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Effects of Computer Gaming on High School Students' Performance in Los Baños, Laguna, Philippines

Maria Daisy S. CORTES*, Jhoana V. ALCALDE**, Jose V. CAMACHO, Jr.***

Abstract

This study examined the effects of computer games on school performance of high school students in Los Baños, Laguna, Philippines. Allowance, gender, peer group and year level positively affect student's decision to play while time spent on studying, year level, previous grade, number of books and time spent playing computer games are found to be significant in affecting student's performance. Results showed that the probability of a computer gamer to fail is 39%, given the student has more than four siblings, a previous grade of at most 84, lesser teachers, lesser hours on studying, living near a computer shop, and spends more hours playing computer games. Moreover, 60% of the students' daily allowance is spent on playing computer games.

Keywords : investment in human capital, computer games, education production function, high school performance, Logit regression model

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1. Introduction

Education is an important element of investment in human capital and economic growth. Secondary education as being the link between primary schooling, tertiary education, and the labor market, is significant in creating social opportunities and economic benefits.

During the late 19th century and throughout the 20th century, new types of mass media were produced and consumed such as dime novels, films, comic books, radio, recorded music, television, video and computer games, and the Internet. Each medium was often immediately praised for its potential benefits and criticized for its potential harms. Many studies have been conducted to test whether technological advances, specifically computers, are advantageous or disadvantageous to individual's school performance.

Many teachers, parents and other concerned organizations and people continuously clamor for a tighter clamp over computer gaming. Protest mainly focused on how the trend is becoming a cause of distraction among students in their studies. Many entrepreneurs set up cafés near schools to cater the youngsters, the market by the industry is seemingly tailored for. Many students are designating cafés as hangout places where hours are spent playing – be it until late at night, or worse, during school hours which makes students skip classes.

In 2007, complaints have been received from schools all over Manila, Philippines' capital city regarding students getting more and more addicted to online computer gaming. This is in spite of the fact that the government's Department of Education (DepEd) values how online computer gaming also helps sharpen the young generation into highly proficient individuals in new technologies and digital trends. DepEd also recognizes that internet and computer shops cater to the research needs of students, especially those without internet access at home. In addition, it is viewed that computer gaming is a shift from the usual vices of young students today, such as drinking and smoking. Apparently, computer game critics are clamoring that many internet and computer shop owners could not care less since it meant more income for the business. The effects of computer games on student's academic performance can be both advantageous and disadvantageous.

With the boom of computer games, income of computer shop owners and operators are expected to increase. This will mean higher revenue for the local town economy. However, additional revenues from computer shops are generated at the expense of future potential human capital through education. Estimates show that in the Philippines, online computer gaming makes up around 80% of the total usage of Internet in the Philippines. Also, computer gaming constitutes to a quarter of the entire business.

Several studies abroad, especially in the United States, supported the use of computer games as a tool in teaching. However, many studies also argued that computer games pose disadvantages to student's academic performance. Several studies have documented negative correlations between computer game use and school performance for children, adolescents, and college students. Another argument is that, computer games are

addictive. Once an individual started playing, he tends to spend much of his time playing.

Quality of education and school performance of students are measured by different factors. In a study by Angeles (2004, 28-29), several determinants of school performance in the primary and secondary levels were identified. Income, foregone income, school quality, and health are the factors that affect the demand for education. These factors have a positive relationship with student's performance, which means that higher/better values of the factors lead to higher demand for education. On the other hand, factors that affect the supply of education are proximity to school, accessibility to schooling, infrastructure and teacher-pupil ratio. All mentioned determinants, except teacher-pupil ratio, positively affect school performance.

With the emerging technological advancements, there are new factors that may affect the quality of educated population (Oliveros and Sapio, 2007, 17-18). Several studies were conducted to find out the relationship between technological advancements, specifically computers and computer games, and students' school performance.

Studies indicate that children who play computer games can improve visual intelligence skills. Parents believed that computer use is related to better academic performance of the children. It was found that high school students who used educational software at home scored significantly higher on computer literacy tests than other students. Computer use at home is also associated with improvements in general academic performance. Other studies also found that students who own computers at home had higher over-all grades, particularly in Math and English, than those without home computers.

On the other hand, a study done in Taiwan by Chuang and Chen (2007, 30) investigated and discovered that digital games improve children's cognitive achievement and can facilitate student's cognitive learning process. Moreover, the findings indicated that digital game playing not only improves participants' fact/recall processes, but also promotes problem-solving skills by recognizing multiple solutions. However, the question on which type of digital games works best for students was not discussed in the study.

