The Effectiveness of a Video Game as an Educational Tool in Incrementing Interest in Dance among Younger Generations

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ABSTRACT: The performing arts are currently in a critical situation worldwide. Various reports warn that the lack of audience. If we focus on dance, and especially folk dances, the situation is worse. In various countries and continents, folk dances are slowly disappearing. In Spain, we find evidence of the downward trend in terms of the number of attendees to performances of Spanish dance -an art form that is highly valued throughout the world. In a generation marked by technological advancements, the only way for classic performing arts to reach young audiences - or digital natives – is to speak the same language they use with new technologies. This paper presents a study in collaboration with the Spanish National Dance Company, carried out with 877 students (aged from 9 to 12) from 12 different schools in the community of Madrid, Spain. We designed a two-phase experiment. In the first phase, we separated the students into 3 groups: students who played a videogame called "Dancing a Treasure," those who received a workshop from professional dancers, and a control group. In the second phase that took place two weeks later, the participants attended to a real show of Spanish dance, and we studied how the previous educational approaches affected to the students increase of interest after the show. The experiment demonstrated that the videogame was, at least, as effective in increment interest about dance in younger generations as a workshop taught by expert dance professionals. Thus, in terms of scalability, the videogame is a better option because it can be applied with the same results to larger groups with no additional cost.

Keywords: Interest, Video games, Spanish dance, M-Learning, Serious games

1. Introduction

The performing arts are in a critical situation in Spain: smaller and smaller audiences attend shows, and their average age is increasing dangerously. If we focus on dance, according to the latest annual report (2017) published in Spain (SGAE, 2017), an art as long-lived as dance has had a decreasing number of spectators over the past ten years, with attendance reduced by half in this period (1.65 million in 2007 compared to 0.85 million in 2016). According to data collected in the latest survey of cultural habits in Spain, carried out every two years by the Spanish Ministry of Education (Ministerio de Educación, 2015), we can see that only 7% of those surveyed attended a dance show between 2014 and 2015. This situation is much worse if we focus on Spanish dance, so representative of Spanish popular culture. Only 17.9% of dance shows attended were specifically Spanish dance shows (1.25% attendees of the total number of people surveyed). These data represent a significant risk for this art form and all the companies and cultural assets related to it.

Moreover, this problem is not exclusive to Spain: the latest National Public Survey on Attendance, Participation & Engagement with the Arts in Ireland (Ireland Arts Council, 2018) shows that ballet is the art that people attend the least, with only 2% attendance in the last 12 months among those surveyed. At the same time, at folk dance performances, attendance barely reaches 9% of the public surveyed.

In countries on other continents, such as Chile (Ministerio de las culturas, 2017), they face similar problems to those already mentioned. Even though in said country arts such as ballet have slightly increased in the last year, statistics showed that numbers are still low. These are just a few recent examples of worldwide statistics that present a worrying situation for the survival of the dance arts in the mid- to long term.

One of the best ways to solve this problem seems to be by raising young people to be interest of this art. In many cases, in addition to ensuring the medium and long-term survival of this type of arts, it also directly influences public attendance due to the tow-along effect the youngest have on their families. Companies such as the Ballet Nacional de España (hereinafter BNE), the world's leading Spanish dance company (España, 2018), realize this, and they have taken action to become more accessible to children. The BNE has launched one main activity with

that goal in mind: they have been organizing workshops in schools. These workshops are taught by the dance company staff and consist of several activities with the students to learn basic concepts of Spanish dance.

This activity is undoubtedly essential to reaching new audiences. However, there is a challenge: it's scalability. The workshop is an activity that can only be carried out in particular locations (schools) that are willing to include it in their schedule and, most importantly, it can only be taught in one place and at one time. This workshop is carried out by people from the organization itself, so they have to stop performing their functions in the company in order to free up time for the workshop, thus limiting their willingness to do so.

We live in the digital native era, which makes it difficult to reach audiences that receive information from many sources simultaneously (Piscitelli, 2008; Prensky, 2010). In order to reach these young people in the ecosystem in which they live, there is a method that tries to use so-called serious games (Michael et al., 2005). Besides, these types of videogames are used for raising awareness about other topics such as volcanic hazard education and communication (Mani et al., 2016) or cybersecurity (Hendrix et al., 2016), among others. Finally, there are already existing studies of useful techniques for the development of this type of tools (Wouters et al., 2017).

There is evidence of the possibility that new technologies can increase motivation towards different disciplines. There are studies that demonstrate the effectiveness of video games in motivating reading (Doran, 2010; Edwards, 2009). We can also find predecessor projects (Tongpaeng et al., 2018) where researchers applied serious games to increase the interest of young people in the arts, mostly in those with a higher probability of extinction due to their lack of spectators. Specifically, there are other videogames, based on classical plays, which have demonstrated the effectiveness of these tools in increasing young people's interest about art-related (Iglesias et al., 2013; Romero-Hernandez et al., 2018).

