackboard
Number of students	60	23	7
Number of responses	54	22	7

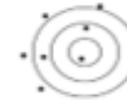
Table 1. Description of the courses and game participants

RESEARCH METHOD

The task of creating the questionnaire involved three main steps.

1. Two of the authors developed a pilot questionnaire. For that, they determined the format, length, and concepts to evaluate.
2. An expert committee (5 members) reviewed the questionnaire to make sure it was accurate, free of item construction problems, and grammatically correct.
3. The committee analyzed the validity of the constructs, those being: process variability, buffers, and flowline.

Table 2. Questionnaire developed for evaluating the learning of the concept of variability through the game Parade of Trades

N°	Questions and alternatives
1	<p>What effects of high variability (in construction processes with dependency relationships) on a construction project?</p> <p>a: Increases productivity, decreases runtime, and improves performance. b: Decreased productivity, increases runtime, and reduces performance. c: None of the above. d: All previous ones. e: I don't know the answer.</p>
2	<p>What is the difference between processing capacity and production rate?</p> <p>a: There is no difference between the two concepts. b: Processing capacity is always greater than or equal to the production rate. c: Production rate can be greater than processing capacity. d: Production rate can never be achieved. e: I don't know the answer.</p>
3	<p>What is a flow line?</p> <p>a: A graphical way to represent the performance of a process. b: Mathematical model of representation of the relationship between activities. c: Model of representation of the production rhythm. d: A graph of the representation of the dependency relationship between activities. e: I don't know the answer.</p>
4	<p>In a flowline, what does it mean when the lines of two activities are parallel?</p> <p>a: That the activities ended within the same time frame. b: That both activities are the same construction process. c: That activities have the same productivity during the week. d: That the processing capacity of the two activities is the same. e: I don't know the answer.</p>
5	<p>What are buffers?</p> <p>a: They are a tool to eliminate waste from processes. b: They are used to reduce uncertainty in the construction. c: It is a kind of constructive process to improve productivity. d: They are a mechanism to avoid possible impacts of variability. e: I do not know the answer.</p>
6	<p>If your goal is to reach the target, which of the scenarios below do you prefer?</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <p>a: Option 1 b: Option 2 c: Option 3 d: I don't know the answer.</p>
7	<p>Looking at the image below, tell us what buffers are for in production planning?</p> <p>a: Prevent the train from advancing beyond the end of the track. b: Prevent a production activity from advancing beyond the scheduled time. c: Protect the platform from possible impacts of trains that cannot break before. d: Protect a production activity from possible impacts of other production activities that fail to end within the established deadline. e: I don't know the answer.</p>