Majority of studies regarding the impacts of computer games on school performance were conducted abroad or internationally. There were only few attempts in discussing the subject locally. Thus, this study analyzed the impacts of computer games on school performance of high school students in Los Baños, Laguna, Philippines. Specifically, the study (a.) identified the factors that influence students' decision to play computer games; (b.) established the relationship between the number of hours devoted by the students on computer games and the level of performance in school; (c.) determined the probability of computer gamers to fail in academics; (d.) estimated the average cost incurred by computer gamers who play in computer shops and the portion of this to their allowances; and (e.) identified economic implications based on the results of the study.

2. Theoretical and Conceptual Framework

Production function refers to the physical relationship between the inputs or resources of the firm and the output of goods and services at a given period of time, ceteris paribus (Costales et al., 2000, 67). This can also be applied for education where output is represented by the grade and the inputs are the resources and other factors affecting the student's performance.

There is no single model that can fully capture the relationships between school inputs and quality of education. However, educational production function remains a good analytical tool to determine the significance of any input used to enhance student learning. The effect of new resources like televisions, information technology and computers on education can be measured using the education production model.

The education production function is a structural relationship and depicted as:

$$G = g_{pf}(C, FS, MS, Q, S, E)$$

where G is grade, 'pf' denotes a production function, C is a vector of fixed child characteristics (innate ability), FS and MS are fathers' and mothers' education, Q ('quality') is a vector of school and teacher characteristics and EI refers to all educational 'inputs' under parental control (e.g. time spent studying at home and education materials at home).

Charts and Diagrams

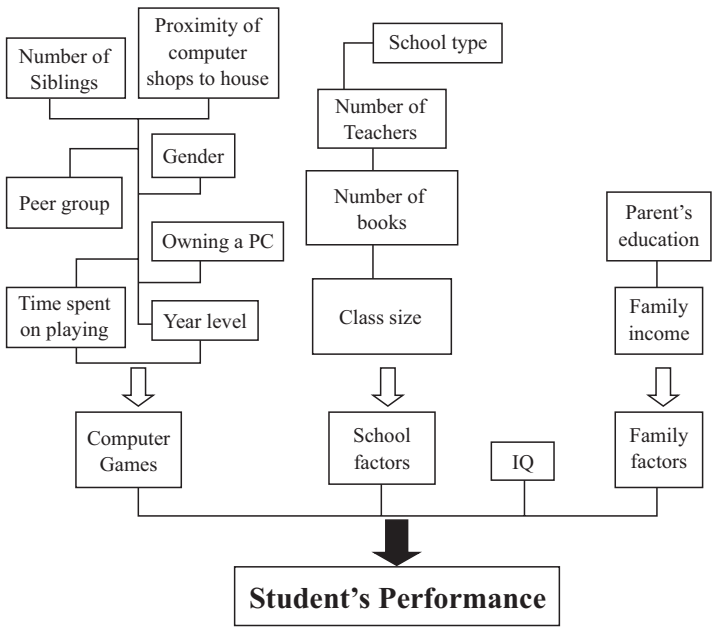

Figure 1. Factors affecting school performance.

School performance is affected by several factors, however, for the purpose of the study; the factors considered are limited to school factors, family factors and factors affecting computer gaming, and IQ level (see Figure 1). School factors such as class size, number of books and number of teachers affect students' performance. It is hypothesized that class size is negatively related to student's performance. Bigger class size will have a negative impact on school performance. However, number of teachers and books positively affect students' performance. Schools can be private or public. School type affects school performance due to the differences on grading system and resource endowments. Private schools have higher ratio of resources than public schools relative to students.

Intelligence Quotient (IQ) level, proxied by student's final grade during the sixth grade in elementary, directly affects students' academic performance. Holding all other variables constant, students with higher IQ level tend to perform better than others.

Family income, indirectly, has a huge influence on school performance. Students from high-income families are more capable of buying school supplies, paying tuition fees, and attending review and/or advance classes that may help them perform well in class, resulting in higher grades. Parent's education also affects students' performance. Parents with higher educational attainment will have higher valuation on education thus; will motivate children to exert more efforts in studying. Having a personal computer at home will mean better access to computer games since the machine is free and always available. Longer hours of playing games may be spent when there is computer at home. Time spent on playing computer games largely affect students' scholastic performance. As a student spend more time playing, lesser hours are devoted for homework, reviews, and other school-related activities. Longer hours of computer gaming might have a negative impact on school grades. Proximity of computer shops to student's house is another determinant of school performance. If a computer shop is located near a student's house, there is a greater tendency to play computer games rather than do school tasks.

