IJET

Original Paper

Journal homepage: http://educationaltechnology.net/ijet/

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Benefits and meanings of educating with videogames in a Puerto Rican sixth grade public school classroom

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KEYWORDS

Public policy
Videogames
English learning

A B S T R A C T

Educational research on videogames has demonstrated benefits of using videogames as instructional tools in classrooms because learning becomes meaningful and interesting for students because it incorporates student's needs. The aim of this study was to explore the benefits and meanings of implementing videogames in a Puerto Rican public school classroom using a mixed-methods multi-dimensional design. Our findings show that implementation of video games for learning English in public school classrooms is beneficial and meaningful to students. Quantitative and qualitative findings showed favorable outcomes and provided evidence to support this.

Introduction

The idea of implementing videogames in school classrooms has gained attention in recent years because of increase in videogame use among school age children and youth. In the United States, 49% of households own a dedicated game console and videogame use of players under 18 years old is 32% (Entertainment Software Association, 2012). There has also been an increase in videogames research of children and youth, not only regarding to violence, but of positive effects on learning, which has led to studies exploring and documenting the benefits of videogames as learning tools, on implementation of videogames in classrooms, on designing videogames in accordance to school curriculum and thus, incorporating videogames in educational public policy.

Educational research on videogames has demonstrated benefits of using videogames as instructional tools in classrooms because learning becomes meaningful and interesting for students because it incorporates student's needs (Rosas, Nusbaum, Cumsille, Marianov, Correa, Flores & Salinas, 2003; Gelman, 2010). However, the implementation of videogames in classrooms can present a challenge because of the ratio of computers per student, teachers' resistance towards computer technology, poor teacher training, educational games lacking the entertainment to make them attractive to students, general lack of institutional infrastructure and overly-complicated technologies (Rosas et al., 2003; Kenny & McDaniel, 2011). In Latin America, there is also the additional problem of having little software translated to local language or in accordance with the school curriculum (Rosas et al., 2003). Rosas and colleagues suggests the creation of easy to use, portable hardware with instructional and entertaining software, aligned with the school curriculum that children can use regularly in the classroom (Rosas et al., 2003). While ideally, this would be the better option, researchers have demonstrated benefits of incorporating existing handheld videogames consoles and commercially available educational software in classrooms. The Entertainment Software Association (2012) states that 35% of players own a handheld system and 25% of games are played in using them.

In Puerto Rico, the intention of the local educational system is to promote a bilingual fluency- most of the academic results of the student population have consistently fallen behind expectations. According to the Department of Education of Puerto Rico (2012), 35% of public school students perform at a basic level in English in the Puerto Rican Tests of Academic Achievements. New strategies to strengthen and reinforce the teaching of English in Puerto Rico, such as implementing new technologies in classrooms, could contribute to academic achievement.

Empirical Research on Videogames in Classrooms

Although there is notable absence of more empirical researches in the area of educational videogames in classrooms, a few key studies have been conducted (Ke, 2008; Kennerly, 2009; Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009; Gillispie, Martin and Parker, 2010; Gelman, 2010; Miller & Robertson, 2010; 2011; Cobb and Horst, 2011; Mifsud, Vella & Camilleri, 2013; Barker & Sadler, 2013; Hitosugi, Schmidt and Hayashi, 2014). The study conducted by Cobb and Horst (2011) investigated Canadian students who learn English as a second language (ESL) in terms of improvements on developing and expanding English vocabulary, as well as lexical production and meaning recognition using the Nintendo DS game My Word Coach. A sample of 50 students used the game over a four-month period in a quasi experiment, within subjects design. The researchers found significant results in word meanings recognition. The experiment also revealed a positive reception of the technology, where students expressed satisfaction after the experience.

