A Study of the Influence of Gaming Behavior on Academic Performance of IT College Students

Completed Research Paper

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Abstract

Video-game playing is popular among college students. Cognitive and negative consequences have been studied frequently. However, little is known about the influence of gaming behavior on IT college students' academic performance. An increasing number of college students take online courses, use social network websites for social interactions, and play video games online. To analyze the relationship between college students' gaming behavior and their academic performance, a research model is proposed and a survey study is conducted. The study result of a multiple regression analysis shows that self-control capability, social interaction using face-to-face or phone communications, and playing video games using a personal computer make statistically significant contributions to the IT college students' academic performance measured by GPA.

Keywords

Gaming behavior, self-control, gaming genre, academic performance

Introduction

More than half of the American population and a billion people worldwide are playing video games and the number is increasing because of the fast growing portable devices, e.g., Android-powered and iOS devices, and social networking websites, e.g., Facebook1,2 (Liu et al. 2013). People play video games for a number of reasons, e.g., stress relief, challenge and competition, relaxation, enjoyment, social interaction, and even mentally escaping from the real world (Sherry et al. 2006).

The academic performance and cognitive consequences of playing video games have been an ongoing debate in both the educational environment and the public. While it is still arguable whether playing video games actually affects students' academic performance, recent studies of many educators have considered digital games as an educational tool to foster students' learning interests and motivation (Choi et al. 2013; Jennifer Henderlong Corpus 2009; Van Eck 2006) and deliver different levels of knowledge more effectively. Studies have shown that motivation is a crucial catalyst for learning success and correlated with academic achievement (Jennifer Henderlong Corpus 2009; Jurisevic et al. 2008).

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The purpose of this study is to analyze the relationship between college students’ gaming behavior and their academic performance. To serve the purpose, we derived a research model based on literature review and tested the model by using a survey study. We report here on a survey study conducted to investigate the influence of gaming behavior on the academic performance of IT college students. A conceptual model was proposed to examine whether six identified gaming behavioral variables, including self-control capability, social interaction, gaming platform, gaming frequency, gaming genres, and motivation, influence on college student’s academic performance.

The analysis results show that self-control, social interaction, and gaming platform make statistically significant contributions to the academic performance of IT college students. The authors believe that the results of this study could be used to enhance the classroom experience and to develop educational gaming software.

**Literature Review**

**Gaming frequency, time, and types of gamer**

The gaming frequency and the amount of time spent on playing video games have been studied for years frequently in association with gaming addiction (Daniel Luke King 2012; Ko et al. 2009), psychological constructs (e.g., self-concept clarity, self-control, and flow) (Khang et al. 2013; Lee et al. 2012), negative consequences (e.g., missing school work) (Hellström et al. 2012), and even academic performance or learning outcome (Furió et al. 2013; Ip et al. 2008).

Ip et al. (2008) analyzed the relationships between gaming frequency and academic performance among 713 students. The study found that frequent gamers, who spend more than 2 hours per day playing video games, performed less well than infrequent gamers. Hellström et al. (2012) examined the relationship between gaming time, motives to play, and negative consequences because of playing Massively multiplayer online role-playing games (MMORPGs). They recruited 7,757 Swedish adolescents and had them completed a questionnaire and found that time spent on gaming was related to negative consequences, e.g., “less sleep due to gaming.” Ventura et al. (2012) constructed an online survey with 252 undergraduate students and a positive indication was found between video gameplay and academic performance. That is, students who spent 11-50 hours playing video games had significantly higher GPAs than students who spent 0-10 hours playing video games.

Types of gamers are associated with the frequency and amount of time a player has spent on playing video games. However, the segmentation between types of gamers has not been significantly, rigorously studied. Two types of gamers, casual and hardcore gamers, have been growing rapidly in recent years. Kuittinen et al. (2007) discussed the characteristics and differences between casual and hardcore gamers. For example, hardcore gamers play extremely competitive games and require a much higher degree of involvement than casual gamers.

