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Article

Global Game Jam in Latin-America, a Collaborative Videogame Learning Experience

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Abstract: Videogame production events, particularly the Global Game Jam (GGJ), is an activity par excellence aimed at the development of the world's largest games, enhancing the form of personal expression, critical thinking, and appropriation of new media through collaborative work. The general objective is to explore the development process within the context of the GGJ, calculating the correlation between level of education and source of inspiration, the correlation between level of education and purpose of the game to be designed in the Global Game Jam and the correlation between level of education and skills. The main source of inspiration is defined by game genre, game mechanics, or other video game, in addition the purpose of the game is mainly due to learning a technical skill, enjoy doing it, and generate satisfaction in the players. Finally, the skills that prevail are 2D Design, Programming, and 3D Design. People with a high level of knowledge have the same passion as those who have just started in the multidisciplinary field of the development of video games motivated by creating an original game that has a good script and provides them a life experience.

Keywords: videogame production; Global Game Jam; quantitative study; learning; educational level

1. Introduction

Video games are a clear reference of cultural globalization (Šisler et al. 2017), in fact, figures of the video game industry show that at the beginning of the XXI century video games listed for \$20 billion (Bernal-Merino 2017). Almost 20 years later, in 2019, it has a potential to surpass \$118 billion, including computer games, mobile apps, entertainment webs, among other platforms (Cheng and Lin 2017). Additionally, in the United States 65% of the population spends three or more hours playing video games (Entertainment Software Association 2017). In China, it is estimated that from 751 million active Internet users, about 422 million are online players (Jiang and Fung 2019). Therefore, Seiffert and Nothhaft (2015) stated that the video games market exceeds other entertainment industries such as cinema and music in audience, growth, and income.

This phenomenon is no coincidence, the immersive experience of video games has provided cognitive and perceptual stimulation of attention, memory, and executive control (Boot et al. 2008) also benefiting visual sensitivity (Appelbaum et al. 2013), decision-making (Green and Bavelier 2015), and the transmission of values (Martinez et al. 2015). While, in the field of communication, video games have served as new advertising support—advergaming—(Aldas-Manzano et al. 2014), they increase confidence by fostering social institutions and communication processes (Ratan et al. 2010), they create new forms of interaction through virtual communities (Granic et al. 2014), develop informative news,

newsgames (Plewe and Fürsich 2017), among other advantages. Video games are part of the digital and participatory culture, while their effective realization, design, and promotion reflect the changing formats of the media for their application within the new communication ecosystem.

1.1. Production of Videogames

There are multiple circumstances that have channeled the promotion of video game production in the last decade. First, for Dezuanni (2010) the computer skills incorporated in the so-called technological literacy have provided the generation of knowledge aimed at the development and implementation of new technologies (Peñalva et al. 2019), including digital programming and animation; likewise, the progressive access to Internet has reduced inequality gaps and generated a greater field of opportunities and experiences, thus preparing young people in the production of video games (Jenkins 2009). Also, restructuring high schools, museums, community centers, and libraries by adding computers and audiovisual equipment has facilitated the production of video games (Torres-Toukoumidis et al. 2017). To complement such circumstances, Bogost (2007) considers that cultural influence clearly affects the creation of video games.

The creation of video games is a process that combines creativity, innovation, and participation. On the one hand, creativity is a form of personal expression that boosts critical thinking and the use of new media (Chiang and Qin 2018). In fact, there are games like Mario Maker, Minecraft, Lode Runner: The Legend Returns, Lunar Magic, Dustforce, and Super Meat Boy where the borders between the player and the video game designer are removed. Specifically, in Mario Maker that is the most popular among the video games that have been mentioned, the creativity corresponds to the level of interaction with the different normative components and restrictions of the interface accompanied by the supposed effect that it could generate when spreading its creation in the community (Lefebvre 2017).

Second, innovation is revealed in the creation of video games as an agent of technological solutions (Earp 2015) which demonstrates the use of mechanisms, strategies, and original design techniques, especially for the educational context (Rich and Hodges 2017). It is worth noting that innovation is also imbued in aesthetics with the incorporation of new graphic projection systems, 3D including sound, modeling, texturing, thus sustaining the formalization of new activities within the playful interface (Gee and Tran 2016).