Rosas and colleagues (2003) studied 1274 students from private and public schools in Chile in an experimental design research, where participants used a game for an average of 30 hours a week in 3-month period. The Sugoi game was designed in accordance to Chilean curriculum with a videogame console modeled after the Nintendo Gameboy. The game was designed to develop math and reading comprehension skills. Students were assessed in both skills, as well as in preference regarding videogames. Teachers' expectations of learning outcomes were also measured. The study concluded there were significant gains in achievements and changes in teachers' expectations. This study was later part of a comprehensive assessment of benefits, cost effectiveness, and feasibility analysis of videogames implementation in Chilean classrooms which concluded that ultimately it was not feasible (Margolis, Nussbaum, Rodriguez, & Rosas, 2006).

In Puerto Rico, few studies have been conducted regarding videogames, but none about implementing videogames in classrooms. This study is a first step towards incorporating the suggested framework by Margolis and colleagues (2006) by exploring the benefits of implementation of videogames in classrooms; incorporating the perspectives of key stakeholders, such as teachers and school director. The theoretical framework is Vygotsky's Socio-cultural Theory, one of the most popular approaches for the research of human-computer interaction. From the Vygotskyan standpoint, the insertion of videogames in the classroom is not simply the introduction of an extra learning tool, but a significant object that hopes to reshape the learning environment. Videogames are an integral component of the social and cultural context of today's students, and, therefore, as a tool they should be easy to integrate into the learning processes. To follow the concept of incidental learning, the students will be "playing" a game in which they'll have to acquire and assimilate knowledge, because it is the only way in which they can continue "playing". As Rivas (2012) states, video gamers internalize concepts and rules as part of a rhetorical process of persuasion when they are playing, because the gamer seeks to engage in a signifying process that will help him/her advance in the game. Videogames can help transcend the common problem that arise from the approaches that are inherent to educational systems where English is treated as a second language, because it adds the ludic element to the learning scenario. In this sense, games clarify the motives of an activity, by providing a specific set of rules and parameters; and the knowledge acquired through gaming is derived from a pragmatic use in context.

Goal

The aim of this study was to explore the benefits and meanings of implementing videogames in a Puerto Rican public school classroom.

Specific aims

Quantitative component objectives:

1. Measure English vocabulary words known to public school six-grade students before and after using the videogame My English Coach (Spanish Edition) in classroom for twenty minutes in four weeks.
2. Explore six-grade students' attitudes towards videogames and using games for learning English, before and after videogames implementation in classroom.

Qualitative component objective:

1. Explore the meanings of implementing the use of videogames in a public school's classroom from the teachers, students and school's director perspectives.

Methods

Design

A mixed methods research design with a multi-dimensional approach was used in this study. In this study, quantitative data was used to answer a question in a quasi-experimental design and a qualitative approach answered other questions related to the experiment and its implications (see Table 1).

The **quantitative component** was a small scale, pre-post test, quasi-experimental design study using purposive sampling. This component was intended to serve as a pilot design for a future up-scale controlled trial benefits analysis. The benefits analysis is part of the three steps (benefits, cost-effectiveness and feasibility analysis) in the framework for evaluating new technologies proposed by Margolis and colleagues (2006).

The **qualitative component** consisted of a triangulation of qualitative data collection techniques, which are participant observation (Kawulich, 2005) and semi-structured interviews (Mason, 2004; DiCicco-Bloom & Crabtree, 2006). The qualitative data analysis technique used was a conventional content analysis (Hsieh & Shannon, 2005).

Table 1

Diagram of Research Design

		Data Collection	Implementation	Data Collection	Data Analysis
Quantitative Component		**Pre-tests** *VST*: EG, ICG & ECG *AS:* EG	**Quasi-experiment** EG	**Post-tests** *VST*: EG, ICG & ECG *AS:* EG	**Statistical Analysis**
Qualitative Component		**Semi-structured interviews** EG Teachers	**Participant Observation** EG	**Semi-structured interviews** EG Teachers, EG Director	**Conventional Content Analysis**

Note: Abbreviations: *VST:* Vocabulary Size Test, *AT*: Attitudes Survey, EG: Experimental Group, ICG: Internal Control Group, ECG: External Control Group.