**Gaming genre and platform**

A game genre, a type of games, is classified based on how gamers interact with a game. For example, an action game, e.g., first-person shooters, usually involves physical challenges, which requires gamers to react to the game scenario swiftly to achieve goals or to overcome obstacles. The first book dedicated to computer and game design is the Art of Computer Game Design by Chris Crawford (Crawford 1984). He recognizes gaming genres change quickly so a complete taxonomy of gaming genre is difficult to develop. Ventura et al. (2012) investigated the relationship between video gameplay, game genre preference, personality, and GPA with 319 university students. Both positive and negative relations were found between video game genre preference and academic performance. For example, two significant negative correlations to GPA are social media and shooter types of game. In addition, Ip et al. (2008) found that the number of genres played is associated with academic performance in examinations. That is, gamers who play four or more game genres generally perform less well in examinations.

The electronic devices or systems used to play video games are called video game platforms. The well-known gaming platforms include personal computers, consoles, e.g., Nintendo’s Wii, Sony’s PlayStation, and Microsoft’s Xbox, and even mobile devices, e.g., Android-based and iOS devices. Appel (2012) conducted a study to examine the association between adolescents’ computer and Internet activities and
computer literacy, knowledge and skills to complete tasks with a computer technology. Two hundred participants were recruited at secondary schools in Austria and hierarchical regression analyses were conducted. The study found that an increase in video game playing on a personal computer was associated with higher scores on computer knowledge.

**Self-control and flow**

Self-control, sometimes called self-regulation, is the ability to control emotions, anxiety, and behavior to gain possible rewards or avoid punishment (Timpano et al. 2013). LaRose et al. (2003) describe deficient self-regulation as diminishing consciousness of self-control because of lacking awareness and attention to behaviors. Khang et al. (2013) found that self-control affected users' flow and addiction in mobile phones, Internet, and even video games. A detailed distinction of those psychological factors is beyond the scope of this study; however, it is worth including the factors into our survey questions.

Psychological factors, e.g., flow and self-control have been frequently studied in gaming addiction and gaming behaviors. Flow, proposed by Csíkszentmihalyi (1991) which has been studied over 30 years, is the mental state of immersion or concentration in an activity. Playing games can give rise to a state of flow which led to the loss of self-consciousness and sense of time (Csíkszentmihályi 1975; Liu et al. 2013). The association between flow and video-game playing has been studied in nascent studies with different findings. For example, it was found that the flow was not related to the amount of time spent on playing video games (Lee et al. 2007) and to online game addiction (Wan et al. 2006). However, Lee et al. (2012) conducted a survey with a sample of 330 students drawn from a university in the northwestern in the U.S. and found that instances of the flow experience were associated to the amount of time spent on gaming.

**Model Development and Research Questions**

**Model Development**

Referring to previous related works, the authors developed the research questions of this study along with a conceptual research model. Since a variety of factors could affect students’ academic or learning outcome, it is not wise to pinpoint a single factor that can influence on students’ academic performance. Previous studies showed that various factors shown in Table 1 including gaming frequency, gaming genre and platform, self-control, social media, personal characteristics, and even motivation to play video games can be positively or negatively correlated to academic performance and learning outcome. Therefore, our research model was developed based upon aforementioned previous researches.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Description</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaming time and frequency (Turner et al. 2012; Ventura et al. 2012)</td>
<td>• The factors, e.g., video gameplay, genre preference, personality, total and average time spent on playing video games, and GPA were investigated.</td>
<td>• On average, how many hours a week do you play video games? • How many different video games do you typically play in a year? • I enjoy playing the following types of video games.</td>
</tr>
<tr>
<td>Gamer type (Kuittinen et al. 2007)</td>
<td>• Causal gamers refer to people who play games occasionally for fun. • Hardcore gamers refer to people who spend significant time on playing video games.</td>
<td>• Casual (occasional) gamer, hardcore (expert) gamer</td>
</tr>
<tr>
<td>Construct</td>
<td>Description</td>
<td>Items</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Game genre (Ventura et al. 2012) and platform (Connolly et al. 2012)     | • The factors, e.g., game genre, platform, and learning outcome were reviewed. | • Game genre: action, puzzle, role-playing, strategy, sport, and adventure games  
• Positive impacts and outcomes are associated with playing video games.  
• Platforms: PC, video console, and online games |
| Self-control (Khang et al. 2013; Tangney et al. 2004)                    | • The relationship between self-control, grade, and Internet and gaming addiction have been studied. | • Pleasure and fun sometimes keep me from getting work done  
• Sometimes I can’t stop myself from doing something, even if I know it is wrong  
• I am always on time |
| Ignore school work (Daniel Luke King 2012; Hellström et al. 2012; Turner et al. 2012) | • The factors, e.g., frequency and hours of playing video games, and modified version of the Problem Video Game Playing (PVP) have been investigated. | • Did you spend an increasing amount of time playing video games?  
• Did you skip school or work, or lie or steal, or argue with someone so that you could play video games?  
• Did you ignore homework, or go to bed late, or spend less time with family and friends because of your video game playing? |
| Social media for communications (Creighton et al. 2013; Haagsma et al. 2013) | • The relationship between using social media, online social interaction, self-regulation and academic performance has been studied. | • The use of text messaging, email, social networking sites, cell phone communication, and online gaming  
• I prefer online social interaction over face-to-face communication  
• I prefer communicating with people online rather than face-to-face |
| Personal information (Elliott et al. 2012)                              | • The relationship between personal information such as age and gender and video game playing has been studied. | • Age, gender, race, education, employment, household income, etc. |
| Motivations (Paavilainen et al. 2013; Peng et al. 2012)                 | • The relationship between motivation and game playing has been studied.      | • Fun, frustrations, sociability, competition, escape, etc. |