Finally, Peppler and Kafai (2007), said that the production of video games is participatory. Participation is a component of media culture (Kafai 2006) that has been promoted because of the support in the creation and extension of knowledge and thus encouraging a civil commitment and artistic expression between people (Jenkins 2009). Therefore, the activities that are part of the creation of video games trace a path toward participation (Hayes) and through a constructive process individual and collective characters among team members are optimized, this fosters group dynamics and favorable attitudes for learning (Kafai and Burke 2015).

Beyond the theoretical aspects suggested by narratology (Bal 2009) and ludology (Juul 2001), to determine ways of configuring video games, it can be seen as an unprecedented social movement for educators in the development of an educational agenda adapted to the educational context.

1.2. Video Game Production Events

Video game production events are situations where participants can exchange experiences and where people demonstrate new skills, methods, techniques, and tools to design video games (Pirker et al. 2016). Some of the most recognized events are Hackathons and Game Jams, according to Grace (2016) they have many differences; Hackathons are competitions aimed at creating products, not necessarily for entertainment, which are evaluated by experts. On the other hand, Game Jams are exclusively aimed at designing video games through collaborative work while participants have fun in the process. There are currently numerous Game Jams held continuously, such as Ludum Dare, Game Prototype Challenge, Klik of the Month Klub, TIGJam, Dream.Build.Play, and Global Game Jam, the latter is known as the most important (Kaitila 2012).

Global Game Jam (GGJ) is the ultimate game development activity in the world. Every year since 2009 thousands of computer game enthusiasts participate in this forty-eight-hour challenge to make games on a same topic. While hackathons and game festivals existed before the GGJ, and continue to proliferate, the 2009 GGJ was perhaps the first time that such an event was held in 23 countries simultaneously. Currently, it exists in 108 countries, where more than 40 people participate to produce more than 8000 games in 48 h.

For spectators, participants, and organizers, GGJ represents an opportunity of high learning potential and a great benefit to apply and experience hands on practice. Academics and organizers of the Global Game Jam have determined that the promotion, organization, and development of research, scientific, and technical activities are related to innovation, experimentation, and collaboration (Fowler et al. 2013a). In this regard, according to Musil et al. (2010) the common elements of Global Game Jam are:

- The experimental development of a video game in 24 h.
- The video games being developed must have the same topic and must be known by all the participants.
- The events are open to everyone who can contribute to the development of the game. However, some countries have age restrictions and membership to institutions, high schools, universities, or education centers.
- Teams must be made up by a maximum of 5 people.
- Games can be developed for any device or platform.
- At the end, the best games are presented to an audience.

Game events like the Global Game Jam have generated multiple effects in participants, from an academic perspective there is an increase of performance regarding the development of creative thinking and expansion of computational thinking (Preston et al. 2012). From the psycho-emotional perspective, the phasic psychophysiological responses related to the excitement caused by the interaction in these events are connected with the active participation of participants and the obtained rewards (Ravaja et al. 2006). They also indicate that the psychological mechanism of self-efficacy is correlated with enjoyment, competence, control, and subjective experience of the user in this type of event (Trepte and Reinecke 2011). From a social perspective, social interaction is essential to succeed in the development of games, especially when communicating ideas to others, influencing the team, understanding the skills of others, making friends and, where appropriate, getting a new job (Smith and Bowers 2016).

Global Game Jam and other similar events are an attractive way to promote the production of digital games by originating a variety of positive results (Scott et al. 2014). In this regard, the aim of this research is to explore the development process within the GGJ context. There are three hypotheses:

Hypothesis 1 (H1). *The level of education has a correlation with the source of inspiration.*

Hypothesis 2 (H2). *The level of education influences the purpose of the game to be designed in the GGJ.*

Hypothesis 3 (H3). *The level of education has a repercussion on the competencies enhanced by the GGJ participants.*

2. Materials and Methods

An exploratory research with a quantitative approach was conducted in order to measure the dependency between education and three other variables: source of inspiration, purpose of the game and competencies developed in the Global Game Jam.