Video games can provide an ideal environment for increase interest for various reasons: (1) The youngest perceive video games as an element that is typical of their generation, so their acceptance of games as educational tools is very strong ; (2) They can offer a virtual environment that allows the player to become immersed in the narrative that is unfolding (Fernández-Vara, 2009a); (3) They allow the player to be the protagonist of the story (Blumberg et al., 2011), listen to the original music, see the animations recorded by professional dancers, etc.; and (4) Video games allow agency to the players, which it is not offered by a film or documentary (Fernández-Vara, 2009b).

To the researchers' best knowledge, most studies concerning the effectiveness of serious games are conducted within educational environments. Thus, they are limited to a pre/post experimental design that they compare with a control group. In the literature consulted, we have not encountered any experiments outside educational environments; their effectiveness was always measured directly in schools but not with subsequent experience in a real environment such as a show.

In addition, one of the main problems that we have detected in the studies carried out on the effectiveness of video games as motivational tools is that they only focus on immediate effectiveness, that is, the increase in interest that occurs immediately after playing the video games. However, we do not have knowledge of studies that analyze whether this increase in interest is sustained.

In this paper, we intend to measure the effectiveness of an educational video game as an increasing interest tool for increasing interest in Spanish dance. We pretend to measure any increase in interest at two moments in time: (1) Immediate effectiveness, increase in interest in the dance that is produced by the videogame immediately upon playing, and (2) Real effectiveness, or increased interest in dance produced by the video game and after having seen an actual dance performance.

- The first intervention takes place at the schools, considering the following educational points for comparison: (1) Video games, (2) Recurring workshops carried out by the BNE at schools and (3) Control group that does not participate in either activity.
- The second intervention takes place two weeks later and intends to show whether there is a difference in student interest in Spanish dance after having attended a live dance performance in each of the three groups described in the previous section.

In order to achieve this, we used the video game "Dancing a Treasure" (Romero-Hernandez et al., 2019), based on the previously mentioned book "Bailando un Tesoro" (Huidobro et al., 2016), developed in collaboration with the BNE.

The BNE has always said that "You can only love what you know." Therefore, to get young people to love Spanish dance, they first needed to get to know it. The question we asked ourselves was: Can a videogame played before watching a real show make it more interesting?

To get a measure of effectiveness, the first step is to register the effect the tool has in comparison with other possible activities in the school context.

- **RQ1.1**. Is the videogame "Dancing a Treasure" effective in increment interest about Spanish dance?
  On the other hand, we are interested in learning the differences between this tool and those previously (mentioned above) used on other occasions by the BNE in the school context.
- **RQ1.2.** How effective is the video game "Dancing a Treasure" in producing immediate increased interest in Spanish dance in comparison with the traditional method used in the BNE's workshops?

Following the process outlined before, the objective is to measure how effective the videogame is in increment interest in a real environment in the medium term. We wanted to measure how these same young people (after having previously attended the workshop, played the videogame or without any previous activity) perceived Spanish dance once they attended the show. On this basis, the following questions arose:

As we will demonstrate in the results section (see Section 4.2.1), attending a live Spanish dance show increases interest in Spanish dance among the audience.

- **RQ2.1.** Is that increment higher when the spectators have played the video game "Dancing a Treasure" before attending the show than when they do not do anything previously?
- **RQ2.2.** Is that increment higher in those who played the video game than in those who attended the traditional educational approach (workshop)?

Figure 1. Diagram of the experiment and research questions
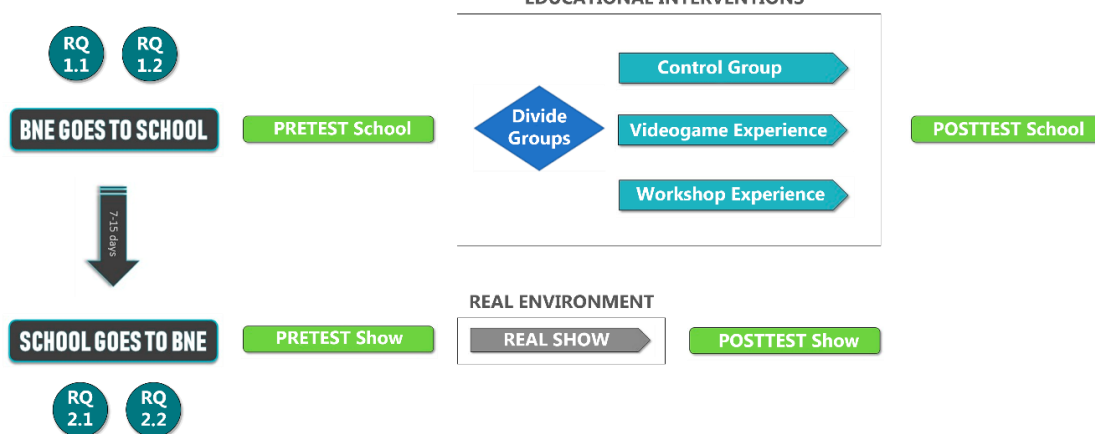
This article is structured as follows. In section 2, we explain the methodology followed. In section 3, we present the results obtained in our research. In section 4, we discuss the results of the previous section. Finally, in section 5, we explain the conclusions, limitations, and future work.