Gender is one of the major determinants of computer gaming. Several studies have shown that the probability of male students to engage in computer gaming is higher than females. Moreover, in terms of frequency in playing, males are more frequent players than females. Many studies have shown that the number of siblings is also a determinant in playing computer games. Frequent players are usually those who belong to a small family with 1-2 children, especially if of opposite sex.

Peer groups affect individual's attitude towards computer gaming. Those who belong to a group wherein members are computer gamers have higher tendency to become a computer gamer than those who do not have.

3. Methodology

3-1 Data Collection

The study was conducted in Los Baños, Laguna, Philippines. Both primary and secondary data were used in the study. Secondary data were composed of school records, municipal records, other related studies, journals, books, and other publications. Interviews/surveys were also conducted. Both students and teachers participated in the interview and survey.

Data gathering was done from October-December 2008 through personal visits in respondents' schools. A total of 240 students from both public and private schools were interviewed. The schools included in the study were Maquiling School Inc. (MSI), Trace College, Los Baños Community National High School, and Los Baños National High School (LBNHS). Using random sampling, 15 students for every year level were selected as respondents of the study, or a total of 60 students per school.

3-2 Data Analysis

To identify the factors that could influence student's decision to play computer, the logit model below was employed. A value of 1 is assigned if the respondent is a computer gamer, and 0 if not. The variables in Figure 1 illustrate the factors that influence students' decision to play or not. Peer group is a dummy variable; a value of 1 was assigned if more than half (majority) of the members were computer gamers and 0 if not.

To identify if playing computer games is a significant factor that contributes to student's school performance, an Ordinary Least Squares method was conducted. The dependent variable was student's performance (measured by the student's previous average grades). Explanatory variables include family's monthly income, parents' education, number of siblings, student's peer group, distance between student's school and nearest computer shop, child's year level, number of hours spent on playing computer games and doing school work, presence of computers at home, class size, number of teachers and number of books.

To determine the probability of a computer gamer to fail in his/her academics, the logit equation was used. Sample size consisted of computer gamers only. Variables used in the model denote the factors that affect the student's probability of passing and failing. The passing mark for both public and private schools is 75%, so a dummy value of 1 was assigned if the student got below 75% while 0, if otherwise. Explanatory variables included hours spent on playing, time spent on studying, distance between house and computer shop, distance between computer shop and school, family's monthly income, student's gender, type of school, student's year level, ownership of a PC, peer group, class size, number of teachers, number of books, parents' education and student's final grade during the 6th grade.

4. Results and Discussion

4-1 Overview of the Respondents

Results showed that forty-eight percent of the respondents are classified as non-computer gamers while 52% are computer gamers. More than 75% of the total number of computer gamers belong to a peer group whose members are also computer gamers. Also, 68% of non-gamers belong to a peer group whose members are, likewise, non-gamers.

With regards to parents' education, 23% of computer gamers have parents who did not reach college level, 30% have a parent who reached college level, either mother or father, and 47% have parents who reached college level. Meanwhile, 27% of non-computer gamers have parents who did not reach college level, another 31% have parents who reached college level and 42% have parents who both reached college level.

The survey revealed that 61% of the total number of computer gamers have less than three siblings while 33% have greater than four but less than six siblings. Lastly, only 6% belongs to a family with greater than seven siblings.

The average daily allowance of computer gamers is PhP 70.69, relatively higher than the average daily allowance of non-gamers which is PhP 58.28. Twenty-six percent of computer gamers have a daily allowance of more than PhP 101 while only 3% of non-gamers have the same amount of daily allowance. (At the time of the study, a Philippine peso (PhP) is equivalent to approximately 1.79 Japanese yen).

Majority of the respondents (74%) have monthly family income ranging from PhP 0-30,000. Computer gamers and non-gamers whose monthly family income is less than or equal to PhP 30,000 comprised 66% and 84% of the samples, respectively. However, it is important to note that 11% of computer gamers are within the range of PhP 60,000-120,000 monthly income compared to that of non-gamers which is only 6%. From the results of the survey, it can be concluded that computer gamers have higher monthly family income than non-gamers.