An exploratory research was used to obtain information about an unknown phenomenon by determining the trends and relationships between variables (Sampieri et al. 2010). The Global Game

Jam, like other video game production events, are recent, especially when it comes to evaluating their incorporation in the scientific field. The most important international databases, Scopus® and Web of Science show that conferences respond more frequently to the analysis of these multidisciplinary areas.

Analyzing the Global Game Jam and the hackathon (Table 1) demonstrates that this is still a new area of study which makes it necessary to create a theoretical structure to measure its impact on education and communication.

Table 1. Global Game Jam in international databases.

“Global Game Jam”	Scopus	Web of Science
Articles/Papers	2	1
Conferences	17	2
“Hackathon”		
Articles/Papers	64	46
Conferences	93	40
Total	176	89

A simple random probability sample was carried out by sending the validated questionnaire to registered participants of the GGJ from four Latin American countries: Ecuador, Peru, Colombia, and Venezuela. 395 out of 567 participants answered the questionnaire (70% of the sample) thus enabling the measurement of the existing correlation between education and other variables focused on game production.

The applied survey is subject to the questionnaire models implemented in Global Game Jam events (Fowler et al. 2013b; Zook and Riedl 2013). Both the questions and the options come from the surveys, finally a questionnaire that presents the total number of questions from both questionnaires was designed. There were 12 questions in all, the first five asked people’s name, age, education level, employment status and country. The other four were close ended questions focused on the aim of the study, they were related to source of inspiration, objective, most common problems and competencies. The last three were open questions about the most knowledgeable skill, the time spent on video games and justification to attend the Global Game Jam. In summary:

- * Preliminary questions: name; age (under 18, 18–20, 21–29, 30–39, 40–49, 50–59, older 60); education level (under high school, high school, bachelor, engineering, master, PhD., other); employment status and country (Peru, Venezuela, Chile, Guatemala, Ecuador, Cuba, Bolivia, Haiti, Dominican Republic, Honduras, Paraguay, El Salvador, Nicaragua, Costa Rica, Panama).
- * Questions of the variables: Source of inspiration for the concept of the game to be designed in the Global Game Jam (theme, game mechanics, videogames, videogame genre, life experience, history, movie, biology, emotion, book, abstractions, board game, art, other games, music); purpose of the game to be designed in the Global Game Jam (create a game, test a mechanic, produce satisfaction on the players, learn a new competence, recreate a classic game, enjoy making the game, extend an idea, originality, meet people, observe people’s impact, raising awareness about an issue; win the competition, test an idea, create a game portfolio); common problems you may encounter during the development of the game (programming, group management, art, time, bugs, expression, balance, collaboration, integration, idea, ability, hardware, audio, none).
- * Final open questions: Time spent on videogames, the competence with more knowledge and the reason to participate on this event.

After collecting the data, a correspondence analysis was carried out using a clustered representation together with the chi-square test to compare the observed frequencies, the INFOSAT Software Version 2017 was used.

Under the premise that the Global Game Jam (GGJ) is an event where knowledge is shared by creating multidisciplinary teams that create a videogame, the aim is to explore the development process and conceptualization within the context of the GGJ. For this purpose, the results of the survey applied to 395 people who were registered in the event held in Ecuador, Peru, Colombia, and Venezuela from 25 to 27 January 2019, were statistically inferred to test the hypotheses described at the beginning.

Since the data are categorical, they were analyzed through the application of multivariate statistics that enable the description and analysis of multidimensional observations resulting from the measurement of representative factors for the study. Two appropriate analysis techniques were applied, first the contingency tables allowing the analysis of data containing two or more response variables for each case. Second, the correspondence analysis which enables graphic characterization of the relationships formed in a two-way table of categorical variables, as points in a low-dimensional Euclidean space in two-dimensional format.

3. Results

The purpose of the analysis is to take the main idea of the GGJ that tests all the video game fans by using their skills with new technologies (ICTs) to create an original game in 48 h while including various categories of knowledge such as programming, design, production, script, and composition.

The categorized data is analyzed in order to prove the objectives described below:

Based on the correspondence analysis on Table 2, it is possible to distinguish that the level of responses, generated under the assumption of this section, are homogenous or simultaneously correspond between the analysis variables. Also, from the options that best describe the inspiration toward the development of a game, the second option stands out as the one with the greatest representativeness.

