

Can Gamification be introduced within primary classes?

Veronica Marín

vmarin@uco.ces

Universidad de Córdoba, Spain

Magdalena López

magdalenalopez@unez.es

Universidad de Extremadura, Spain

Guadalupe Maldonado

gambucordoba@gmail.com

Universidad de Veracruzana, México

Abstract

Training through gamification is everyday a more evident reality in Primary Education classes. The teachers' view about this has been modified as it is shown in the study published by aDeSe in 2012. However, does it really have place in the students' curricular development in the primary education stage? For the sake of responding to this question, we have carried out a descriptive study about the opinion that the future teachers from primary education have got about this "new" form of implementing the curricular contents. The sample, conformed by 244 students of second course of Media Literacy and Didactic Application of ICT, answered a questionnaire consisting of 23 questions, of which 14 are devoted to determine the attitude that future teachers have facing videogames and the remaining 9 indicate the educative dimension that they give to it within the primary class. The most significant initial result we find is that while they consider having a proactive view as users of this, women are less active within this tool, although the female teachers conclude, however, that it could be an attractive resource for the learning of the youngest students.

Keywords

ITC; videogames; training; pupils; curriculum; primary education

¿Puede entrar la Gamificación en las aulas de primaria?

Veronica Marín

vmarin@uco.ces

Universidad de Córdoba, Spain

Magdalena López

magdalenalopez@unez.es

Universidad de Extremadura, Spain

Guadalupe Maldonado

gambucordoba@gmail.com

Universidad de Veracruzana, México

Resumen

La formación a través de la gamificación es cada día una realidad más latente de las aulas de educación Primaria. La visión que los docentes van teniendo de estos se ha ido modificando tal y como lo señala el estudio publicado en 2012 por aDeSe. No obstante, ¿realmente tienen cabida en el desarrollo curricular de los estudiantes de la etapa de educación primaria? En aras de poder responder a esta cuestión se ha realizado un estudio descriptivo de las opiniones que los futuros maestros de dicha etapa educativa tienen de esta "nueva" forma de implementar los contenidos curriculares. La muestra conformada por 244 estudiantes de 2º curso de la materia Educación Mediática y Aplicación didáctica de las TIC, respondió a un cuestionario compuesto por 23 preguntas, de las cuales 14 están destinadas a determinar la actitud que los futuros maestros tienen ante los videojuegos y las 9 restantes nos indican la dimensión educativa que les otorgan dentro del aula de primaria. El resultado inicial que más destaca es que si bien consideran tener una visión proactiva como usuarios de estos, las mujeres son menos activas en este medio, aunque ellas concluyen, no obstante, que pueden ser un recurso atractivo para el aprendizaje de los más jóvenes.

Palabras clave

TIC; videojuegos; formación; alumnos; curriculum; educación primaria

I. Introduction

The development of Information and Communication Technology (ICT) has meant that different nature elements or elements with different perspectives have been developing not only under the safety net of Internet but also under the several tools which had been created before the technology peak. One of these tools is the videogames, which since their launch in the USA in the seventies up to today, have gone through various phases of love and hatred on the part of society. Right now, little by little and overcoming or moving away from their mercantilist view, we believe that they have opened a gap in the academic areas of children, youngsters and teenagers and not such teenage people today.

Covered by Horizon 2014 report (Johnson, Adams Becker, Estraday Freeman, 2014) as a tool which is worthy to take into account as regards the formation of children and youth from today, we consider that it is necessary to check if the trainers of social, political, educational and economic leaders from tomorrow share the same perspective. In the study we have presented below, we approach the reader to open and holistic perspective, where it is revealed how teachers at the initial training consider that while they are not expert players nor excessively keen on them, it can be a tool which invigorates and brings closer the curriculum contents of Primary Education, as well as the data collected in the report carried out by the *Tomorrow* Project (2008) or those collected in 2012 by the aDeSe association.

II. Is there an educational vision in videogames?

As Morales notes (2013), Pedagogy has always tried to innovate teaching, either from the addition of new resources or through the design of paradigms or theories covering the changes, sometimes turbulent, by which society passes, and one of those resources and also one of those changes is the incorporation of Information and Communication Technologies (ICT) to teaching-learning processes. The different legal regulations which have been developed in recent decades, such as the Organic Education Act (2006) and the Organic Act of Educational Quality Improvement (2013), make reference to a new way of teaching and learning, based on a series of competences called basic. In both cases, it is mentioned the digital and informational ability of students, which must be achieved after having completing the primary stages. While in the early stages (Early Childhood Education) it is made reference to the need to initiate students into a digital and media literacy, in all the reviews made in these regulations, the emphasis is put on the development a critical view of digital media which are now available to everyone. In conclusion, the learning process of the twenty-first century means that the students can have access, analyze, evaluate, create and consider in order to lead curricular practice into action (Hobbs, 2010) supporting them in ICT.