Sample

Purposive sampling was used to select three groups of six-grade students from two public schools in the Metro Area of Puerto Rico with similar socioeconomic backgrounds. Sixth grade level was chosen based on Cobb and Horst (2011) study using similar game software. Students were divided according to educational group and placed in either an experimental group (EG), or an internal control group (IC)—groups in the same school and at the same educational level—or in an external control groups (EC)—groups in different schools where the tool was not introduced, but at the same educational level as the EG (see Table 1). This division was constructed to minimize Hawthorn's effect (Rosas et al., 2003). The average classroom size in Puerto Rico is 30 students. A sample of 25 students in the EG, with one subject missing post-test, 22 students in the ICG and 30 students in the ECG were tested for a total of students (n = 77). The students were between the ages of 10-12.

Game and instruments

The videogame used in this study was *My English Coach- Spanish Edition. My English Coach (Spanish Edition)* is an educational game, developed and published by Ubisoft and released in 2009. The game is intended for use on the Nintendo DS. The videogame teaches the basics of word use, grammar, and construction of phrases through mini-games, and evaluates your progress. The game starts with an initial placement test to determine starting English level and advances through a serious of lessons plans, which include information for first-time English speakers about USA. The game also teaches pronunciation by using a voice recording and playback feature of the DS that allows the player to compare his or her accent (words and phrases) to a native English speaker's. Eight mini-games reinforce lesson plans and the ability to read and speak in English (Ubisoft® Entertainment, 2013). The game has 10,000 English words and a built-in Spanish-English Dictionary and phrase book with 400 phrases (Ubisoft® Entertainment, 2013). Cobb and Horst (2011) state that the learning content of *My Word Coach* is effectively (revising) the entire contemporary, non-specialist lexicon of the English language, represented by 14,000 most frequent word families, linked to a specially adapted version of the *Cambridge Advanced Learner's Dictionary*.

A shortened version of The *Vocabulary Size Test* (bilingual Spanish version) (Vocabularysize.com©, 2010-2013) was used to assess student's learning outcomes in the experiment. This version is similar to the version used in Cobb and Horst's research (2011) of *My Word Coach*, but bilingual. The Vocabulary Size Test is designed to measure both first language and second language. In addition, it will also measure the learners' written receptive

vocabulary size in English, knowledge of written word form, the form-meaning connection, and, to a smaller degree, concept knowledge (Nation, 2010). The Vocabulary Size Test has ten questions at each 1,000-family level, such that the score multiplied by 100 gives an estimate of the number of word families known at that level (8 out of 10 = 800 families known) (Cobb & Horst, 2011). The psychometric properties of the test can be found on Nation (2010). Using Cobb and Horst's research (2011) as reference, we only administered the first ten levels of the test.

Attitudes survey

Students attitudes towards video games and their use for learning English was assessed with the survey constructed by Gillispie, Martins and Parker (2010), but translated to Spanish and modified for the English course. The survey consists of 10 Likert-type questions that were rated from strongly agree (scored as 4) to strongly disagree (scored as 1). No psychometric properties have been evaluated for this survey.

A guide of questions for the semi-structured interview of teachers and director and a sociodemographic questionnaire.

Procedures

Prior to initiate data collection the proposed protocol was submitted and approved by the Institutional Review Board of the University of Puerto Rico, Río Piedras Campus. The data collection was done in 2014.

Phase 1: Pre-implementation

Initial contact was established with the school directors of schools with the inclusion criteria to schedule an initial meeting where the proposed study was explained and voluntary agreement to participate was explored. Meetings where scheduled with four school directors from schools that met inclusion criteria. Informed consent was distributed to voluntary school directors and teachers that decided to participate in the study. The school made contact with parents of English six-grade teachers' students in a written letterform where the study was explained. Interested parents of participants were given a written informed consent form to discuss and sign with students. Assent forms were given to students prior testing.

The teacher's training on the game was done by one of the researchers. In their initial approach, we conducted a semi-structured interview to two teachers, one was the EG English teacher and the other one was a teacher from an earlier considered school for the study.

