ACADEMIC PERFORMANCE AND EDUCATIONAL VIDEO GAMES: DOES GENDER MATTER?

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Abstract

The academic literature suggests that differences between male and female students regarding video gaming habits are blurring. While it persists slightly differences in media affinity regarding the use of video games -mainly based on video game genres- our research question addresses precisely if gender matters regarding students’ performance while playing an educational video game. To answer our research question, a post-test pre-experimental design was used with students playing an educational video game designed to learn English vocabulary. Our main results suggest no gender differences on students’ performance while playing the educational video game (measured both as a subjective measure: students’ perceived performance: and as an objective one: students’ video game scores) nor in the test that students’ took after playing the educational video game. Therefore, despite gender differences were found in media affinity (with male students playing more video games than female students) these differences did not affect students’ performance. The main limitations of the study and future research opportunities are also addressed.

Keywords: educational video games, gamification, performance, gender, media affinity.

1 INTRODUCTION

Student academic performance is a wide construct which can be conceptualized and measured in different ways. Common ways to measure student academic performance include Grade Point Average (GPA) scores (or letter equivalents), and amount of time spent studying [1]. The academic literature acknowledges the importance of student academic performance indicators such as GPA not only as a key criterion for postgraduate selection and graduate employment but also as a predictor of occupational status [2]. Therefore, the outcomes of student academic performance are a key concern for all types of educational institutions. Moreover, educational institutions are constantly seeking new ways to improve student academic performance. This is the case of innovative teaching methodologies such as educational video games, game-based learning and gamification, which have deserved an increasing academic attention over the last years (e.g. [3]). One main reason of the growing academic interest in game-based learning is its effectiveness on several learning objectives including knowledge acquisition [4], self-efficacy, declarative knowledge, procedural knowledge, and retention [5]. It is assumed that achieving these learning objectives might contribute to increase student academic performance, and therefore to foster student academic success.

However, as a first step to evaluate the effectiveness of educational video games on student academic performance, researchers should evaluate first if students are able to successfully manage (play) educational video games. Moreover, because previous research suggests gender differences in gameplay [6] and attitude towards video games [7], our main research interest focuses in exploring the effect of gender on students’ performance while playing an educational video game.

This paper is organized as follows: first, we review the academic literature and posit the research questions. Then, the methodology used is explained, and the results are presented and discussed. Finally, the conclusions, limitations of the study, and future research lines are addressed.

2 RESEARCH QUESTIONS

The academic literature suggests gender differences regarding the use of video games [6], [7]. Moreover, gender differences have been found in college student samples with male students spending more hours playing video games than their female counterparts [8]. Furthermore, the higher average number of hours spent by male college students playing video games have been suggested as a possible cause of the lower academic performance of male students (as reflected in terms of achieving a B.A) when compared to female college students [8]. Besides, gender differences appear to spread...
across cultures and educational level. For example, [9] also found gender differences among Taiwanese high school students regarding hours played, motivation to play video games, and enjoyment experienced while playing video games. It is noteworthy that [9] also found gender differences in both the frequency and the types of games genres the students played. Despite all these gender differences regarding the use of video games, few research has addressed the gender issue in relation with students performance when using an educational video game. Therefore, the first research question addresses this issue:

RQ1: Are there gender differences in students’ performance when playing an educational video game?

On the other hand, media affinity is an important construct regarding the use of media (including video games). Media affinity refers to the importance that a medium has in the lives of individuals [10], [11]. For example, media affinity towards the mobile phone was found to have a direct and positive influence on the intention to engage in mobile shopping [12]. Broadly speaking, previous research suggest that media affinity is an important factor that influences future behavioural intentions regarding the medium [13]. Moreover, media affinity has been used not only to assess the attitude of individuals towards a given medium but also the attitude towards the contents delivered by the medium [12], [14]. Given both the attitudinal and behavioural importance of media affinity it seems useful to explore gender effects in media affinity when using educational video games. Therefore, we posit the following research question:

RQ2: Are there gender differences in media affinity regarding video games?

Finally, age was also analysed as previous research suggests that age can affect not only use but perceptions of video games. For example, in the specific context of educational video games [15] found that age affected teachers’ perceived value of educational video games. Therefore, we posit our last research question:

RQ3: Does age relate to students’ performance when playing an educational video game?

3 METHODOLOGY

3.1 Experimental Design

A post-test pre-experimental design was used in this research. In order to increase the ecological validity of the experiment, the experiment took place on a regular classroom in a real English course at a private Spanish University.

3.2 Stimuli

An educational video game to teach English vocabulary was commissioned from a game developer. The video game was designed following the mechanics of a well-known Arcade type entertainment video game (Breakout). The dynamics of the game selected consisted of three mini games within a main game that allowed the player to obtain points and special bonuses as each mini game involving English vocabulary was won. The main goal of the three mini games was to encourage students to practice the vocabulary taught in class. In the first mini game (How do you say…?), a word was presented in Spanish with three possible translations with only one correct option. The aim of this game was that the student selects the correct term in English equivalent to the proposed word in Spanish with three possible translations with only one correct option. The aim of this game was that the student selects the correct term in English equivalent to the proposed word in Spanish. In the second mini game (Pairs), a list of short expressions in English was given with their translation in Spanish. The goal of this game was for the student to successfully pair up each English expression with the corresponding Spanish one. The third of the mini games (Translate the Sentence), encouraged the student to put together a sentence using words from the vocabulary given in class. A snapshot of the Translate the Sentence mini game is depicted in Annex I.