2. Methodology

2.1. Experimental design

Quasi-experimental design is an empirical intervention study used to estimate the causal impact of an intervention on the target population (Gribbons et al., 1996; Miller et al., 2020). Following this, and as mentioned in section 1, the experiment consisted of two phases (see Figure 1): (1) the BNE goes to a school; we carried out this part of the experiment in the schools themselves, and (2) the school goes to the BNE; that is, when the students went to the BNE's headquarters.

This experimental design supposes that there is a period of X days between the two phases. Because of scheduling conflicts on both the BNE's part and the schools', this period was not always the same, but we kept it within particular margins: 7 to 15 days at most between the first phase and the second one.

2.1.1. BNE goes to school (RQ1.1 and RQ1.2)

This subexperiment (that took place in the schools' classrooms) aims to test the immediate effectiveness of our game: How is the interest increasing in spanish dance just after playing the videogame? And, how is the interest increasing in comparison with the traditional educational approach (the workshop)? Thus, it will address RQ1.1 and RQ1.2.

2.1.1.1. Research design and data collection

In this first phase, students were divided into one of the following groups randomly: (1) the Control Group (CG), which received no instruction, (2) the Workshop Group (WG), which participated a workshop by the BNE staff, and (3) the Game Group (GG), which played the videogame Dancing a Treasure. For our study, the groups that resulted are statistically homogeneous and comparable (see section 4).

Due to the nature of the environment, we designed the activity to be completed in a single classroom session (50 mins approximately). We divided the activity as follows:

- **Pre-test (from now on PRETEST_School):** The researchers go into the three groups' classrooms and, without giving any information about the intervention so as not to raise students' enthusiasm in any case, they hand out some tests. The tests are anonymous (all students have received a code to identify their answers throughout the experiment). In these questionnaires, they are asked mainly about their interest in Spanish dance in general. We also collected demographic data such as sex, age, or the course they were in. This first test takes about 5 minutes. We will explain this tool in detail in section 3.3.2.

- **Intervention:**
  o The people in charge of organizing the **workshop** prepare the necessary materials to develop the WG activity, and the workshop starts, lasting about 40 minutes. This workshop is a purely practical experience for the students, where BNE members bring their work tools (shoes, castanets, etc.) and teach the essential company and Spanish dance concepts. Finally, the students can try out these tools, touch them, and watch firsthand, among other things, a live professional display of the rhythmic heel-stomping style of dance.
  o The researchers in charge of the **Game Group** distribute tablets (mostly Lenovo model TB-X103F) and headsets to each student. These tablets contain the previously installed game and have a shortcut on the desktop for easy access. As soon as all the students have the material ready, the game starts, lasting about 40 minutes.
  o The researchers in charge of the **Control Group** distribute the pre-test to the students and, later, they leave the classroom and allow the teachers to continue with the rest of the school day.

- **Post-test (from now on POSTTEST_School):** After finishing the activities, GG students and WG students complete a second test with the same questions as in the pre-test.

2.1.1.2. Data analysis

To answer question **RQ1.1** we performed a statistical analysis comparing the responses of the game group only. Through a *t*-student test we compared the increase of the responses mean between the PRETEST_School and the POSTTEST_School. However, to address question **RQ1.2** we will consider both game group and workshop group data. Through a one-factor ANCOVA test, we compare the difference in interest increments between the two groups above mentioned. Thus, we will use PRETEST_School as covariate and POSTTEST_School as dependent variable.

2.1.2. School goes to the BNE (RQ2.1 and RQ2.2)

After attending a real dance show, is the students' interest in spanish dance higher if they previously played a videogame (Bailando un tesoro)? Which interest increment is higher, those who played the videogame or those who attended the dance workshop? Thus, this subexperiment aims to answer RQ2.1 and RQ2.2. and took place at BNE's headquarters.

2.1.2.1. Research design and data collection

The second activity follows a similar scheme to the first one but with small changes. All these activities have the following scheme:

- **Pre-test (from now on PRETEST_Show):** We continue with the anonymous tests; students answer the interest questions regarding Spanish dance again. This test has been included so that the reader can check the evolution of the increase in interest produced by both educational interventions. As can be seen in the graph of the control group, the PRETEST_Show is influenced in a certain way by a variant of the Hawthorne effect. The simple fact of knowing that you are going to attend a real dance performance increases the interest of the subjects in it. For this reason, and because it is not within the scope of this paper, the data obtained in the PRETEST_Show are not used in this study.
- **Real Environment:** All three groups attend a private show at the BNE headquarters. This allows the students to experience Spanish dance in a real environment (see Figure 2).

Figure 2. Students at a BNE show

- **Post-test (from now on POSTTEST_Show):** After the show, the students answer the interest questions regarding Spanish dance again.

2.1.2.2. Data analysis

To address **RQ2.1** we will use game group y control group data. Again, we used the T-student test to compare the increment of interest (POSTTEST_Show - PRETEST_School). To answer **RQ2.2** we use the three groups' data (game group, control group, and workshop group). We used unifactorial ANCOVA to compare the interest increment among groups. PRETEST_School as covariate and POSTTEST_Show as the dependent variable.