Phase II: Implementation

Pre-test of Vocabulary Size Test (Spanish Edition) was done to students in both EG and ICG, as well as students in ECG. Then a pre-test of the Attitudes Survey was done to the EG students only. The training of the students and teacher in the EG about the use and instructions of the game was done by the principal investigator and co-principal investigator on the following day. The EG students played for twenty minutes, every day of the week for four weeks (1 month approximately). Coordination with the teachers in the EG was done in order to ensure compliance with the intervention. The PI and Co-PI, three research assistants, and a few voluntary students from our university participated in the observation of the EG during every game-playing session. A maximum of three observers were present each day during observations. Observations were recorded in field notes. Participants' game-playing logs, indicating their time gaming scores, were archived and analyzed every week.

Participant observation

Participant observation was done in the EG group only from an observer as participant stance: this perspective let the researchers participate in the group activities as desired, their role was to collect data taking in account that the group being studied was aware of researcher's observation activities (Kawulich, 2005). The researcher closely observed participants verbal and nonverbal expressions when they interact with the videogames, peers, teachers and the external environment.

Document analysis

The videogame records participants' level in lessons learned and the numbers of words mastered. These records were collected every week and coded.

Phase III: post-implementation

The post-test on the Vocabulary Size Test (bilingual edition in Spanish) was administered to students in EG, IGC and ECG during an hour, the day after completion of the study. Post-tests on the Attitudes Survey was done to EG students only. In addition, post semi-structured interviews to the teacher involved in the EG group was conducted for the purpose of exploring the changes, if any, in expectations of videogames learning outcomes and feasibility. As a final step, we conducted a semi-structured interview to the school director of the experimental school. All interviews were recorded digitally and transcribed.

Phase IV: Data analysis

Quantitative data analysis was done with the statistical software SPSS, version 22. For qualitative analysis, conventional content analysis as described by (Hsieh & Shannon, 2005) was used to identify themes and patterns in notes and interview transcripts. The researchers both did the analysis described below and later had a discussion for agreements on categories. First, data was read repeatedly to achieve immersion and obtain a sense of the whole. Then, data was read line by line to derive codes, by first highlighting the exact words from the text that appear to capture key thoughts or concepts. Next, notes were written of impressions, thoughts, and initial analysis and coding. Codes then were sorted into categories based on how different codes were related and linked. These emergent categories were used to organize and group codes into meaningful clusters, were their relationships were analyzed to derive in emergent categories following development of definitions for each category, subcategory, and code. Lastly, a comparison of findings with relevant theories. To ensure credibility in analysis, we did peer debriefing and an audit trail recording our decisions on data analysis.

Results

Our findings show that implementation of video games for the learning of English in public school classrooms is beneficial and meaningful for students. Quantitative and qualitative findings show favorable outcomes and provide evidence to support this.

Quantitative findings

Receptive word meanings known

The three groups took the first ten levels of the Vocabulary Size Test (bilingual Spanish version) of meaning recognition (100 items) at all two testing points (T1 and T2). The differences of meaning recognition between groups at pre-test were similar, with a slight advantage for the internal control group (see Table 2). At post-test (T2), the results show significant and extensive growth of words known for the EG and ICG.

Table 2

Comparison of receptive word meanings known pre-post intervention of EG, ICG and ECG

	EG		ICG		ECG	
	Pre	Post	Pre	Post	Pre	Post
Mean of receptive word meanings known	1664	2513	2211	3252	1807	1953
SD	827.1	880.9	1092.7	908.1	811.4	1014

Note. Abbreviations: EG: Experimental Group, ICG: Internal Control Group, ECG: External Control Group.

A paired-samples t-test was conducted to compare words known at T1 and words known at T2 for all groups. Missing data was not accounted for in data analysis. In the EG, there was a significant difference in words known at T1 (M = 1664; SD = 827.1) and words known at T2 (M = 2513; SD = 880.9); t(23) = 4.346, p = 0.000. For the ICG, there was significant difference in words known at T1 (M = 2211; SD = 1092.7) and words known at T2 (M = 3252; SD = 908.1); t(16) = 4.877, p = 0.000. Fort the ECG, there was not a significant difference in words known at T1 (M = 1807; SD = 811.4) and words known at T2 (M = 1954; SD = 1014); t(24) = 1.102, p = 0.281. The results of the EG and ICG could be explained by the Hawthorne Effect. Both groups shared the same English teacher.