Against this background of technological excess, some resources are being adapted to the environment, whereas others evolve to survive in the technological jungle, which has seen the rise of Web 2.0 tools born under the fast and explosive growth of Internet. One of these technologies is videogames. Demonized by some people, when back in the 50s they ousted traditional television the throne of the means devoted to occupy our leisure and free time, being classified as violent, as submitting an excessive number of erotic scenes, as encouraging the consumption of various substances, as giving a vision of life far away from reality or presenting the image of a distorted woman, as promoting obesity and poor diet, as isolating the subject from its close family, and so

on (Marín, 2014; Marín and Maldonado, 2014). Such aspects have not made the advantages or positive views which they can have of them, have been despised, since they allow us to develop and exercise creativity, imagination and symbolic games; to work social skills in the socialization processes of the individuals and the repetition of behaviours until perfection; to promote the increase of attention, motivation for learning, the changing of unhealthy behaviours, the learning doing or the active learning (GBL); to appreciate different cultural values, the development of critical thinking, construction and reconstruction of knowledge, the creation of reflection processes (in and for the action), the collaboration, the ability to react to adverse situations, the faculty to solve problems, the development of spatial skills, the effective use of information; to enhance attention and memory, verbal and nonverbal language, the ability to work collaboratively and cooperatively, the desire for self-improvement, the eye-hand skills, etc. (Killiemuir & McFarlane, 2003; Barendiegt & Bekker, 2011; Watson, Christopher & Harris, 2011; Contreras, 2013; Alamri, Hassan, Hassain, Al-Qurishi, Aldukhayit & Hossain, 2014; Marín, 2012; Marín, 2014; Marín and Martín, 2014; Márquez, 2013; Mortaraa, Catalanoa, Bellottib, Fiuccic, Houry-Panchettid & Petridise, 2014), elements which make possible their incorporation into classrooms at all educational levels. It is true, as García Cortés and Lacasa (2014) point out, that video games named as "*serious games*" have been used for a long time in the classrooms. However, our vision tries to incorporate into the classroom methodology those videogames used by students in their leisure time, so that when relating something daily, something that for them means a relaxation and pleasure moment, and which will not be linked to the training strictly speaking, the student will acquire the contents in a playful way without being aware that he or she is "studying" (Azorín, 2014). In this line, we find the results presented by Williamson in 2009, which reflected that 60% of teachers taking part in his study about the videogames use in the British classrooms, weighed positively to include them in the teaching methodologies and 55% of them was using them with good results. The works by Cortés, Gómez, and LaCasa (2012) related to the introduction of a non-serious or educational game like *Sims 3* or by Téllez and Iturriaga (2014), based on the *Assassin's Creed* saga or by Nieto, Téllez and Cannon (2014) with the *Body and Brian Connection* game, is also a proof that this reality is gaining a greater presence every day. As Valverde, Alicia and Revuelta indicate (2013: 149), "which better way to learn without being aware of it and to be able to transmit and evoke concepts which are present in our minds".

III. Methodology

The research we present is born from the question: Can videogames modulate the learning behaviours? Can they be tools helping to develop the learning in an effective and efficient way? From these questions the starting objectives have been:

1. Determining whether videogames are elements which can modulate behaviours, affecting the belief systems, values, attitudes, aptitudes of students.
2. Clarifying whether videogames are a technological resource which can help in understanding of the curriculum contents.
3. Establishing whether the methodological systems must employ them in the classrooms in order to improve their atmosphere.
4. Checking whether education should take them into account from a didactic and pedagogical perspective.

IV. Data Collection Instrument

a. Instrument Construction: reliability and validity

For the collection of the data, the survey method was used, and within this the questionnaire technique is found. In this case, we used the same employed by Marín (2014), which is composed of 23 items, with different scales of answer, grouped into two dimensions. So, items 1 to 14 form part of the dimension 1 called "Attitude towards videogames". They had an answer choice of a nominal kind: yes, no, not know/no answer. The second group, which has been entitled "Videogames and the primary classroom", is composed of 9 items with a Likert scale, where 1 corresponds to strongly disagree and 5 to strongly agree. In order to verify that the questionnaire measured what it had been set in the objectives to be achieved and that in turn it answered to the starting questions, it was tested for validity and reliability.