2.2. Gaming preferences of students

This study (see Table 1) involved $N = 877$ students in 5th grade (9-12 years old) from 12 schools in the Community of Madrid (Spain). The gender ratio in the study group is 50.4% female to 49.6% male. The group's ages are between 9 and 12 years, with age 10 being the most frequent (72.1%). There were also 11-year-old students (26.2%), 12-year-old students (1.1%) and 9-year-old students (0.6%).

Regarding the schools, 47% of the students went to public schools, while 44% attended mixed/charter schools (funded both by public and private monies), and the remaining 9% were at strictly private schools. Both in terms of gender and school type, the sample is very similar to the population of students within the Community of Madrid in these courses (Madrid, 2019; Ministerio de Educación y formación profesional, 2019), so it can be considered representative of this area.

Group	Number of participants		Age	Total
	Female	Male		
Game based instruction (GG)	96 (48.2%)	103 (51.8%)	10.22 +- 0.425	199 (22.7%)
Workshop based instruction (WG)	159 (52.0%)	147 (48.0%)	10.31 +-0.503	306 (34.9%)
Control Group (CG)	187 (50.3%)	185 (49.7%)	10.29 +-0.5	372 (42.4%)
Total	442 (50.4%)	435 (49.6%)	10.28 +-0.486	877

Table 1. Demographics of participants

3. Materials and instruments

3.1. Dancing a Treasure: The Videogame

The videogame "Dancing a Treasure," described in detail in the article published in ICCE 2019 (Romero-Hernandez et al., 2019), is a videogame based on Spanish dance that aims to increment young people's interest about dance. The project was carried out with the collaboration of the BNE, and it is the first videogame based on Spanish dance that we are familiar with.

We based the videogame's narrative on the book of the same name "Bailando un Tesoro" (the name of the videogame is the literal translation from Spanish to English). It tries to give the best representation of the Spanish dance world (see Figure 3). Since a former dancer wrote this book, we can find parallels between this narrative and the beginnings of a dancer's career, making this story a perfect starting point.

The videogame does not focus on a particular performance. However, it includes various representations of the four styles that the BNE features (flamenco, folk, stylized dance and the bolero school). We designed it as such to disassociate the videogame from a specific show performed at a particular moment. The game could be applied to any of the functions that this company could be performing at any time.

The videogame has a very practical part based on Spanish dance. Dance is the star of the videogame. Throughout all levels, the main character stands in the middle of the screen. This character dances in all the styles of Spanish dance according to the narrative mentioned above. At the same time, the videogame has a purely rhythmic base. We designed a system of interactions for the player to mark the tempo and rhythm of the songs chosen for the videogame (from the BNE's repertoire). These interactions appear on both sides of the character and at the bottom of the screen so that the user can see the dance clearly while playing.

Figure 3. The process of motion capture: From Antonio Najarro (BNE director) to Dancing a Treasure
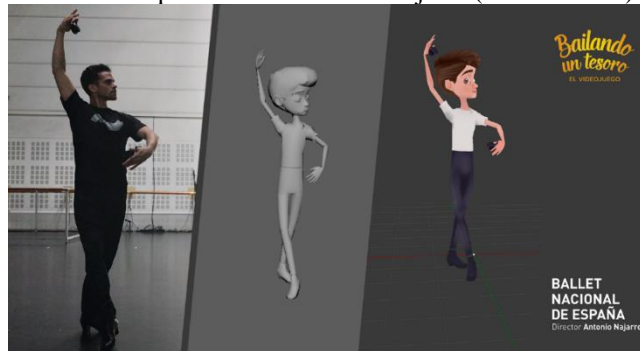
3.2. Questionnaires

For the development of this experiment, researchers created four questionnaires: (1) an experience pre-test in schools (**PRETEST_School**); (2) a post-test for the experience in schools (**POSTTEST_School**); (3) a pre-test to be filled in before the students' experience at the BNE headquarters (**PRETEST_Show**); and (4) a post-test at the end of the BNE experience (**POSTTEST_Show**). The main goal of those questionnaires is to measure the interest about Spanish dance. We could not find any validated tests, so we created ad-hoc tests for this experiment. We based these tests on other very similar ones from previous projects that we had as a reference. This is one of this experiment's clear limitations, and we will explain in more detail in the Limitations Section.

In the first pre-test, we collected demographic data, such as the participants' age and sex. This questionnaire asks about their knowledge of the BNE, Spanish dance and the number of times they attended a Spanish dance performance in the last year. The second part of the test consists of 4 questions (see Table 2) related to their interest of Spanish dance.

The tests, which the students completed during the different stages of the experiment, contain the same four questions about interest of Spanish dance. We based these questions on a Likert 7 scale (Joshi et al., 2015), and, in the end, we added them up to obtain the total result. Therefore, these sums can have a minimum value of 4 and a maximum of 28 in total.

Table 2. Questions and type of answers

Questions
Evaluate from 1 to 7: How much do you like to dance?
Evaluate from 1 to 7: How much do you like to dance Spanish dance?
Evaluate from 1 to 7: How much would you like to attend a Spanish dance performance?
Evaluate from 1 to 7: How much would you like to know more about Spanish dance?