Out of 124 computer gamers, 54% owns a computer at home while the remaining 46% does not have computers at home. Also, the survey showed that most respondents who have computers at home are from private school.

On the average, a computer gamer spends two hours per day doing school tasks while non-gamers spend three hours for the school tasks. In fact, 69% of computer gamers spend a maximum of two hours on doing assignments, etc. while the largest part of non gamers spends 3-5 hours. This is because, 56 out of 124 computer gamers claimed that if not playing, they are most likely doing the assignments, reviews, projects, etc. It is also shown that extra-curricular activities and household chores are given up when playing computer games.

On the other hand, 31% of the total number of computer gamers revealed that sleep had to be given up as well

as other leisure activities such as watching television just to play computer games.

More than half of computer gamers are from private schools while the remaining 48% are from public schools, another indication that most of computer gamers come from rich families. First and second year high school students are more frequent computer gamers than those students who are already juniors and seniors. Basically because junior and senior students spend more time studying to prepare for college years.

Grades incurred by the students during the second grading period were noted. Results showed significant difference between the grades earned by computer gamers and non-gamers. Lower grades were achieved by gamers compared to non-gamers. Thirty one out of 124 computer gamers got a grade ranging from 70-75. In addition, 29 out of 31 students earned a failing mark (74 and below). The average grade of non-gamers is 86, higher than the average grade of computer gamers which is only 82.

There seemed to be a negative relationship between grades and time spent on computer gaming. In fact, 80% of computer gamers spend 1-3 hours a day playing. Furthermore, gamers who play for 4-6, 7-9, and more than 10 hours daily amounted to 14%, 5%, and 1%, respectively. The average daily number of hours spent on playing is 2.5.

Given the amount of time spent on playing, it is also important to know the types of computer games that students play. Massively Multiplayer Online Role-Playing Games (MMORPG) are games that do not have ending and is designed to be played forever. MMORPG's are usually played with thousands of other players online at the same time, adding a highly addictive social component to the game. Examples of endless games are Warcraft, DOTA, Ragnarok and Cabal. Another type of game is fighting game which is also called versus game. That is, one player versus another. The game emphasizes brutality of fighting, and learning of the fighting moves. Fighting games often take a lot of playing in order to master all of the moves of a given fighter. Examples of versus games are Tekken and Street fighter.

Role-playing games (RPG's) on the other hand, are usually designed for only one player, unlike MMORPG's and RPG's, have an ending. Depending on how the gamer plays the game, the ending is often different. The more a gamer plays, the deeper he gets into the story, and the more powers the character gains. The player usually portrays a role; waitress, musician, etc. Examples of this kind of game are dinner dash, automania and burger restaurant. There are games which are typically abstract games of logic with no theme or characters, they are called Puzzle games. Players of logic games must line up blocks or games to solve math problems. Abstract games are simple to learn and play. Examples of these are Zuma, Textwist, and Solitaire.

Survey showed that the most played type of computer games is the Massively Multiplayer Online Role-Playing Games (MMORPG), next is fighting games followed by puzzle games and lastly, role-playing games.

Results revealed that MMORPG and fighting games are usually played by male gamers while role-playing and puzzle games are common for female gamers. More than half of the male gamers (53%) frequently play MMORPG, while 33% usually play fighting games. On the other hand, there are 32% and 24% female gamers

who commonly play RPG's and puzzle games, respectively.

4-2 Factors Affecting the Decision to Play Computer Games

A Logit regression model was used to identify the factors that could influence students' decision to play computers. Results of the regression are summarized in Table 1.

Table 1. Factors affecting the decision to play.

Parameter	Estimate
Number of siblings	-.022
Type of school	-.389
Gender	.66**
Peer group	1.95*
Mother"s education	-.02
Father"s education	.31
Allowance	.013**
PC at home	.49
Year level	.69**

* = *significant at 1%* Prob > $chi^2 = 0.00$

** = *significant at 5%* Pseudo $R^2 = 0.23$

n = 124

Based on the results of logit, at 5% level of significance, factors such as allowance, gender, peer group, and year level increase students' the decision to play computer games. All factors exhibited a positive sign. This means that the variables imply a directly proportional relationship to the decision-making behavior of the students.