To determine the reliability of the instrument, the Cronbach alpha test has been applied. Once the test was performed to the whole questionnaire, a reliability of 0,903 was obtained, what, according to Mateo (2012) can be considered as high.

Carried out the discrimination item by item (see Table 1), it was found that the reliability of the instrument ranged between 0,903 and 0,896, so that reliability can be assured in each of the items.

Item	Cronbach Alpha
15. Learning to work cooperatively and collaboratively through teamwork.	0,903
16. Distinguishing the body parts.	0,893
17. Learning the synchrony between the upper and lower limbs.	0,891
18. Identifying primary and secondary colours.	0,886
19. Development of "heuristic" thought (test-mistake).	0,892
20. Self-regulation of the self-learning (continuous assessment).	0,885
21. Development of inductive thought.	0,890
22. Development of the visual and retentive memory.	0,896
23. Understanding the concept of success and failure, up-down, inside-outside, before-after, front-back.	0,892

Table1. Reliability item by item. Source: Own production

Next, it has been considered to carry out an exploratory analysis between the scale variables proposed in the instrument, seeking to endow it with validity, in order to find out the latent factors existing in the same; for this purpose, and as Marín García shows (2011), we have performed the following analysis: descriptive statistics of the variables and an exploratory factorial analysis with the maximum authenticity.

As regards the descriptive statistics of the instrument (see Table 2), it can be observed that the scale variables ranging between the 241 and 244 cases; the minimum of the most of them is 1 and the maximum is 5, coinciding with the opposed extreme values. With respect to the average, the values range between 3,51 and 3,91, so we can maintain that there is a considerable variability

(minimum and maximum values) and a moderate degree of use in the variables by the participating students (averages).

	Min.	Max.	M.	S.
15. Learning to work cooperatively and collaboratively through teamwork.	1	5	3,59	,983
16. Distinguishing the body parts.	1	5	3,63	,902
17. Learning the synchrony between the upper and lower limbs.	1	5	3,53	,906
18. Identifying primary and secondary colours.	1	5	3,72	,911
19. Development of "heuristic" thought (test-mistake).	1	5	3,71	,836
20. Self-regulation of the self-learning (continuous assessment).	1	5	3,54	,862
21. Development of inductive thought.	1	5	3,57	,821
22. Development of the visual and retentive memory.	1	5	3,91	,788
23. Understanding the concept of success and failure, up-down, inside-outside, before-after, front-back.	1	5	3,90	,868

Table 2. Descriptive study of dimension 2. Source: Own elaboration

In conclusion, in view of the results it can be observed that two latent factors will exist within the instrument scale.

Finally, it has been carried out an exploratory factorial analysis with the maximum authenticity with the intention of subjecting to validation the scalar items, as it has been indicated before, giving as a result that the Kaiser-Meyer-Olkin adequacy measure gives a value of 0,837, close to 1, which indicates that it is feasible to perform the exploratory factorial analysis. Also, the Bartlett test of sphericity throws significance ($p < 0,001$).

Factor	Initial self-values			Sums of the saturations to the extraction square			Sums of the saturations to the rotation square		
	Total	% of the variance	% accumulated	Total	% of the variance	% accumulated	Total	% of the variance	% accumulated
I like playing videogames	4,514	50,156	50,156	4,075	45,283	45,283	2,673	29,703	29,703
I read specialised magazines about videogames	1,337	14,857	65,013	,914	10,159	55,443	2,317	25,739	55,443
I read through Internet everything which is new related to videogames	,708	7,869	72,882						
I read in the case the classification of the videogame before using it	,602	6,687	79,569						
I like making comments of the videogames with my friends or acquaintances	,537	5,963	85,532						
I take part in forums or chats about videogames	,421	4,682	90,213						
I have taken part in online "parties"	,371	4,122	94,335						
I imitate the characters from the videogames I play with	,279	3,100	97,435						
I like playing videogames for adults	,231	2,565	100,000						

Table 3. Total variance explained. Source: Own production

Subsequently, we have analyzed the variance extracted by the retained factors. As you can check, there are two factors or scales on which all the results are based: the first of them explains the 45,28% and the second one, the 55,44% of the variance, implying that these nine items or questions from the questionnaire are divided into two scales or factors.