**Table 1. The constructs related to academic performance and learning outcome**

The main construct listed in Table 1 is comprised of factors in our research model. For example, the ‘social media’ factor refers to the use of ‘email’, ‘cellphone’, ‘social websites’, and ‘face-to-face’ for social interactions with college students. Therefore, the six factors described in Table 1 were selected to develop the conceptual model (see Figure 1).
Research questions

Our interests are to investigate the influence of gamer’s behavior, including gaming frequency/time, gaming genre/platform, social media, motivation, and self-control capability, on the academic performance of college students. This research intention led to our major research question:

• **Question**: Do various aspects of gamer’s behavior, including gaming frequency/time, gaming genre/platform, social media, motivation, and self-control capability significantly influence on college students’ academic performance?

Research Methods and Study Design

Participants

In Fall 2013, three instructors in the School of Information Technology (IT) at a four-year college in the southern US invited students of their courses to participate in this study. The 221 students from the thirteen courses, of which seven courses are online, taught by the three instructors were invited to the study. Students who participate in the study received 10 or 20 bonus points dependent upon the grading scale of each course. An alternative assignment with bonus points was given to students who did not want to participate in the study. Participants’ age ranged from 18 to 50. The majority of participants (70%) were under 33 years old.

The academic performance of survey respondents measured by using a 4.0 scale GPA ranged from 1.82 to 4.0 with the average of 3.033. 78% of the participants were male, 81.20% were full time students, and 65% had a part or full time job.

Data Collection and Process

An online, anonymous survey and convenient sampling method was used for data collection. LimeSurvey³, an open source, web-based survey application, was used to conduct the survey and collect responses. The gaming frequency/time, types of gamers, types of games, social behavior, self-control capability, and other relevant information were collected through 30 survey questions. Students could opt out of the survey any time if they find some questions are too sensitive or inadequate. Students’ academic performance indicators such as GPA were collected from the school’s information system. Any information related to students’ privacy, including names and GPA was protected and especially students’ names were encoded using a unique numeric code.

A pilot survey was conducted with three undergraduate students. Based on students’ feedback, sensitive questions were revised. Ten students opted out while taking the survey. The total number of usable responses was 117 after removing 5 incomplete responses.

Measures and Data Analyses

The survey was conducted by using 30 questions in 4 categories: 1) gaming experience, 2) social and academic experience, 3) personal information, and 4) open questions. The survey questions were classified into 6 main areas for the research model (see Appendix A): 1) gaming time/frequency, 2) gaming genre/platform, 3) self-control capability, 4) social media usage, 5) computer and Internet usage, 6) motivation and bio. Each main area is comprised of subareas and survey questions. For example, self-control includes self-control in academic work and in personal life with the questions:

- Self-control in academic work: Have you missed any deadlines of assignments or exams because of playing video games?
- Self-control in personal life: Have you forgotten things to do because of playing video games?

