Collaborative creation between students and teachers for the development of an evaluation game board in class

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Abstract

Prehispanopolis is the result of a pedagogical, dynamic and innovative proposal for teaching, learning and evaluation of students through the creation of a board game developed between teacher and students. As part of the activities of evaluation, the students are proposed to create a game that involves the subjects and concepts of the course, and it can later be used as an evaluation tool.

The pilot test was conducted in the subject called Arquitectura Hispanoamericana (Hispano-American Architecture) of the Architecture program and limited to pre-Hispanic architecture and urbanism, hence the origin of the name of the game.

The main objective in the proposal of the creation of this game is to generate greater motivation and interest in students for learning in classes that have high theoretical content and are passive, monotonous and dense both in its content and in its class methodology. History of architecture meets these characteristics among students, for this reason it was decided to start with the project in this class.

Results show a high motivation and participation of the students, both in the development of the game and at the time of being used as an evaluation tool. Likewise, the academic results corresponding to the subjects evaluated with the game were improved.

Keywords: Boardgame; game-based learning; gamification; motivation; methodology.

1. Introduction and Background

Usually the theoretical classes use common techniques and methodologies for their development and teaching processes, among these are: the master class and presentations by the students. In this type of techniques, the person who is facing the students in the classroom, talking about the topics of the course, should have the ability to involve and capture their listeners, otherwise, this activity will be monotonous for the students. students. Likewise, in these theoretical classes, it is common to agree on forms of evaluation, which include: written exams (open question or closed question), exhibitions, written essays and portfolios.

These types of described situations are very commonly presented in history classes that are part of the curriculum of academic programs that tend to have courses with more practical content (workshop and laboratory), as they are usually in Engineering and Architecture.

Some of the current methodologies that support teaching processes and promote better learning are case study, project-based learning, problem-based learning, project work, inverted classroom and game-based learning (GBL).

Some of the tools available for the creation of games are: Kahoot, FlipQuiz, Quizizz or ClassDojo, with which it is possible to do an evaluation process, in which the students get involved in the class with the available technology in the questionnaire solution.

According to (Verdú Surroca, 2016) the learning methodologies are not isolated but are interrelated among them. In this way, the games can enhance collaboration through consensus among the members of the group, which must deploy the skills of exchange of ideas, opinions and knowledge, tolerance with the ideas of others, the elaboration and contribution of new knowledge, the negotiation of emerging perspectives and ideas and decision making.

Educational history games can be used as an alternative so that learning history is a motivating experience (Nor Azan, Azizah, & Wong Seng, 2009). Teacher designs the mechanics, dynamics and components creating scenarios and narratives to make learning attractive, combining teaching strategies in which you can use both physical and virtual tools.

Apart from the above characteristics, the learning based on the game are designed specifically for learning with favorable points such as: real-time feedback, socialization, the development of creativity and the promotion of participation.

Having the above mentioned, a proposal was developed that included the use of a board game for the evaluation of the History of Architecture class, specifically in the area of prehispanic architecture and urbanism, but that later evolved into a methodological

proposal that includes the participation, proposal, creation and testing of a game by students, including the concepts and topics that must be evaluated.

2. Project: Creation of a board game

The History of Architecture class has three evaluations during an academic semester. As an activity for the first evaluation, the students were proposed to create a board game, which could evaluate the topics corresponding to the architecture and urbanism of the main pre-Hispanic cultures of America, such as: Maya, Azteca, Inca and Tayrona, along with some of its cities, among them: Uxmal, Chichen Itza, Tenochtitlan, Teotihuacan, Cusco, Machu Picchu and Ciudad Perdida ("Lost City").

The creation of a board game was proposed, to be played within the class, as a learning tool, in such a way that there would be more interaction among the students themselves, that they would evaluate their classmates and discuss the answers, providing Real-time feedback

This idea was proposed with the aim of expanding the thematic content of the evaluation, increasing student participation, encouraging their motivation and involving them in the development of the evaluation activity.

In the elaboration of the educational game proposal several components must be taken into account, among them are: coherence between the theoretical, pedagogical, artistic and design components. For this development have taken into account techniques, dynamics and application of gamming concepts (Cortizo Pérez, et al., 2011), which is a design tool that contributes to meet the proposed objectives, for the case of learning, can help to obtain better results by obtaining rewards, points, prizes, challenges and classifications.