Mastered game words per week

The EG was measured at four times (T1, T2, T3 and T4), at the end of every week, for words mastered on the game (see Table 3).

Table 3

Comparison of mastered game words per week

	T1	T2	T3	T4
Mean of Mastered game words per week	57.4	87	121.9	138.8
SD	31	42.7	51.8	56.4

A paired-samples t-test was conducted to compare mastered game words known at T1 and mastered game words known at T2, T3 and T4. There was a significant difference in mastered game words at T1 (M= 57.4; SD= 31) and mastered game words at T2 (M= 87; SD= 42.7); t(24)= 7.527, p=000; in mastered game words at T1 and T3 (M= 121.9; SD= 51.8); t(23)= 9.785, p=000; and mastered game words at T1 and T4 (M= 138.8; SD = 56.4); t(23)= 11.345, p=000.

A paired-samples t-test was conducted to compare mastered game words known at T2 and mastered game words known at T3 and T4. There was a significant difference in mastered words at T2 and T3; t(23) = 8.807, p=000, and mastered words at T2 and T4; t(23) = 10.786, p=000.

A paired-samples t-test was conducted to compare mastered game words known at T3 and mastered game words known at T4. There was a significant difference in mastered words at T3 and T4; t(23) = 7.223, p= 000.

The results show a significant increase of words mastered at T4 compared with T1. It also shows significant increase at every other time compared to T1, T2 and T3.

Advanced game levels

The EG was measured at four times (T1, T2, T3 and T4), at the end of every week, for advanced game levels. See Table 4.

Table 4

Comparison of Advanced Game Levels

	T1	T2	T3	T4
Mean of Advanced Game Levels	6.68	9.6	12.25	14
SD	2.7	3.89	4.67	5.14

A paired-samples t-test was conducted to compare advanced game levels at T1 and advanced game levels at T2, T3 and T4. There was a significant difference in advanced game levels at T1 (M= 6.68; SD= 2.7) and advanced game levels at T2 (M= 9.6; SD= 3.89); t(24)= 5.085, p=000; advanced game levels at T1 and T3 (M= 12.25; SD= 4.67); t(23)= 9.003, p=000; and advanced game levels at T1 and T4 (M= 14; SD = 5.14); t(23)= 10.496, p=000.

A paired-samples t-test was conducted to compare advanced game levels at T2 and advanced game levels at T3 and T4. There was a significant difference in mastered words at T2 and T3; t(23) = 4.074, p=000, and advanced game levels at T2 and T4; t(23) = 5.980, p=000.

A paired-samples t-test was conducted to compare advanced game levels at T3 and advanced game levels at T4. There was a significant difference in advanced game levels at T3 and T4; t(23) = 8.307, p= 000.

The results show a significant increase in advanced game levels at T4 compared with T1. It also shows significant increase at every other time compared to T1, T2 and T3.

Attitudes towards video games and their use for learning English

The EG was measured in attitudes towards video games and their use for learning English using an Attitudes Survey pre and post intervention. A Wilcoxon Signed-ranks test was conducted to compare pre-intervention attitudes and post-intervention attitudes in every item on the survey. A Wilcoxon

Signed-ranks test indicated that "I like playing video games" (Z = 2.26, p = 0.024) and "I would play a video game about English at school" (Z = 2.35, p = 0.019) was statistically significantly lower post-intervention. No other items showed statistically significant differences.

The items 2 and 10 were statistically significantly lower post-intervention, but students answers remained mostly on the "agree" and "strongly agree" categories on each item post-intervention. Also, even though it was not statistically significant, students reported higher results on the item 5 "English is easy to learn" post-intervention.

Qualitative findings

A conventional content analysis was done for our participant observations that generated the following main categories: (1) Group game dynamics, (2) Gamers' style and (3) Class dynamics.