After recolenting all these data, we carried out a data analysis that we explain in detail in section 4 of this paper. Figure 4 shows the four stages of the data analysis and the performed tests. To summarize, we performed an ANCOVA test to measure the educational approaches efficiency: (1) within the school environment (**PRETEST_School and POSTTEST_School**), and (2) in the overall experience (**PRETEST_School and POSTTEST_Show**).

Figure 4. Data analysis diagram
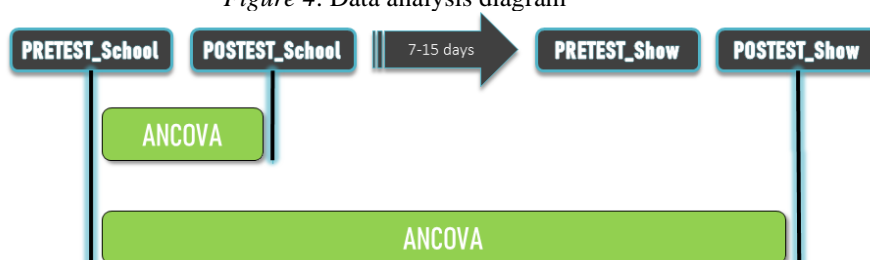
4. Results

In the following section we will review the results of the experiments that were conducted. In order to understand the results better, we include below the general descriptive statistics table, which will serve as a guide for the entire section (see Table 3).

Table 3. Descriptive Workshop (WG), Control (CG) & Game (GG) Groups

Descriptive	Interest (I) in PRETEST_School		Interest (I) in POSTTEST_School		Interest (I) in PRETEST_Show		Interest (I) in POSTTEST_Show	
	Mean (4-28)	*SD*	Mean (4-28)	*SD*	Mean (4-28)	*SD*	Mean (4-28)	*SD*
Workshop Group	19.73	5.80	22.51	4.71	22.07	5.35	23.69	4.71
Game Group	19.34	5.55	21.81	5.05	21.14	5.08	23.13	5.05
Control Group	19.95	5.56	--	--	20.71	5.85	22.95	5.54

We also include a graphic which shows the evolution of the interest in the tree groups though the different tests (see Figure 5). The blue line represents the workshop group, the red one represents the game group and the green one represents the control group. Y-axis shows the interest average, while the x-axis shows the four data collection points. This allows the reader to see an overall summarize of the process.

Figure 5. Means graphic separated by group
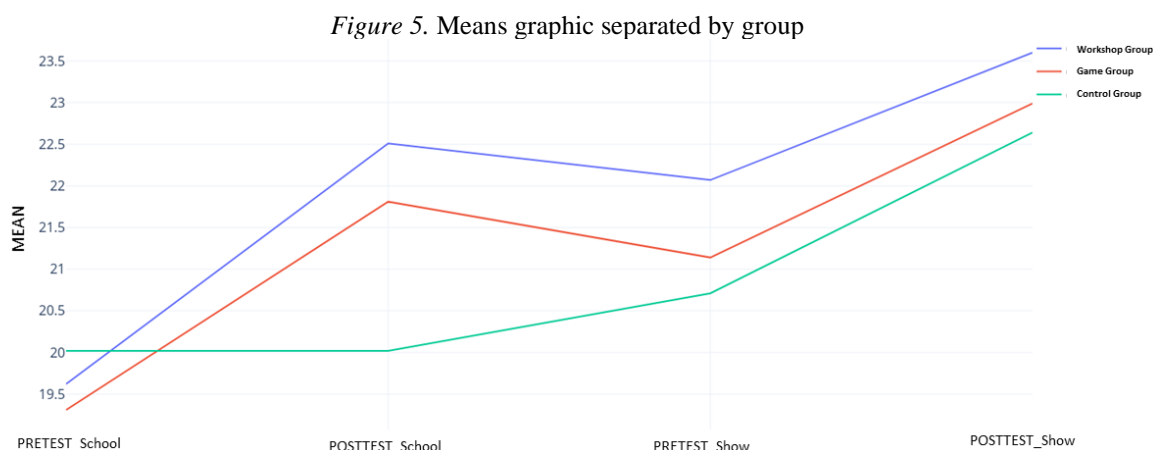
4.1. BNE goes to School (RQ1.1 and RQ1.2)

In this section the objective is twofold: (1) To test if playing our videogame increases the interest in spanish dance (**Intra-group comparison**) (RQ1.1). To that aim, we compare the interest before and after playing the videogame; and (2) To compare the efficiency of both educational interventions (**Inter-group comparison**: Game vs. Workshop) (RQ1.2). Thus, we will compare the increment produced by the game with the one produced by the workshop.

4.1.1. Intra-group comparison (Game group and Workshop group)

To answer RQ1.1 we compared **PRETEST_School** (before playing the videogame) and **POSTTEST_School** (after playing the videogame) through a unifactorial *t*-test with the GG. The test gives us a statistically significant difference between the average of pre-test and post-test responses (*sig.* < .0001). More precisely, we observed a difference of 2.47 points between the average of the different tests (That is the increment of the means of interests. From now on, we will use the symbol ΔI to mention it) with a standard deviation of 3.61 (see Table 4).