Next, it has been analyzed the factorial matrix and the rotated factors matrix of the items studied. As it can be checked in Table 4 we have obtained two factors, on which the scalar items are based. In the rotated factors matrix (see Table 5), it is stated which item or question from the questionnaire would be classified in each factor: in other words, a scale would be composed by the items 23, 20, 19, 22, 21 and 17, and the other, by the items 20, 21, 16, 18, 15 and 17; items 20, 21 and 17 could be included in any of the two factors, although due to their value, the items 20 and 21 would be in the first scale and the item 17 would belong to the second scale.

	Factor	
	1	2
Learning to work cooperatively and collaboratively through teamwork.	,801	
Distinguishing the body parts.	,694	-,459
Learning the synchrony between the upper and lower limbs.	,691	
Identifying primary and secondary colours.	,686	-,413
Development of "heuristic" thought (test-mistake).	,666	,371
Self-regulation of the self-learning (continuous assessment).	,651	,316
Development of inductive thought.	,630	
Development of the visual and retentive memory.	,625	
Understanding the concept of success and failure, up-down, inside-outside, before-after, front-back.	,592	,347

Extraction method: Maximum authenticity. ^a. 2 extracted factors. 4 interactions required

Table 4. Factorial matrix. Source: Own production

	Factor	
	1	2
Learning to work cooperatively and collaboratively through teamwork.	,736	
Distinguishing the body parts.	,711	,418
Learning the synchrony between the upper and lower limbs.	,687	
Identifying primary and secondary colours.	,666	
Development of "heuristic" thought (test-mistake).	,665	,307
Self-regulation of the self-learning (continuous assessment).		,813
Development of inductive thought.		,774
Development of the visual and retentive memory.		,590
Understanding the concept of success and failure, up-down, inside-outside, before-after, front-back.	,328	,567

*Extraction method: Maximum authenticity. Rotation method: Varimax normalization with Kaiser. ^a. The rotation has converged in 3 interactions

Table 5. Rotated factors matrix. Source: Own production

b. Population and sample

The population participating in this study was the students from the Primary Education Grade, in the Faculty of Education Sciences at the University of Cordova. The participant sample was finally consisted of the students enrolled in the course Media Literacy and Didactic Application of ICT, a compulsory subject in the second year of the degree. Given the compulsory nature of the subject, it was decided to administer the instrument in its sessions, as in such a way the students participation would be higher. Finally, it has been obtained a participation of 244 subjects, from whom 161 were women and 83 were men. According to their age, we have checked that it is located at the frequency of 19 years old (136 subjects), followed by the 20 years old (99 subjects) and ending with 21 years old (9 subjects).

Considering the contingency sex-age (see Figure 1) it can be checked that the presence of women is higher in the three age ranges identified.