Group game dynamics

The main category in our observations was game's group dynamics. Game's group dynamics was divided in the following sub-categories: comments about the game, competition and peer support. During gaming time in class, students made a lot of comments about the game and process. Some of the comments were made without prompting, as part of the gaming experience, directed to themselves or to their peers. Comments were related to aspects of the game, sharing levels completed, giving instructions, feelings about the game and the class, as well questions about the game. Students also commented about the intervention and words learned when prompted by the researchers. For example, a girl said: "I have 130 words mastered"; indicating her progress on the game. Similar verbalizations were stated by other students:

> *"Look, 100"*
>
> *"I am going too fast, cool"*
>
> *"Wait, I have two more (words) left".*

Students gave information about what kind of words they were learning. When asked, a girl responded: "I learn two forms of saying él, him or he". Students also asked about the meaning of some words and about how to reach certain levels or mastered some of the games. Comments about the intervention were made when prompting.

Competition was observed during the intervention. Students compete against themselves and against their classmates. For example, a girl showed her screen to another, and the other student said: "Ok, you'll see", as if challenging her. On the other hand, collaboration or peer support was also observed between students. Some students help other students giving instructions on the game or indicating how they completed certain mini-games or showing the console screen to another student. Therefore, the game fomented positive interaction between students.

Gamer's style and dynamics

Students differed in the way they played during the intervention. Game posture varied between sitting, standing up, inclining the head, holding the console up or sitting it up in the chair. During playtime, the most striking aspect was the concentration and focus on the game. Sometimes long periods of silence were observed during gaming. This demonstrates careful attention to the game or immersion. Students also expressed themselves nonverbally. Some of the gestures were shrugging shoulders, looking constantly to the sides, or gestures expressing surprise, difficulty and interest.

Class Dynamics

During our observations, class dynamics were analyzed. This category is divided in (1) interaction with the teacher, (2) class assignments, (3) daily interruptions and (4) class physical environment. The teacher taught the class mostly in English. Assignments included a diagnostic test, quizzes, repeating vocabulary words and looking words in the dictionary. One of the days, the teacher made a competition about looking words in the dictionary. Students were motivated by the competition and express similar interest as the gaming experience. The teacher also commented about the intervention to incentive students to do the learning. Daily interruptions in class were common, but students continued along the intervention and studying.

The intervention took place in the English classroom where chairs were aligned vertically and not enough space to comfortably walk in. Some days the intervention took place in another classroom were students were sitting in various tables and contributed to student's interaction with peers indicating that classroom organization may be related to the gaming experience.

Teachers' interviews pre-intervention

Three main categories emerged from the teachers' interviews: (1) Expected learning outcomes and (2) predicted limitations.

Expected learning outcomes

Both teachers expected a positive impact on learning from integrating videogames in classroom. They predicted students would be more motivated and pay more attention to class. Among the reasons provided one teacher said: "when you give something novel to a child, something of his/her interest, I understand, he/she will pay more attention, be more receptive and more positive towards learning. What he/she wants to do." One of the teachers indicated that videogames will help in vocabulary acquisition.

Predicted Limitations

Among the predicted limitations to the intervention, teachers indicated that not everything should be about the game. Technology should be integrated to the class. They recommended needed free training for the teachers and availability for resources to impact the whole school.

Teacher and director interviews post-intervention

The following main categories emerged from the teacher's and director's interviews post-intervention: (1) positive impact of the study's intervention, (2) recommendations for implementing videogames in classroom, (3) limitations of the intervention and (4) administrative role in implementing videogames.

Positive impact of the study's intervention

Overall, both teacher and director coincided that the intervention brought a positive impact in learning. The teacher indicated that students were more motivated to learn, pay more attention to class and express interest in learning vocabulary words. For example, students asked to use the dictionary and were more interested in learning specific vocabulary words that they encountered on the game. She also indicated seeing "a few changes, but favorable". She also noticed that students that weren't interested in English before were now after the intervention. Among the benefits pointed out by the director were: more empowerment of the students, acquisition of motor skills, visual and hearing, otherwise not acquired in school and the use of videogames in a positive way.

Recommendations for implementing videogames in classroom

Among the recommendations given by the teacher and director for implementing videogames in classrooms are: (1) research that culminates in a pilot plan that could impact the Puerto Rico Department of Education, (2) a company that can adopt schools and provide resources and (3) teacher's training in videogames for learning process. The teacher indicated that integration of videogames and classwork should be tried during different times or days, as well as an extended schedule for playing the games.