We also checked the workshop effectiveness applying the same process. WG students displayed a statistically significant increase (see Table 4) in their interest of Spanish dance (*sig.* < .0001), with a difference of 2.78 points between the means of the two tests with a standard deviation of 5.39.

Table 4. *t*-Student test results intra-group comparison: Game Group and Workshop Group (POSTTEST_School /PRETEST_School)

GROUP	Mean	Std. Dev	T value	Sig.
WG	2.78	5.39	9.26	< .0001*
GG	2.47	3.61	9.75	< .0001*

Note. *p < .05.

4.1.2. Inter-group comparison (Game group vs. Workshop group)

To answer RQ1.2, we proceeded to compare the interest increment between the GG and the WG. To make this comparison, we had to confirm one premise: the two groups had to be homogeneous at the beginning (in PRETEST_School). For this purpose, we performed the equality of variances test ($F = 1.10$, *sig.* > .05). The test shows (see Table 5) no statistically significant differences between the groups, so their evolutions are comparable.

Table 5. Equality of variances in Game Group and Workshop Group (PRETEST_School)

	Method	*F* value	Sig
PRETEST_School	Folder F	1.10	.460

Note. *p < .05.

We perform the bifactorial ANCOVA to compare the average increase in students' interest using the POSTTEST_School and PRETEST_School variables and the group (GG or WG). This test showed no

statistically significant differences (see Table 6) between WG and GG (*sig.* > .05). The interest increments are: WG (ΔI = 2.78, *SD* = 5.39) and GG (ΔI = 2.47, *SD* = 3.61).

Table 6. School ANCOVA test results inter-groups: Workshop group vs. Game Group (PRETEST_School/ POSTTEST_School))

	Mean Square	*F* value	*Sig.*
Workshop group vs. Game Group	27.66	1.10	.221

Note. *p < .05.

4.2. School goes to BNE (RQ2.1 and RQ2.2)

Firstly, we need to check whether attending a dance show increases interest in dance. To this aim we used our Control group (CG), that had not performed any activity prior the experiment, and compared their interest before and after the show (see section 4.2.1. Control group analysis).

Once we demonstrated that attending to a dance show increases the interest towards this art, we need to know if playing a videogame before attending the same show could make that increment higher (RQ2.1). Finally, we want to measure the effectiveness of the videogame in comparison to the traditional educational approach (workshop)(RQ2.2). In the increment produced by attending a real show higher when the audience played the videogame in advance or when they attended the workshop? Section 4.2.2, Inter-group comparison (Game group vs. Workshop group vs. Control group) includes the results for both research questions.

4.2.1. Control group analysis

To determine whether assisting a dance show increases interest in dance, we must check if there is any significant difference between PRETEST_School and POSTTEST_Show of the CG. To analyse this, we apply a T-test for related samples. This test shows us that there is a significant statistical difference between PRETEST_School and POSTTEST_Show (see Table 7). There is a total increment ΔI = 3.00 (*SD* = 4.406) in the control group (CG).

Table 7. *t*-test results in control group (PRETEST_School/POSTTEST_Show)

	Mean	*SD*	*t* value	*Sig.*
Control Group (CG)	2.61	4.40	10.44	.000*

Note. *p < .05.

4.2.2. Inter-group comparison (Game group vs. Workshop group vs. Control group)

Once we have the previous result, and to answer RQ2.1 and RQ2.2 questions, we must verify that the three groups start from the same point, i.e., PRETEST_School are homogeneous. To guarantee this, we performed a unifactorial anova (see Table 8) test (*F* = 0.72, *sig.* > .05). This test showed no statistically significant differences between the groups, so their evolution is comparable.

Table 8. Unifactorial ANCOVA test results in Workshop (WG), Control (CG) & Game (GG) Groups (PRETEST_School)

	Mean square	*F* value	*Sig.*
PRETEST_School	22.90	0.72	.480

Based on this homogeneity, we were able to perform the ANOVA Unifactorial test to see if there were statistically significant differences among groups (GG, WG or CG), by comparing POSTTEST_Show with PRETEST_School. This test showed statistically significant differences among the different groups (*sig.* < .05).

By separately analyzing the groups with the ANCOVA test (see Table 9), we observe statistically significant differences between WG and CG (*sig.* < .001), and between GG and CG (*sig.* < .05), but not between WG and GG (*sig.* > .05). The interest increments are: WG (ΔI = 3.96, *SD* = 4.222), GG (ΔI = 3.79, *SD* = 5.246), and CG (ΔI = 3.00, *SD* = 4.406).

Table 9. Show ANCOVA test results inter-groups: Workshop group vs. Game Group vs. Control Group
(PRETEST_School/ POSTTEST_Show)

ANCOVA	WG	GG	CG
WG	X	.304	.033*
GG	.304	X	.000*
CG	.033*	.000*	X

Note. $^*p < .05$.

5. Discussion

As previously mentioned, questions RQ1.1 and RQ1.2 are centered on the comparison of the efficacy of the video game in the classroom (differences between PRETEST_School and POSTTEST_School). However, questions RQ2.1 and RQ2.2 focus on the analysis of the tool's influence when students attend a live performance of the BNE (differences between PRETEST_School and POSTTEST_Show).