Table 2. Contribution to the Chi square of education and source of inspiration.

	Value	Inertias	Chi-Square	(%)	% Accumulated
1	0.67	0.46	22.76	49.47	49.47
2	0.57	0.32	16.13	35.04	84.52

The correspondence analysis confirms the dependence between the two qualitative variables, level of education and source of inspiration, where it is evident that from the dimensions, the factors or the differentiating elements, the first one explains more inertia (49.47%) than the second (35.04%), which was expected since the dimensions were obtained by means of a factorial analysis, meaning the more dependency between variables, the more inertia. Therefore, it means that the categories have a greater dispersion of variance in dimension 1, although both dimensions have a representative value of inertia.

In the following Table 3 we will distinguish which category per variable would represent greater variance or dispersion. In the case of the “education” variable we have “Less than high school” and “Doctorate” as the categories with the highest level of variance. In the case of the “source of inspiration” variable we can distinguish that Life experience has a greater degree of variance.

Therefore, in order to define its dependency. If they are dependent, there will be a lot of inertia, that is, lots of dispersion which is proven in our case. (To define if they are independent there will be little inertia and if they are dependent (they are related) there will be a lot of inertia, that is, a lot of dispersion which is proven in our case).

To verify the dependence, a new contrast with contingency tables is carried out and the level of dependence of variables is tested under the following assumptions:

Ho: Independence Ha: Dependence

The calculated *p* value in Table 4 is not less than or equal to 0.05, therefore the null hypothesis is rejected and the alternative hypothesis that states that “education” and “source of inspiration” are dependent and correlated is accepted.

Table 3. Column of education and source of inspiration.

	Axis 1	Axis 2
Life experience	1.36	0.80
Abstract	−0.90	0.73
Game genre	−0.62	0.32
Book	−0.90	0.73
Video game	−0.19	−0.29
Movie	−0.04	0.50
Game mechanics	0.23	−0.49
Art	0.90	−0.73
History	0.16	−0.55
Excitement	0.24	−0.91
Other games	0.24	−0.91
Board games	−0.90	0.73

Table 4. Chi square contingency table of education and source of inspiration.

Statistical	Value	gl	<i>p</i>
Chi-square test Pearson	46.02	44	0.3888
Chi-square test MV-G2	42.22	44	0.5482

In order to characterize the contrasted variables, a descriptive study per categories of these variables are carried out according to the respondents’ answers:

It is possible to identify that the levels of High School Education and Licentiate/Engineer make up 84% of the total with a representativeness of 42% each. The interviewees consider that the main sources of inspiration are: game genre (18%), game mechanics (16%), video game (16%), and life experience (14%) that make up 64% of the total.

The correspondence analysis on Table 5 distinguishes an optimal concentration toward common definitions between variables in virtually all inferred survey records. Regarding the purpose of the game where three options that consider is the end of the development of the game were taken, there is greater representation in option two.

Table 5. Contribution to the Chi square of education and purpose of the game.

	Value	Inertias	Chi-Square	(%)	% Accumulated
1	0.52	0.27	13.51	52.10	52.10
2	0.39	0.15	7.53	29.03	81.13

A homogenous response level can be distinguished for the competencies that are required to develop a game for the GGJ, the first option provided by the interviewee demonstrates the highest level of representativeness.

Two dimensions of the analysis that correspond to the crossing of the variables “education” and “purpose of the game” were formed on Table 6, where the first axis denotes an inertia of 52.10%

and the second dimension 29.03%, where the greatest variance dispersion in the variable “level of education” are in “Less than high school”, “Masters,” and “Doctorate”, also in the variable “purpose of the game in GGJ” it is “originality” which presents greater dispersion of variance. The following tables present the indicators by dimension that lead to the conclusion that there is dependency between the analyzed variables.

Table 6. Column of education and purpose of the game.