Limitations of the Intervention

The first limitation of the intervention stated by the teacher and the director was time duration. The understood the intervention was too brief (4 weeks). The teacher also had difficulties maintaining both groups, the EG and the ICG, which are the only sixth grade classrooms in the school on a par with curriculum. Better integration with the curriculum is needed, matching game content with lesson plans. Other limitations were resources; both agree they will like all school to be impacted by the intervention.

Administrative role in implementing videogames in classroom

The director expressed that administrative roles should be providing access to resources and interventions, evaluative of the interventions and obtaining results. She stated the importance of a liaison with the Puerto Rico Department of Education for this kind of interventions to work.

Discussion

We conducted this multi-dimensional mixed-methods study with two main goals divided in a quantitative and a qualitative component. Our main goal with the quantitative phase was to prove that implementing videogames in a public school classroom for learning English was beneficial for students. Our findings on the main measures showed improvement in students learning of vocabulary words in English. Our main goal with the qualitative phase was to explore the meanings of implementing videogames for the learning of English in a sixth grade public classroom. Our findings show that learning with videogames means a mainly a more motivated classroom experience for students and teachers involved. It also means more attention to the learning of vocabulary words in English.

Regarding the effects of video games over learning, significant differences were found between the EG and ICG groups in relation to the ECG group in vocabulary known words. The results show greater words known in the EG and the ICG compared to the ECG. This may be explained by the Hawthorne Effect because both groups had the same teacher and both groups knew about the intervention. Also, the ICG had a slight advantage on the pre-test meaning that the ICG group may have known more words than the EG group before the intervention.

The EG mastered a significant amount of words at post-intervention as indicated by the data in the game. Each week presented with significant difference in comparison to the first week. This could mean that students were successfully accomplishing the games and tasks presented by the game and learning the words. Students also advance level significantly each week of the intervention. This could mean that 20 minutes of time a day using the game is sufficient time to master the words at a significant rate.

These findings can be compared to Chile's study (Rosas et al., 2003) where significant results were also obtained on measures in the ECG and ICG. The Hawthorne Effect was also observed in Chile's study. This could mean that implementing videogames has the indirect effect of motivating other teachers and students to outperform the groups using videogames. Our findings also compare to other studies that implemented videogames in classroom and obtained significant results in measuring specific learning outcomes, including vocabulary words (Miller & Robertson, 2010; Tüzün et al., 2009; Kennerly, 2009; Hitosugi, Schmidt & Hayashi, 2014; Cobb & Horst, 2011 & Ke, 2008).

Learning was also confirmed by qualitative data in observations and interviews. Student's expressions of words learned and known indicated learning and encountering new vocabulary words through the game. The teacher also indicated a few changes in learning after the intervention.

Students Attitude towards Videogames and Learning English

Results from the attitudes survey were not favorable for our study and they present a sharp contrast with our qualitative findings on similar themes. There were also similar to Gillispie, Martins and Parker (2010), which reported no statistical differences in student's attitudes towards math or videogames with a similar instrument. In contrast, Gelman (2010) found significant results on attitudes towards their teachers, classes and school post-intervention. Mifsud, Vella and Camilleri (2013) also found positive attitudes towards learning with videogames, as stated before. We believed findings from the survey are explained by test conditions and not do not accurately represent students attitudes in the study. This demonstrates the importance of taking and comparing different data (quantitative and qualitative) and not relying solely on quantitative instruments.

Qualitative findings demonstrate students' motivation on learning with videogames, as wells an increase in interest in knowing vocabulary words and more interest in the English class. This is confirmed not only by our observations, but teacher and director as well.