RESEARCH METHOD

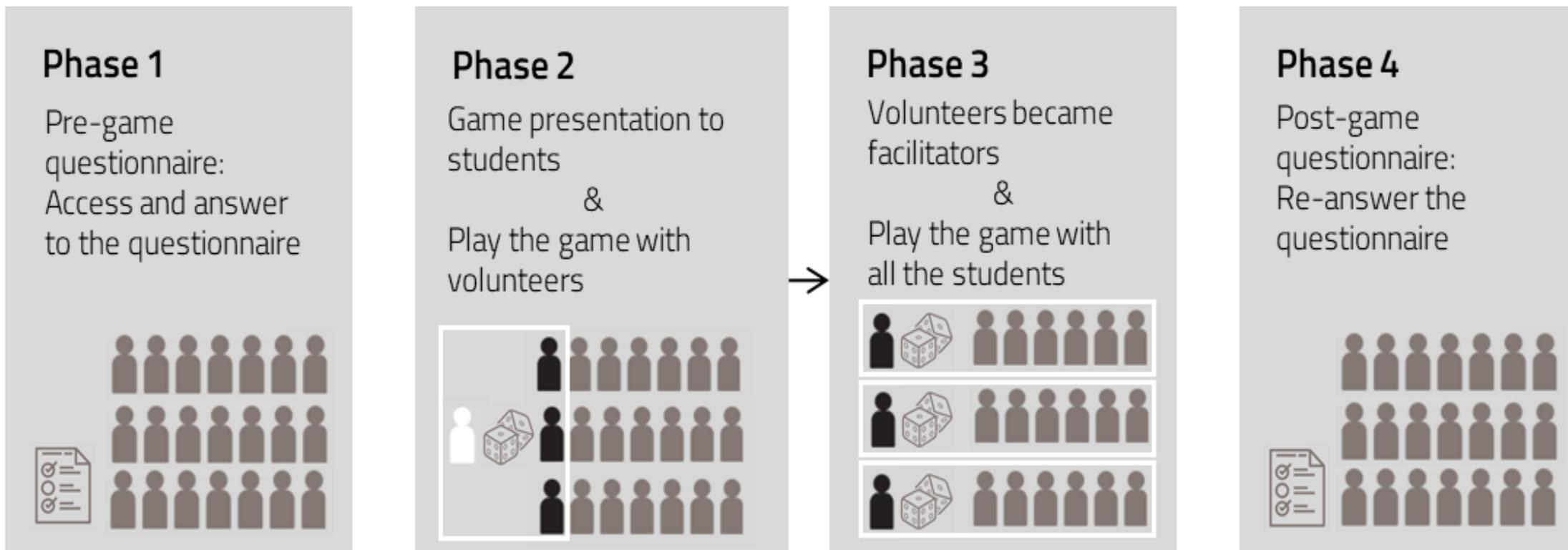


Figure 3. Description of four phases of the activity

RESEARCH METHOD

At the end of the game, the students answered two additional questions.

1. "Do you believe that this sort of game strengthens the process of teaching-learning?"

The Likert Scale of five points was adopted:

- (1) Strongly disapprove;
- (2) Disapprove;
- (3) Neutral;
- (4) Approve; and
- (5) Strongly approve.

2. "Would you like to play other games like today's game in the future?"

- (1) Yes;
- (2) No.