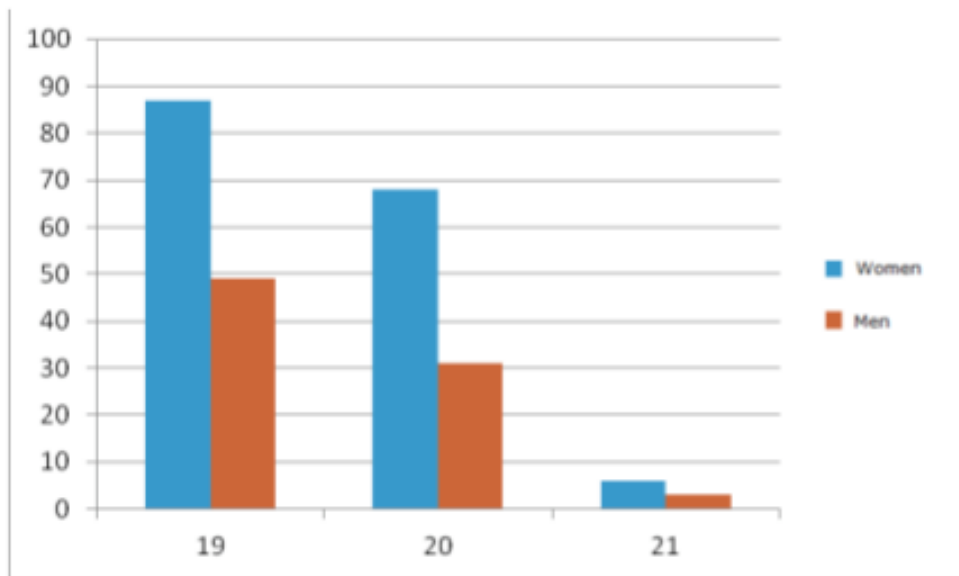


Figure 1. Sample distribution according to the age. Source: Own production

V. Results

a. Descriptive study

As it can be found in table 7 (Dimension 1: study of frequencies and percentages) it is determined that students participating in this study tend not to like playing videogames, and therefore they do not read specialised magazines on the topic nor they participate in chats, forums or online parties about videogames unlike the results obtained in the study of Marín (2014) where the sample studied liked videogames, playing videogames and reading specialised magazines, as well as talking with their colleagues and friends about them. However, it is significant that they consider that videogames can be educational, that they like to there be more in this line and the fact that they have used any of educational character (items 10, 12 and 13).

	YES	NO	NK/NA
1. I like playing videogames	104/42,6%	137/52,1%	3/1,2%
2. I read specialised magazines about videogames	6/2,5%	238/97,5%	
3. I read through Internet everything which is new related to videogames	10/4,1%	234/95,9%	
4. I read in the case the classification of the videogame before using it	49/20,1%	194/78,3	4/1,6%
5. I like making comments of the videogames with my friends or acquaintances	80/24,6%	161/74,2%	3/1,2%
6. I take part in forums or chats about videogames	7/2,9%	233/95,5%	4/1,6%
7. I have taken part in online "parties"	26/10,7%	214/87,7%	4/1,6%
8. I imitate the characters from the videogames I play with	9/3,7%	234/95,9%	1/0,4%
9. I like playing videogames for adults	82/25,4%	165/67,6%	17/7
10. Videogames can be educational	177/72,5%	57/23,4%	10/4,1%
11. The teacher uses videogames in class	30/12,3%	189/77,5%	25/10,2%
12. I would like there would be more videogames	189/77,5%	42/17,2%	13/5,3%
13. I have placed educational videogames in some occasions	162/66,4%	68/27,9%	14/5,7%
14. Playing videogames affects my studies negatively	35/14,3%	148/60,7%	61/25%

Table 7. Dimension: Study of frequencies and percentages. Source: Own production

As it can be observed in Table 8, the students participating in this research agrees that videogames can be seen as a tool to work collaboratively and to help to develop the curriculum contents related to natural sciences, particularly with the human body in general. They are positioned in the same way for the contents related to the visual arts and the development of heuristic and inductive thought, as well as the visual and retentive memory. Similarly, they consider agreeing with the fact that educational games help in the inductive learning and with the basic concepts of success and failure, up and down, inside-out, before-after and front-back.

2. Dimension: Videogames and primary classroom		1	2	3	4	5
1.	Learning to work cooperatively and collaboratively through teamwork.	f. 11	22	56	122	33
		% 4,5%	9%	23%	50%	13,5%
2.	Distinguishing the body parts.	f. 7	13	80	107	36
		% 2,9%	5,3%	32,8%	43,9%	14,9%
3.	Learning the synchrony between the upper and lower limbs.	f. 9/	17	77	115	25
		% 3,7%	7%	31,6%	47,1%	10,2%
4.	Identifying primary and secondary colours.	f. 8	13	58	126	39
		% 3,3%	5,3%	23,8%	51,6%	16%
5.	Development of "heuristic" thought (test-mistake).	f. 5	15	52/	139	30
		% 2%	6,1%	22,5%	57%	12,3%
6.	6. Self-regulation of the self-learning (continuous assessment).	f. 8	15	92	104	27
		% 2,5%	6,1%	37,7%	42,6%	11,1%
7.	Development of inductive thought.	f. 7	11	83	123	20
		% 2,9%	4,5%	34%	50,4%	8,2%
8.	Development of the visual and retentive memory.	f. 4	7	43	144	46
		% 1,6%	2,9%	17,6%	59%	18,9%
9.	Understanding the concept of success and failure, up-down, inside-outside, before-after, front-back.	f. 6	7	47	127	55
		% 2,5%	2,9%	19,3%	52%	22,5%