Impact on students' motivation to learn

Our qualitative findings show an increase in motivation towards the English class and learning new vocabulary words in English. This is a significant contribution of our study because few qualitative studies have been conducted to compare with our findings. Rosas and colleagues (2003) reported similar results from classroom observations and a preference survey. They reported that students were visibly happy by the intervention and arrived punctual to class. Cobb & Horst (2011) found similar results in their semi-structured written reports of students after the intervention. Students indicated feeling satisfaction with the intervention as stated before. Quantitative studies like Tüzün et al. (2009) reported significant results in intrinsic learner's motivation after the intervention.

From a Vygotskian perspective, motivation is important for learning. Specifically, extrinsic motivation may help with the child's activity as seen through the concept of the Zone of Proximal Development. The ZPD states that there is a wide gap between what a child can do alone and what a child can do with the assistance. The extrinsic motivators, like videogames, can facilitate the narrowing of the gap. Incidental learning was also observed throughout the intervention. Students approached videogames as a form of entertainment and foster competition without the association of it being an educational task or assignment. Ke (2008) found that students felt differently between learning within gameplay and learning outside gameplay. They found learning outside of gameplay was more boring (Ke, 2008). Therefore, specific qualities of videogames contribute to the motivation in learning by making learning incidental.

Attention, focus and concentration

Our qualitative findings show that students pay more attention to learning through the use of videogames. Our observations and interviews with the teacher and director indicated that students seemed engaged in the activity most of the time during the intervention. Similar findings are shown in the Rosas and colleagues (2003) study where teachers attributed an improvement and concentration of their students during and following the intervention.

Peer collaboration and communication

Our qualitative findings showed students engaging in competition and supporting each other during the intervention. Similar to our study, game players were very active in exchanging game scores, expressing feelings about the games, and doing social talk during the intervention in Ke (2008)'s study. This activities and discussions are important for learning, because learning is socially constructed. Peers also form part of the ZDP discussed earlier and contribute to the learning of others.

Benefits for public policy

Even though policy makers frequently evaluate new educational technologies and decide whether to implement them in the schools they oversee (Margolis, et al., 2006), their practices to increase the effective use of technologies in the classroom more often than not conflict with implementation (Kenny & McDaniel, 2011). Policy makers carry the burden of correcting the infrastructural issues for practical and costs reasons, but teachers' adoption of any instructional strategy is directly correlated with his or her views, ideas, and expectations about what is possible, feasible, and useful (Kenny & McDaniel, 2011). This study contributed by incorporating the evaluation of new technologies framework suggested by Margolis and colleagues (2006), and serving as a first step (benefits analysis) of three that has proven to be useful to both educational policy makers choosing between various improvement initiatives and to educational technology producers seeking to evaluate their own technology. Teacher and school director's perspectives were taken into account to evaluate feasibility, in order to gain knowledge of resistance, if any, towards new technology implementations in classrooms and alternatives. Lastly, because new educational technology initiative is frequently expected to justify its costs based on its contribution to improve children's learning of traditional subjects (Margolis et al., 2006), this study also contributed in evaluating if the use of an educational videogame in students learning of English vocabulary was beneficial.

Aside from the recommendations given in our qualitative findings sections, we proposed further studies similar to this one with a wide sample of schools. We also suggest alternating game time and game periods, as well as evaluating available educational games looking for compatibility with the Puerto Rico Department of Education curriculum. We recommend also that the Puerto Rico DE foment research that culminates in the development of game software and, if possible, game consoles, addressing the curriculum.

Limitations

This study was a pilot generating data that was non-existent in Puerto Rico. It lacked the rigor of true experimental designs and had a small purposely obtained sample. Because of this, findings cannot be generalized. Also, during the implementation, participant observation may have introduced potential bias that affected the outcomes of the quasi experiment. No attempts were made to control other variables, such as teacher's preparation or if some students were known to possess their own Nintendo DS consoles with the *My Spanish Coach* game. This game is available commercially at the time, and no attempt was made to assure that learners had no contact with the game in their non-game periods. Limitations were also found because the game software is not based on state or national sixth grade English school curriculum (unlike Rosas et al., 2003 and Tüzün et al., 2009), and assessment tools aren't also based on it. The qualitative component had typical qualitative research limitations; some were addressed by doing an audit trail and triangulation of observations. No member-checking was done to corroborate our findings with research subjects.

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