RESULTS AND DISCUSSION

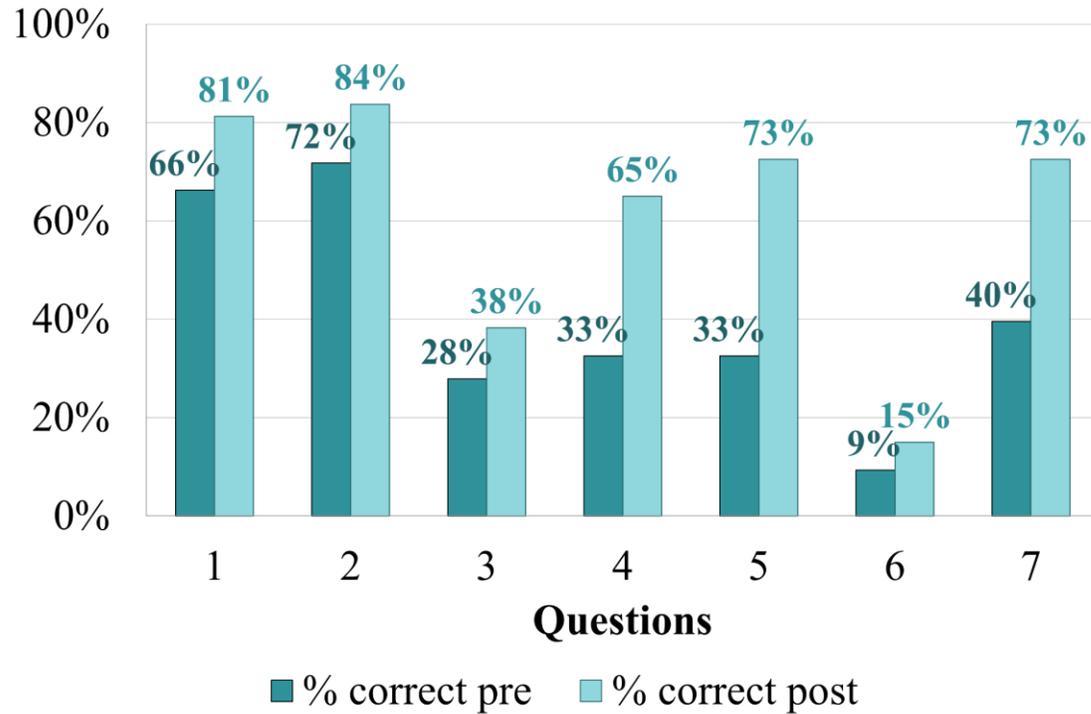


Figure 4. Percentage of students' "I don't know the answer" to the pre-and-post-game questionnaire

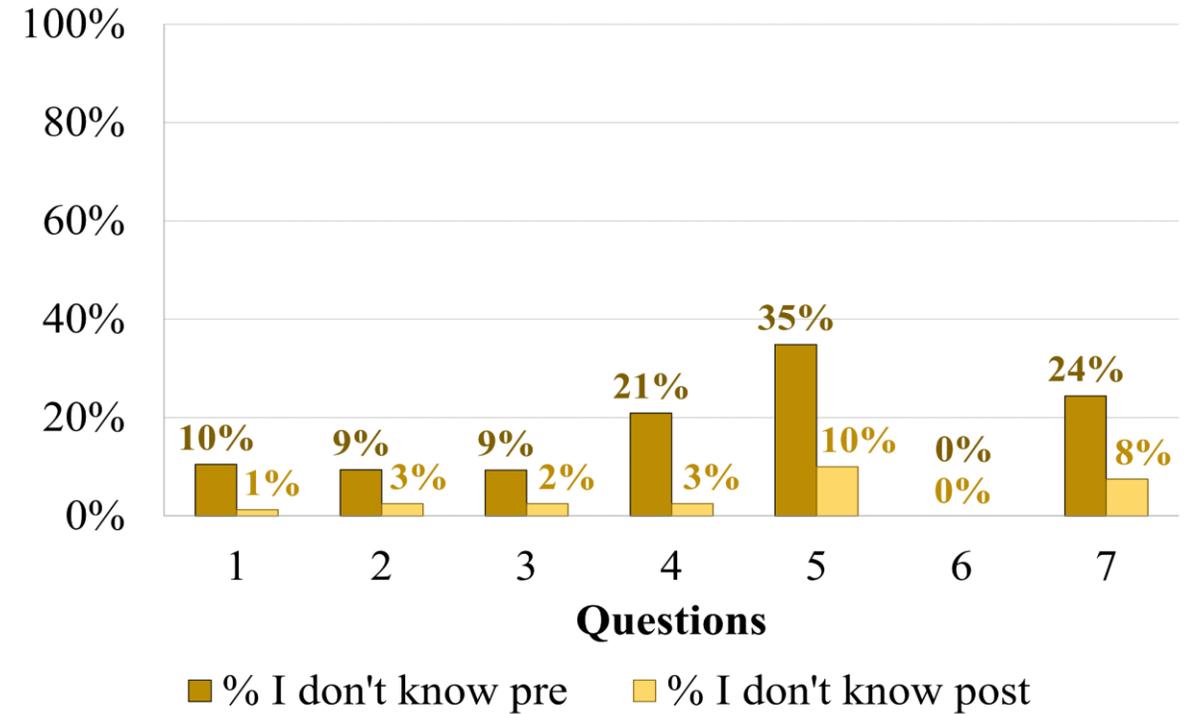


Figure 5. Percentage of students' correct answers to the pre-and-post-game questionnaire

RESULTS AND DISCUSSION

Do you believe that this sort of game strengthens the process of teaching-learning?