5.1. RQ1.1. Is the videogame "Dancing a Treasure" effective in increment interest about Spanish dance?

The results obtained after carrying out the Unifactorial *t*-test (see Section 4.1) show a statistically significant increase in students' interest in Spanish dance after playing the video game. This means that the answer is yes: the video game increases students' interest in Spanish Dance.

These results were predictable, due to the increasing interest characteristics of the video game as demonstrated by similar studies applied to performing arts such as theater (Manero et al., 2015a; Romero-Hernandez et al., 2018). Thus, this result confirms that video games can also be used to increase interest in other performing arts.

However, when analyzing these results, one should not ignore the effect that the novelty of playing a video game during class time can have on students. This effect, which can also be produced during other educational interventions such as the workshop, would require a separate study to demonstrate which part of the increase in interest is due to the educational intervention and which part is due to the novelty.

5.2. RQ1.2. How effective is the video game "Dancing a Treasure" in producing immediate increased interest in Spanish dance in comparison with the traditional method used in the BNE's workshops?

The results obtained after carrying out the bifactorial ANCOVA test to compare interest between the GG and WG groups do not show statistically significant evidence for concluding that one tool is more effective than another.

This finding differs from those obtained previously in other studies (Manero et al., 2015). In Manero's paper, researchers found statistically significant differences between playing a video game and attending a workshop; specifically, an actor-led class was more efficient than a video game. In this study we expected a similar result which is to say that the workshop was more efficient than the video game.

On the other hand, researchers' observations led us to believe that our videogame could have worked better than the one in Manero's experiment and outperform the workshop. Within the GG, we observed a pattern in how they interacted with the game: they started with silent calm and moved to noisy excitement. This excitement led to creating a competitive environment to see who would go the farthest in the game. At the end of the experience, we observed more excitement in the GG students than in the WG students, which was ultimately not reflected in the questionnaire data.

At the end, it seems that our videogame worked better than those used in previous studies. It is possibly due to various circumstances.
- The first is that we created a narrative that allowed a better immersion in the dance world than the one used in the aforementioned study. The story and characters design resulted adequate. According to the researchers' observations, the children started imitating the main characters movements. This leads us to believe that they developed a strong bond with the game's characters.
- Following the same idea, the design of the video game levels may have played a role in their impact on efficiency. Within the GG, we observed a pattern in the way they interacted with the game: they started out

quietly calm and swapped to a noisy excitement. This excitement led to creating a competitive environment to get the highest level in the game. Definitely, after playing the videogame, the classroom atmosphere was fun.

- Another possibility is that this type of technology is better adapted to a very visual art such as dance. Music and dance movement are very adaptable to audiovisual media.
- On the other hand, the platform used for playing video games is different than the PCs used by Manero et al. (2015). In this study mobile devices were used. It is possible that these devices increase students' interest more greatly.
- Finally, this video game doesn't use any particular dance performance. While Manero et al. (2015) created a video game based on a concrete theatrical play, "Bailando un tesoro" is not based on a specific work but on the life of a dancer.

5.3. RQ2.1. Is that increment higher when the spectators have played the video game "Dancing a Treasure" before attending the show than when they do not do anything previously?

Although not the objective of our research, it is very interesting to note that according to our results, the attendance of a live performance of the National Ballet of Spain causes students' interest in Spanish dance to increase significantly (see Table 7). This result was to be expected, but we have not been able to find any study that proves it. In fact, as we see in Figure 5, the mere fact of leaving school and going to the BNE headquarters increases interest (as can be seen in the Control Group students). This is probably due to the excitement generated by breaking the usual class routine to go somewhere else, especially to see a show.

That said, regarding question RQ2.1, the answer is yes. The ANCOVA test demonstrates that those students who played the "Dancing a Treasure" video game before attending the show (Game Group) showed more of an increase in interest in Spanish dance than those who only attended the show (Control Group).

This may be because familiarity with the different styles and dances in advance makes what is being seen in the real show more comprehensible and, therefore, the message is much clearer. As we stated in the introduction: "You can only love what you know." These results are the best expression of it.

This result shows the possibility of using video games for purposes other than pedagogical projects. The familiarity effect produced by video games can make a show more enjoyable: when the viewer is familiar with the plot in a classical play, or when a spectator reads a libretto before an opera performance, the experience is improved.

5.4. RQ 2.2. Is that increment higher in those who played the video game than in those who attended the traditional educational approach (workshop)?

There is no statistically significant difference between Game Group and Workshop Group. It means that the "show effect" is the same either the students played the game or attended the workshop in advance. Both groups increase the interest in Spanish dance in a similar way after the show. As seen before, attending to a real show increases the interest in Spanish dance, but our results showed that the increasing is higher when the participants previously played our videogame or attended the workshop. Both approaches are equally efficient.

This does not coincide (as in RQ 1.2) with previous studies. In fact, we consider that the reasons why the game works better than we expected coincide with what is written in RQ1.2. However, in this case we feared the deception effect that those who played the video game could experience. Something like: "This show is not what they sold me in the video game." This effect did not occur, and the increase in interest after the show is statistically the same in the Game Group and in the Workshop.