Table 8. Dimension 2: Videogames and primary classroom. Source: Own production

b. T test

Once the Student t test for independent samples ($ns = 0,05$), taking the sex as the classification variable, it is found that the existence of significant differences in all the questionnaire items is in favour of men as regard the items "Learning to Learning work cooperatively and collaboratively through teamwork", "Distinguishing the body parts", "Identifying the primary and secondary colours", "Development of "heuristic" thought (test-mistake)", "Development the inductive thought", "Development of visual and retentive memory" and "Understanding the concept of success and failure, up-down, inside-out, before-after, front-back" and in favour of women as regard the items "Learning the synchrony between the upper and lower limbs" and "Self-regulation of the self-learning (continuous assessment)".

c. Bivaried correlation

In regards to the r coefficient test by Pearson to determine the existence of correlation between the items of the second dimension, in Table 9 the results related to dimension 2 are available, - remember that it is the one with the answer modality of scalar type-, and you can check that items have a full correlation with a significance level of $n=0,001$, although the relationship between them varies according to the categorization made by Pérez, García, Gil and Galán in 2009, in response to each item, among the low of item 19 to 15 ($r=0,248$), the average of item 22 with the 16 ($r=0,330$) and the high of the item 16 with the item 18 ($r=0,647$).

		Item 15	Item 16	Item 17	Item 18	Item 19	Item 20	Item 21	Item 22	Item 23
Item 15	R	1,000	,448**	,456**	,493**	,248**	,408**	,427**	,349**	,262**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 16	R	,448**	1,000	,615**	,647**	,403**	,450**	,385**	,330**	,400**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 17	R	,456**	,615**	1,000	,551**	,439**	,500**	,425**	,290**	,379**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 18	R	,493**	,647**	,551**	1,000	,468**	,587**	,440**	,380**	,455**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 19	R	,248**	,403**	,439**	,468**	1,000	,588**	,487**	,429**	,579**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 20	R	,408**	,450**	,500**	,587**	,588**	1,000	,580**	,468**	,545**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 21	R	,427**	,385**	,425**	,440**	,487**	,580**	1,000	,495**	,456**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 22	R	,349**	,330**	,290**	,380**	,429**	,468**	,495**	1,000	,564**
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000
Item 23	R	,262**	,400**	,379**	,455**	,579**	,545**	,456**	,564**	1,000
	P	,000	,000	,000	,000	,000	,000	,000	,000	,000

** . The correlation is significant at the level 0,01 (bilateral).

Table 9. Descriptive study dimension 2. Source: Own production

VI. Conclusions

Quintanal in 2013 (419), carried out a study in which he suggested participants developing the curriculum in the subjects of Physics and Chemistry by means of mini-kits. The main result that he concludes is that through them autonomy, self-confidence and self-esteem of students increased. He also concluded that "it helps to fulfil the educational objectives in terms of contents, skills (especially social ones) and values; it promotes consideration of the learning rates, of teamwork and of the progress of intellectual skills; it develops and enhances the students' ICT skills and the consideration of them as creators of scientific content which can share with their peers". Following this line, the results presented with the objective 1, indicate that the attitudes of prospective teachers to educational videogames is positive (Contreras, 2013) following the line of Herrero, del Castillo, Monjalet, García-Varela, Checa and Gómez (2014), which may be included within the development of methodologies within the classroom when exercising their profession. However, it is noteworthy that their attitude towards them is negative in contrast with the results obtained by the study conducted by Marín in 2014 on a sample of the same kind. It is significant to note that perhaps the fact that the study sample by Marín (2014) was made up of more men than women, because as it also happens in the studies by Graves, Ridgeers and Scratton (2008), Hamlen (2011) and by Lam, Sit and McManus (2011), where the male population indicates they play more and they consider them to be more attractive. Therefore, this divergence has been obtained within the general overview of videogames.

As regards the objectives 2, 3 and 4, and like the results by Watson, Mong and Harris (2011), we can conclude that active learning, as well as the development of heuristic thought (Killiemuir and McFarlone, 2003), the knowledge construction and collaboration can be developed through the usage of videogames in the classroom (Solano, Forero, Gino, Cavanzo and Pinilla, 2013). Another aspect whose learning is considered to be feasible of being developed through videogames is the content related to natural sciences and to the knowledge of the human body, coinciding with the study by Shane, Pettit, Margenthal and Smith (2008). The results obtained related to the

overemphasis of participatory and collaborative behaviours are in line with those achieved by Greitemeyer and Mügge (2014).

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