The basic dimensions of the gamification are three and are structured in a pyramidal way: -figure 1- the dynamics at the top, the mechanics in the middle and the components at the base (Werbach & Hunter, 2015).

Dynamics: They aim to satisfy the motivations of those who play to perform certain actions. For this, progress, recognition, rewards and status are used.
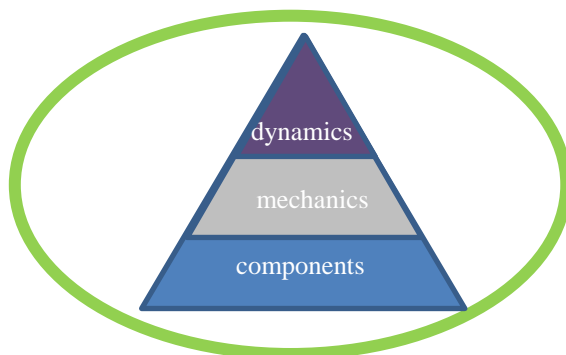
Figure 1. Dimensions of the Gamification. Source: Pisabarro Marrón & Vivaracho Pascual, 2018

Mechanics: Are the elements of the game that allow the participant to advance: rules of the game, control mechanisms, levels, points system, challenges, luck, competition, challenges, feedback, acquisition of resources, rewards, transactions, shifts.

Components: It refers to the objects that constitute the game, as well as the specific elements to materialize what is defined in the mechanics of the game. They include: avatars, badges, collections, content unlocking, gifts, scoreboard, levels, points.

Experience: It is the element that brings the game together and makes it feel real. They are the emotional responses during the development of the game, including fun.

3. Creation and design process

In the first phase of the board game project, the professor defines the topics that must be covered, in this case, the first part of the course was to be evaluated, these areas were: architecture and urbanism of the main pre-Hispanic cultures of America.

Afterwards the students meet to brainstorm about the type of game they wanted to create, based on the game they already knew. The result of this process oriented them towards two game proposals, similar to Monopoly and Parcheesi, but involving some modifications.

The next step was that, from a model given by the teacher, each group had to make ten study cards (cards with basic information about a specific topic - see figure 2.- which serve as study material) referring to the specific topics that should be evaluated, so that, based on the information in these cards, the teacher will create the questions. This activity allows students to study, summarize and learn more about the topics seen in class.

Later in a meeting with all the students without the teacher, an agreement was reached about the model of the game that would be used, defining: objective, instructions and key points for the development of the game. The document with all this information is sent to

the teacher for review and this is returned with the respective recommendations and observations, so that students have a corrected version for the next class.

Figure 2. Sample of Study card: god Chaac of the Mayan culture (In Spanish and translated into English).

In this stage the students are the ones who propose the game and define the rules, which allows that the game is not an imposition of the teacher, but they are part of the creation of this, which provided greater motivation, participation and identity within the group and the game. At the next meeting between all the students and the teacher, a review of the document is made, doubts are clarified, and the necessary adjustments are made.

Subsequently the activities of construction of the game are distributed. Each group has the responsibility to create and build the different parts that make up the game, such as the board, the chips, the cards, the box, the instructions with illustrations, etc. Before making the impression, all the material goes through the group's review, to make the respective recommendations. This means that, even though the tasks have been divided, everyone is involved, creators and participants in the materialization of the game.

Figure 3. Students playing during the evaluation activity.

Finally, the complete game is assembled, and the day of the evaluation is tested. The first part of the grade corresponds to the work done by each group for the creation of the game and the second part of the grade, corresponds to the performance that is held by the students during the game. Figure 3.

4. Results and evaluation

In this first version, the game consists of: 70 thematic knowledge cards (general, housing, urban planning, buildings and techniques), 70 question cards, 12 offering cards, 12 slaughter cards, 1 box, 1 board, 7 Totem poles, 2 dice, 1 pin box and the manual of rules. See figure 4.

The dynamics of the game consists in acquiring the greatest amount of properties and in turn occupying the territories on the map. Each player or group chooses a Totem (each Totem has the form of a god of each culture) places it in the center of the board that corresponds to Lost City, all players or teams roll a die and the player or team that has the highest number starts the game. Throw the dice again and the number that comes out indicates the path through which you must start, throws the dice again and indicates the number of squares to advance.