3.3 Procedure

The experiment started with a lecture of 30 minutes regarding the topic of the day in a real English course at a private Spanish University. After this lecture, the students played the educational video game for about 30 minutes as an innovative way to practice the vocabulary taught. Afterwards, the students took an English vocabulary test and completed a pen and pencil self-administrated questionnaire. To play the educational video game all students used the same computer equipment in a computer laboratory and played the game individually using headphones provided by the University.
3.4 Measurement instrument

Media affinity, perceived performance, and gender were measured using an ad-hoc self-administered questionnaire. Gender was measured as a dichotomous variable (male/female) while the media affinity scale was adapted from Perse (1986) and measured using a 5-point Likert-type scale (1 = strongly disagree, and 5 = strongly agree). Perceived performance was measured using one single item (How would you describe your performance while playing the video game?) using a 5-point Likert-type scale (1 = very poor, and 5 = really good). Video game scores (an objective measure of players’ performance) were provided by the video game using a ratio scale (achieved points). A multiple-response test with 10 questions was used to measure students’ academic performance on vocabulary acquisition. This measurement has been previously used in academic literature to measure declarative knowledge [16].

3.5 Sample

A convenience sample of 103 students from a private Spanish University was used in this research. Age ranged from 18 to 47 years old being the average age was 21 years old (standard deviation of 3.535), and 51.5% of the sample being male.

4 RESULTS

The average student perceived performance when playing the educational video game was 3.75, with a standard deviation of .87. Additionally, the mean score provided by the video game when the students finished playing the video game was 43392.7 points (standard deviation of 30194.3), being the minimum score 6855 points and the maximum 169400. Regarding the English vocabulary test, men achieved a mean score of 8.30 (out of 10) while women achieved a mean score of 8.06 being this difference non-significant (t=.628, sig. >.05). We also measured students’ media affinity, noticing that media affinity was low for the students participating in this research (see table 1).

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playing video games is something I often do</td>
<td>3.00</td>
</tr>
<tr>
<td>If any week I do not play video games I miss it</td>
<td>2.51</td>
</tr>
<tr>
<td>Playing video games is something important in my life</td>
<td>2.33</td>
</tr>
<tr>
<td>I cannot be several days without playing video games</td>
<td>2.01</td>
</tr>
<tr>
<td>MEDIA AFFINITY (Average)</td>
<td>2.46</td>
</tr>
</tbody>
</table>

We were interested in analyzing whether gender had any influence on each of the aforementioned variables. Accordingly, a series of t test analyses were performed (see Table 2). Non-significant differences were found between genders regarding perceived performance when playing the educational video game neither regarding the score reached in the video game. However, media affinity differences were identified, having male students more affinity with video games than female students.

<table>
<thead>
<tr>
<th>Perceived performance when playing</th>
<th>Score provided by the video game</th>
<th>English Vocabulary test score</th>
<th>Media affinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3.6</td>
<td>42624.52 (t = 1.186, sig. &gt; .05)</td>
<td>8.30 (t = .628, sig. &gt; .05)</td>
</tr>
<tr>
<td>Female</td>
<td>3.4</td>
<td>44036.35 (t = -.191, sig. &gt; .05)</td>
<td>8.06 (t = .06, sig. &gt; .05)</td>
</tr>
</tbody>
</table>

Finally, the relationship between the age of the students and the relevant variables of analysis was tested, resulting in two significant relationship out of four. There is a negative and week relationship between the scores reached when playing the game and age: the older the student the lower the score. A correlation between age and the score achieved in the English Vocabulary test was also found: the older the student the lower the score.
Table 3. Results of Person’s correlation coefficient analysis

<table>
<thead>
<tr>
<th></th>
<th>Perceived performance</th>
<th>Score provided by the video game</th>
<th>English Vocabulary test score</th>
<th>Media affinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>$p = -.112$ (sig. &gt; .05)</td>
<td>$p = -.241$ (sig. &lt; .05)</td>
<td>$p = -.280$ (sig. &lt; .01)</td>
<td>$p = .160$ (sig. &gt; .05)</td>
</tr>
</tbody>
</table>

5 CONCLUSIONS

This study aimed to gain a better knowledge of the effect of gender on student academic performance when playing an educational video game. Based on our results, although gender differences arose in media affinity, gender did not affect neither students’ perceived performance nor the score reached when playing the educational video game nor results on the English Vocabulary test. Broadly speaking, while our results suggest a similar gender bias related to video game playing habits (e.g. Ogletree, & Drake, 2007) students’ playing habits did not influence their performance when trained using an educational video game. Moreover, in our case, media affinity was low for both male and female students. This result points out that neither gender nor video game playing habits will be a barrier when trying to implement a game-based learning approach using educational video games in a course. Although weak, a negative relationship between age and student academic performance was found, with older students achieving lower scores both in the educational video game and in the English Vocabulary test. This suggest a possible age bias, warning instructors to be cautious when using educational video games with some segments of the population of students (the older ones). The reason why this age bias might occur (e.g. less experience with video games, less interest in video games, etc.) deserves further attention and could be a fruitful area of future research.

This research is a first step in the process of better understanding the effect of gender in students’ academic performance regarding the use of educational video games. Future research should expand and improve this research in several ways. First, a convenience sample of students was used. Convenience samples prevents the generalization of our results. Moreover, student population was limited to college students. College students might vary in the use they make of video games from other student populations such as a middle or high school students.

ACKNOWLEDGEMENTS

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REFERENCES


ANNEX I. MINI GAME TRANSLATE THE SENTENCE

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**Round: 1**

**Total rounds: 3**

*Hay demasiada grasa en los fritos*

- I do
- There
- Fat
- Is
- Fried
- In
- Enough

**FOODS**

- Much