	Axis 1	Axis 2
Originality	1.28	−0.36
Meet people	0.49	0.88
Generate satisfaction in...	0.39	0.39
Observe the impact in the...	−0.03	−0.03
Enjoy doing it	−0.05	−0.05
Learning a skill	−0.29	−0.41
Test the mechanics	0.46	0.32
Transmit an idea	0.33	0.49
Test an idea	0.83	−0.03
Recreate a classic game	−0.98	−0.35
Create awareness about sth...	−0.98	−0.35

Based on the contingency tables, the alternative hypothesis is accepted. This implies that both “Education” and “Purpose of the game” are interdependent variables (Table 7).

Table 7. Chi square contingency table of education and purpose of the game.

Statistical	Value	gl	p
Pearson’s Chi Square	25.92	40	0.9584
Chi Square MV-G2	29.11	40	0.8986

The interviewees consider that the purpose of the game is mainly due to learning a technical skill (26%), Enjoying doing it (24%), Generating satisfaction in players (10%), and Testing the mechanics (10%) which covers 70% of the total.

According to Table 8, there is a homogenous response level for the skills required to develop a game for the GGJ, the first option provided by the interviewee presents a higher level of representativeness.

Table 8. Contribution to the Chi square of education and skills.

	Value	Inertias	Chi-Square	(%)	% Accumulated
1	0.57	0.33	16.45	60.03	60.03
2	0.38	0.15	7.28	26.56	86.60

Two dimensions of the analysis corresponding to the crossing of the “education” and “skills required to develop a game” variables are generated and presented on Table 9; the first axis denotes an inertia of 60.03% and the second an inertia of 25.26%, where the greatest dispersion of variance in the “educational level” variable is given in “Less than high school” and “Doctorate”. Similarly, in the variable “skills necessary for the game in GGJ”, “Writing and script” represents greater variance dispersion. The following tables present the indicators by dimension that lead to the conclusion that there is dependency between the analyzed variables.

Table 9. Coordinates column of education and skills.

	Axis 1	Axis 2
Writing and script	−0.68	−0.09
2D design	−0.19	−0.15
None	−0.02	−0.96
Programming	−0.32	0.18
Game design	−0.02	−0.96
3D design	0.20	0.84
Sound design	−0.37	0.13

The contingency tables prove the level of dependency of variables, which demonstrates that “education” and “knowledge to develop the game” are dependent.

4. Conclusions

Based on this analysis, it is possible to establish that the level of dependence between the study variables in the education element of the participants in the GGJ is directly related to the greater variance dispersion in schooling of “Less than high school”, “Masters,” and “Ph.D.”; once it is related to the study objectives such as the source of inspiration to participate in GGJ, a higher level of variance is established in “life experience”. In the objective referring to the purpose of the game, a greater dispersion in the category “Originality” is plausible, finally the category “Writing and script” represents greater variance in the knowledge objective that is needed for the development of a good game. Based on what has been presented, the assumption is that all the objectives are fully met when there is significant statistical dependence between the analyzed variables and their interrelationships.

In order to complete the dependence analysis, the main valuations were determined by the interviewees where the levels of high school education and licentiate/engineer make up 84% of the total, with a representativeness of 42% each within the education variable. The study presents the following preferences:

- The greatest source of inspiration is characterized by game genre (18%), game mechanics (16%), video game (16%), and life experience (14%) which make up 64% of the total.
- The purpose of the game is mainly due to the learning of a technical skill (26%), enjoy doing it (24%), generates satisfaction in players (10%), and testing the mechanics (10%), which make up 70% of the total.
- The skills that prevail for the development of the GGJ, according to the interviewees are: 2D Design (44%), Programming (20%), 3D Design (10%), Sound Design (10%), and Writing and Script (10%), which make up 94% of the total.

Ultimately, as [Fowler et al. \(2013b\)](#) states, there is a high level of support from the community for the Global Game Jam, especially when it is proposed from an empirical perspective as a practice aimed towards learning.

5. Discussion

The study shows its purpose toward the composition of the independent variable (Education) and preference for the analyzed variable. It can be said that the purpose of the competition has its advantages and that people with high levels of knowledge have the same passion as those who have just recently joined the multidisciplinary field of video game development, they are motivated to make an original game that has a good script and provides them a life experience. Future research should be done within a broader context and taking other Latin American countries into account. In this regard,

the analysis of the games should be promoted by assessing the consequences of the products created in the Global Game Jam.

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