The survey questions are designed to represent the 6 constructs specified in Table 1. Students’ academic performance was measured by using cumulative GPA retrieved from school’s student information system. While each survey question was selected and developed based on previous research studies (Connolly et al. 2012; Ip et al. 2008; Turner et al. 2012; Ventura et al. 2012), we only selected and revised questions and items relevant to gaming and academic performance in this study. For other factors, gaming frequency (Ip et al. 2008), face-to-face vs. online communication (Haagsma et al. 2013; Lepp et al. 2014) in social media, the number of game genres (Ip et al. 2008), computer gaming on a PC (Appel 2012) in gaming platform, self-control ability (Tangney et al. 2004), and playing video games to escape from real world (Hellström et al. 2012) have been studied frequently together with academic performance or learning outcome and also were used in our model.

The Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. While the dependent variable, GPA, is continuous data, the independent variables are discrete and categorical data. Therefore, a multiple regression was conducted to find out how strongly gaming related independent variables are correlated to the dependent variable, which is academic performance. The analysis also can show the relative contribution of each variable. Additionally, Pearson’s correlations were examined to ensure the correlations among independent variables are not too high.

To prepare data for analysis, the categorical variables with more than 3 levels, such as game platforms, gaming genres, and social communication, were encoded into separate, dichotomous variables with dummy coding. The self-control ability is comprised of 5 dichotomous questions because some students were sensitive to the frequency of missing classes and homework based on the feedback from our pilot study. Therefore, we transformed 5 dichotomous questions into a single predictor with the scale 0 (low self-control ability) – 5 (high self-control ability).

Analysis Results

First, the results of multiple regression show that a standardized residual was between -2.5 and +2 and there were no outliers. The correlation between all independent variables is less than .7, shown in Table 2. Therefore, all variables were retained in the research model. The coefficient of each independent variable and R² value (.37) are shown in Table 3. From the R², it can be argued that our model explains 37% of the variance in GPA. The largest beta coefficient is .27, which is for gaming platform, followed by self-control (.26), social interaction using more face-to-face communication (.18), motivation (.10), gaming genres (.05), and finally gaming frequency (-.02). Among the 6 predictors, three variables: self-control, social interaction, and gaming platform make a statistically significant contribution to college students’ academic performance.
### Table 2. Correlations of variables in the study (n = 117)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unstandardized</th>
<th>Standardized</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>3.057</td>
<td></td>
</tr>
<tr>
<td>Self-control</td>
<td>.07</td>
<td>.26*</td>
</tr>
<tr>
<td>Social interaction</td>
<td>.22</td>
<td>.18*</td>
</tr>
<tr>
<td>Motivation</td>
<td>.12</td>
<td>.10</td>
</tr>
<tr>
<td>Gaming frequency</td>
<td>-.01</td>
<td>-.02</td>
</tr>
<tr>
<td>Gaming genres</td>
<td>.02</td>
<td>.05</td>
</tr>
<tr>
<td>Gaming platform</td>
<td>.28</td>
<td>.27*</td>
</tr>
<tr>
<td>R²</td>
<td>0.37</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05 (2-tailed)

### Table 3. Regression model estimates (n = 117)

### Discussion

The analysis results show that while self-control, social interaction (i.e., more face-to-face interaction than online interaction), and gaming platform make statistically significant contributions to college students’ academic performance, other three variables including motivation, gaming frequency, and gaming genres are not playing any statistically significant role with regard to academic performance. The results of our analysis concerning the self-control and gaming platform variable confirm the findings of prior research, which indicate that the more control students have over their academic work, the higher GPA they can achieve. The analysis result of self-control variable confirms previous research in that the more control students have on their academic work, the higher GPA they can achieve. However, the test results of other two variables including social interaction and gaming platform are somewhat interesting. The similar result has been found by Appel (2012); an increase in video game playing on a personal computer was related to higher scores on computer knowledge. The results indicate that students who prefer face-to-face or phone communication methods obtain relatively higher GPA than those who like to use online or text communication methods and students who play games using multiple gaming platforms achieve a higher GPA than others.