Our starting hypothesis was that the workshop would be more efficient than the video game. We thought that the fact that real dancers were working with them during the workshop would make real show attendance more efficient as a increaser of the interest. As shown in Figure 5, the results of the GG and the WG are parallel throughout the experience: both groups start with a similar level of interest, experience a strong increase in interest after the educational intervention, experience a slight decrease in interest over the following two weeks, and a new increase after the show. And since there are no statistically significant differences, we could say that both interventions are interchangeable in terms of efficiency.

In addition, we asked the participants to evaluate the experience (EE) from 1 to 7 at the end of the experiment (after attending the real show). Answers showed that those in the workshop group evaluated the experience (EE = 6.61, *SD* = 0.885) higher than those in the game group (EE = 6.39, *SD* =1.338). The participants of the control group got the lower result (EE = 6.17, *SD* = 1.313). These results, not included in the results section to improve clarity, led us to think that the human factor of the workshop is key in the perception of the experience. It seems that having attended the workshop or played the videogame improves the perception of a real dance show. In other words, the workshop or the videogame make the real show more fun.

We would also like to point out that the decline in interest that occurs during the two weeks after the educational intervention is similar in both groups. Although it is not within the scope of this paper, we consider that it would be interesting to investigate the decrease in interest that occurs over time in function of the educational intervention used.

6. Conclusions and limitations

This study presents the results of using the videogame "Dancing a Treasure" as a tool to increment students' interest of Spanish dance. After collecting and analyzing the data obtained in the experiment, we conclude that the videogame increases the interest of Spanish dance and improves students' perception when they attend a dance performance. The videogame ended up being as effective as a workshop given by the BNE staff. This project corroborates previous studies that claimed that a videogame is an effective tool to increment interest towards the arts. It also reveals a new use for this type of videogames: they can enhance the experience of attending a real performance.

Demonstrating that a videogame could be as effective as a workshop is good news since the latter has a higher long-term cost: the dancers' travel expenses to get to the schools, their salary, etc. At the same time, these workshops have some significant limitations when it comes to reaching many people (its main goal) since BNE members have limited availability and can only be in one location at a time. The videogame's benefits regarding these restrictions are numerous. The videogame only has an initial outlay (with significant support from public organizations due to the widespread acceptance of new technologies in the classrooms). It can also be played on as many devices as desired simultaneously, thus eliminating many of the disadvantages of other educational approaches. Our recommendation, based also in the researchers' observations, would be to include videogames in educational programs (along with the traditional approaches) to strengthen them.

Unlike other previous studies, in which researchers based the tools on a specific theater play (Iglesias et al., 2013), the videogame "Dancing a Treasure" is a generic tool of Spanish dance. It is not tied to a specific choreography. This means that the videogame may be useful before any Spanish dance show, either by the BNE or by other companies, thus avoiding the cost of developing a new videogame for each show. This dramatically reduces the costs that these types of tools can involve. School campaigns usually carry out cultural outings every year. Since the videogame is free to download, the cost of implementing a videogame that students can play before going on the field trip would be zero (if the necessary equipment is available) and would enhance the experience of going to a show.

There are some limitations to this study. First, we conducted the tests in 12 schools that accepted the invitation to participate, from the many schools that were invited. This may lead to some bias in the data, as the participating schools have often shown interest in cultural activities on other occasions, through regularly programmed events throughout the school year. Furthermore, we only conducted the study in the Community of Madrid, so the data come from a specific region. To tackle this limitation, we will include schools with less interest in these activities and schools from other locations, ideally from the whole of the Spanish territory. The second limitation is the type of tests used. We didn't find any validated tool in the previous work for the proposal of this project, so we had to develop an ad-hoc tool based on similar projects (Hernandez et al., 2016; Manero et al., 2015a). These have a small number of items (4-7 items) because of the reduced time available for the experiments' development. Henceforth, it would be interesting to develop and validate a tool with the support of psychologists and statisticians focused on the audience and the objective sought. At the same time, the videogame has a series of limitations due to the limited budget available for its development. With a bigger budget, a higher number of professional graphic designers, and the recording of dances with more advanced technology, we could have a much more effective videogame.

The present study raises the possibility of numerous future lines of research. First, we aim to analyze the collected demographic variables to see if there are any findings of interest. Second, according to researchers'

observations, at the end of the experience, students tried to imitate the main character's movements in the videogame. Thus, we aim to to develop a virtual reality experience that allows students to put themselves in the shoes of a dancer. And third, to check whether everything learned in this project can be extrapolated to the development of other arts or skills. We maintain the hypothesis that exercises related to dance or theatre can help to improve bodily expression, and we can apply this to the improvement of soft skills such as public speaking.

Finally, as already mentioned, the BNE has been organizing family performances in recent years, with discounts for families with children. At the start of this project (2016), BNE management itself told us that, to ensure that the theatre had an acceptable attendance rate, they invited people from the organization or held drawings through social networks. At the end of this project (2019), the same sources assured us that the tickets for these special performances were sold out weeks before performance day. We do not have empirical data to support that this project influenced the attendance rates, but we are sure that it helped in some way, which gives us hope to think that new technologies can be a solution to fill theaters again.

Acknowledgment

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