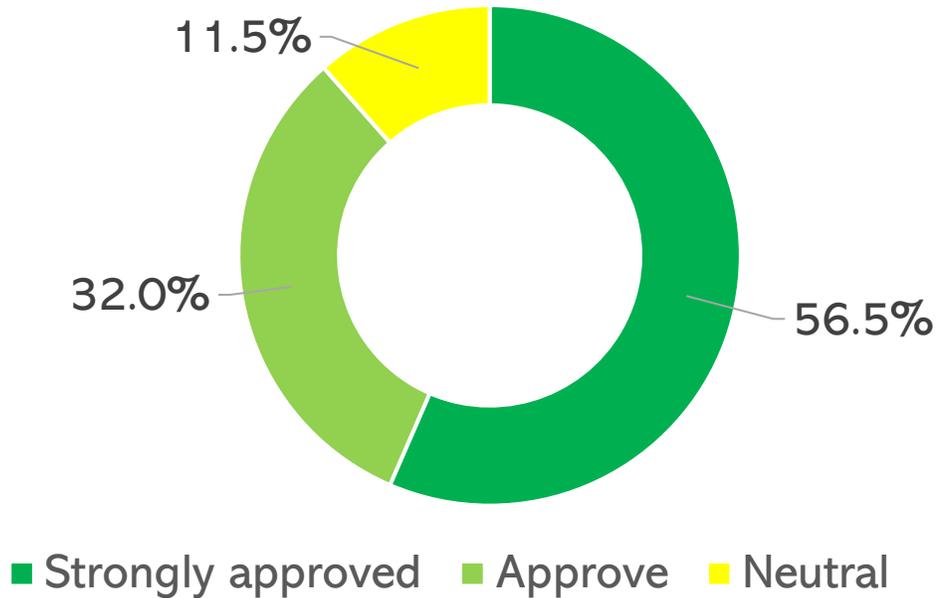


Figure 6. Result of the game evaluation

Would you like to play other games like today's game in the future?

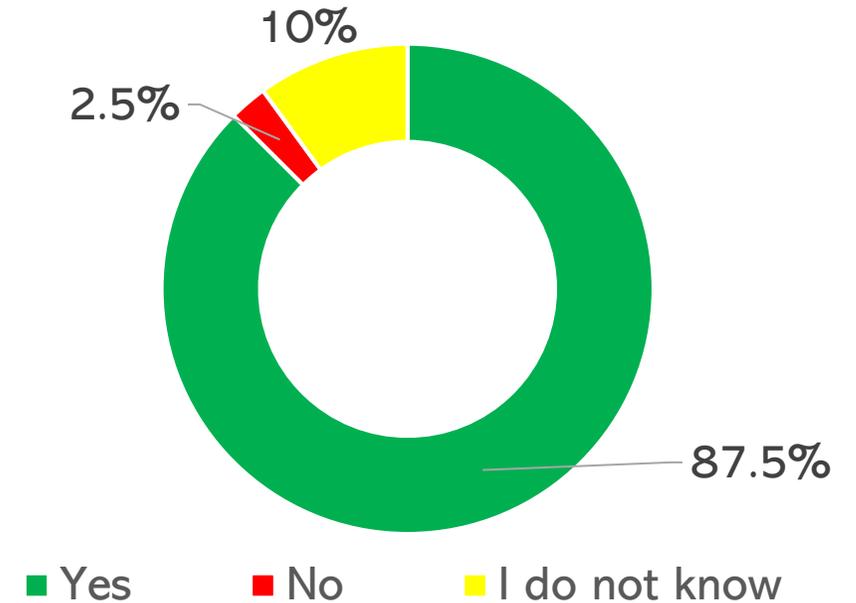


Figure 7. Result of the students' interest in playing a similar game in the future

CONCLUSIONS

A questionnaire was developed and tested with the Production Planning and Control course's students in Civil Engineering in three universities, one from Brazil and two from Chile.



Evaluating the pre-and-post-game responses, there was an increase of 20% of correct answers and a reduction of 9% in the alternative "I don't know the answer" in all questions.



The experience of applying the Parade of Trades game to the virtual environment proved successful, considering the students' engagement and the use of different tools that facilitate remote teaching



THANK YOU!



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