While the aforementioned findings require more in-depth analysis, the result related to social interaction can implicate that college students who achieve high academic performance use less online social media such as Facebook and Twitter. It can be justified because online social media usually requires a considerable amount of time and also are less convenient for in-depth communication with colleagues.
than face-to-face or phone communication methods. Also the study result related to the gaming platform entails that tech-savvy IT students achieve higher academic performance in IT courses than others.

**Conclusion and Limitations**

In this study, we developed a research model based on prior research to investigate the influence of gaming behavior on the academic performance of IT college students. The model was tested by using a survey study and the results showed that among six independent variables, self-control, social interaction, and gaming platform have emerged to have statistically significant relationships with academic performance.

There are several limitations evident in this study. First, the research model was tested using a survey, which is a self-report that may include biased answers. Second, the study surveyed only IT students and, therefore, it may not be appropriate to generalize the results to the entire population of college students. Third, due to time constraints, only one model was reported and tested. To fine-tune our current model, more alternative models and factors need to be tested.

**Future Research**

This study investigates the gaming behavior and factors that may influence students’ academic performance. Potential venues for follow-up research could include developing and testing alternative models with a focus on the effects of moderation and mediation. In addition, we plan to investigate into whether other factors, e.g., students’ prior knowledge, learning efficiency, and learning approaches will affect students’ academic performance. Finally, we are interested in comparing non-educational and educational games in influencing students’ learning and academic performance because our final goal is to design and develop educationally effective game software for K-12 and college students.

**References**


### Appendix A

<table>
<thead>
<tr>
<th>Areas</th>
<th>Subareas</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gaming time/frequency</td>
<td>• How often have you played video game weekly?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• On average, how many hours per week you have spent time playing video games?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compared to three years ago, I play video games: more frequently, less frequently, little change, etc.</td>
</tr>
<tr>
<td>Type of player</td>
<td></td>
<td>• I consider myself as: A non-, novice, occasional, expert (hardcore) video game player.</td>
</tr>
<tr>
<td></td>
<td>Gaming platform and genre</td>
<td>• Types of game platform you have played: PC-based, Console (Xbox, Wii, etc.), Arcade, Mobile, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Which game platform you have played most frequently? PC-based, Console (Xbox, Wii, etc.), Arcade, Mobile, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• You have been playing: Strategy, action, puzzle, role-playing, sports, massively multiplayer online games, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Which game you have played most frequently? strategy, action, puzzle, role-playing, sports, massively multiplayer online games, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Please list names of games you have played.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you played video games during a class?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you played video games during class breaks?</td>
</tr>
<tr>
<td>Self-control</td>
<td>Self-control in academic work</td>
<td>• Have you missed any deadlines of assignments or exams because of playing video games?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you been late or missed any classes because of playing video games?</td>
</tr>
<tr>
<td></td>
<td>Self-control in personal life</td>
<td>• Have you forgotten things to do because of playing video games?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you skipped your dinner or lunch because of playing video games?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Have you forgotten the time because of playing video games?</td>
</tr>
<tr>
<td>Social media</td>
<td>Social interaction &amp; frequency</td>
<td>• How often do you hang out with friends per week?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• I prefer to communicate with people via: Phone, email. Social network websites (Facebook, Twitter, etc.), face-to-face, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• I communicate with people most frequently by: Phone, email. Social network websites (Facebook, Twitter, etc.), face-to-face, etc.</td>
</tr>
<tr>
<td>Computer and Internet</td>
<td>Type of courses (online or regular)</td>
<td>• Type of course I have been taken: __ % Online</td>
</tr>
<tr>
<td>% in-Class</td>
<td>% Hybrid</td>
<td></td>
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</tbody>
</table>
| **Equipment** | • Do you have high-speed Internet at home?  
• Do you own personal computer(s) at home? |
| **Personal information** | **Age, gender, race, employment status, household income, and student status** | • Age range  
• Gender  
• Racial background  
• Student status: full/part time  
• Employment status: full-, part-time, etc.  
• What is your household income? |
| **Motivation** | **Motivation to play videogames** | • I would like to spend more time playing video games if I have: a higher income, more friends playing with me, etc.  
• Please specify your reasons to play games e.g., kill time, too much pressure, social life (most friends play it), or escape real life. |