Figure 4. Components of the board game created and manufactured by students.

Each square has a color and you should take a question card corresponding to this color (green: cultural generalities, blue: urbanism, red: buildings, yellow: housing and purple: technical). If the answer is correct, the pawn stays in that square and earn the card and a pin, which must be located on the map, on the city corresponding to the question. If the answer is wrong, the pawn remains in the previous square without moving. The game ends when a player comes back to the same starting place by running the board clockwise. The player with the most pins and properties earned wins the game.

The dynamics of the game are complemented by some thematic knowledge cards, which can be used by the students, to review the topics before starting the game or they can also be used to verify the answers to the questions during the game, since the knowledge cards are associated with the question cards.

In the following chart, it is summarized how the moment of the game and the elaborated material contribute to the learning and feedback of the student.

Table 1. Summary of the stages of game creation, material used and learning objectives.

Moment	Use Material	Learning objetives.
Previous stage of the game	Thematic knowledge cards	• Remember historical facts of pre-Hispanic cultures. • Understand the differences and similarities of cultures through comparisons.
Stage of action of the game	Question cards	• Contrast what was learned in class and what was reviewed with the thematic knowledge cards, with the answer of the questions.
	Thematic knowledge cards	• In case of doubt, to be able to compare the answers of the other players or groups, with the knowledge cards, to decide if the answer is correct or not. (feedback).
	Bonus cards	• Evaluate the knowledge learned through questions and argumentation in the answers.

A survey was made to 47 students (two different years) about their experience with the board game and their learning after the class. The results are shown on table 2.

Table 2. Survey to the students about the experience and learning using the board game.

Your experience playing the game	★ ★ ★ ★ ★	4,61
To use board games in others classes	★ ★ ★ ★ ★	4,67
Knowledge after the class	★ ★ ★ ★ ☆	4,49
Remembering stuff visiting these places	★ ★ ★ ★ ☆	4,36

During the development of the evaluation process it was evidenced that the learning by the students was greater due to the number of correct answers given during the game, likewise, in terms of grades there was an increase in the average of these. A good part of this increase is due to the fact that the development process of the game occupies 50% of the grade,

however, the remaining 50% of the grade, is still higher than the average of the previous years, going from 3,4/5,0 to 4,4/5,0.

Survey also asked to the students about their preferences on presentation of the topics, evaluations and exams. Results are shown on table 3 and table 4

Table 3. Survey to the students about the experience and learning using the board game.

🔵 Teacher's presentation	17,0%	
🟠 Student's presentation	2,1%	
🟢 Using board game	80,9%	

Table 4. Survey to the students about the experience and learning using the board game.

🟠 Written Exam.	10,6%	
🟢 Online tool.	46,8%	
🔴 Using board game.	42,6%	

On the other hand, we proceed to perform the t-student test to check the equality or statistical difference of the samples of the students' averages, according to the grades when the board game was used as a tool to teach the topics in class or it was not, in class but it was not used to take grades. Taking as null hypothesis $H_0:\mu_1 = \mu_2$, when performing the respective calculations we obtain the computed p-value is lower than the significance level alpha = 0.05, one should reject the null hypothesis H_0, and accept the alternative hypothesis $H_1:\mu_1 \neq \mu_2$. With which it is possible to be affirmed that if there is an improvement in the average of final marks of the students who have been evaluated using the board game as a teaching tool.

5. Conclusions

The board game created with the students is highly satisfactory, since it fulfilled the objectives of increasing the participation and motivation of the students in the History of Architecture class. Likewise, both in appreciation and as a result of the notes, an increase was obtained in the correct answers and in the quality of these. Students enjoyed the experience with the board game.

Although the game fulfilled the objectives during the test, after its evaluation several physical, regulatory and structure aspects were found that must be modified or restructured,

so that other teachers of the class can be used or adapt it to other courses. At this moment we are working on that correction and update process.

When replicating the game with other students who had not participated in its construction, some doubts and inconsistencies were presented, since they did not know the game. Likewise, in order to involve the students more, some activities should be added, in which the students can choose the modification of some of the rules for the evaluation.

By involving students in the design of the game and giving them freedom for their development and creation, a close follow-up must be done so that the objectives proposed by the teacher are achieved and not only the creation of a game.

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