Student's daily allowance is a significant factor that affects decision to play. The factor can work in two ways. First, students with higher daily allowance may mean that they are from a rich family. Families with higher income are more capable of buying a computer set. Thus, making computer gaming more accessible to children. However, availability of computer at home was found to be insignificant regression analysis. Secondly, children with higher daily allowance can spend more money for playing. This also explains why computer gamers have higher daily allowance compared to non-gamers. From these, it can be concluded that students from rich families are more prone to computer gaming.

The study also found out that being a male increases the student's decision to play. This explains why 60% of computer gamers are males and only 40% are females. Students who belong to a peer group whose members are also computer gamers are more prone to computer gamers than those whose peer groups were non gamers. This is because the usual computer games, especially those which are played by males, require three or more players.

Year level was also found to be significant in the regression analysis. Freshman or sophomore is more likely to become a computer player. This is because junior and senior students devote more time studying in

preparation for college education (college entrance exams). The result showed that more than half of the total number of computer gamers are freshmen and sophomores.

4-3 Factors Affecting High School Students' Performance in School

Results of the regression analysis revealed that at 5% level of significance, factors such as time spent on studying, year level, final grade during Grade 6, number of books and time spent playing computer games are found to be significant (Table 2).

Table 2. Factors affecting academic performance

Parameter	Estimate
Income	-.0000165
Year level	1.37**
Time spent on studying	.47**
Proximity of computer shops	-.0000279
Presence of PC at home	.61
Time spent on playing	-.91*
Class size	.01
Number of teachers	.14
Number of books	.30**
Final grade during Grade 6	.70*
Peer group	-.53
Mother's education	-.32
Father's education	.32
Number of siblings	-.13
* = significant at 1%	R-squared = 0.49, n=240
** = significant at 5%	Prob ＞ F = 0.00

Among the significant variables, only time spent on playing computer games carries a negative sign, which indicates a negative relationship with student's grades. This means that one more hour spent on playing computer games results in a 0.91 point decrease in student's grade. This can be interpreted as the trade-off when playing computer games. If the student decides not to play, then there will be no deduction in the grades. Furthermore, if the student decides not to play and devote more time to study, instead of a 0.91 decrease, an increase of 0.47 point in the grade will be attained. That is the reason why time spent on studying and doing school works show a positive relationship with grades.

School inputs such as number of books have a positive relationship with grades. The regression results show that, giving one more book to a student, increases grades by 0.30 point. Students' final grade during Grade six was used, as a proxy variable for child's IQ level. A one unit increase in the student's final grade during Grade six causes a 0.70 increase in grades.

Year level is also a positive factor. If a student is a junior or senior, grades increase by 1.37 compared with freshman or sophomore. According to the interview and survey, lower level students tend to participate more

in extracurricular activities such as clubs, organization, etc. while juniors and seniors concentrate more on academics in preparation for enrollment during college years.

A correlation between the dependent and independent variables was conducted. Result showed that class size and income were correlated to the type of school and daily allowance. Also, the matrix confirmed that the distance of the nearest computer shop to school and the respondent's house are highly correlated. Therefore, to eliminate multicollinearity in the model, variables such as class size, allowance, and distance between the nearest computer shop and school were dropped.

4-4 Determining Computer Gamers' Probability of Failing

Another logit regression was carried out to determine the probability of a computer gamer to get a failing mark. The results of the logit regression analysis are as follows:

$$\mathbf{F} = 3.47 - 0.67\ \text{Income} - 0.84\ \text{Gender} + 3.70\ \text{No_siblings} - 1.10\ \text{TOS} + 0.97\ \text{Year_lvl} + 2.81\ \text{Prox}_H + 0.88\ \text{Peer} - 2.12\ \text{Time}_S + 0.60\ \text{Mo_educ} - 0.41\ \text{Fa_educ} - 1.96\ \text{NoTe} + 0.60\ \text{NoBo} + 3.27\ \text{Gr6} + 4.50\ \text{Time}_P$$

At 10% level of significance, factors such as number of siblings, final grade during grade six, number of teachers, time spent doing school works, distance between the nearest computer shop and respondents' house, and time spent playing computer games proved to be significant (Table 3).

Table 3. Probability of having a failing mark

Parameter	Estimate
Gender	-.84
Type of School	-1.10
Number of siblings	3.70**
Year level	.97
Final grade during Grade 6	3.27**
Number of books	.60
Number of teachers	-1.96***
Time spent on studying	-2.12**
Proximity of computer shops	2.81**
Peer group	.88
Time spent on playing	4.50*
Mother's education	.60
Father's education	-.41
Income	-.67
* = *significant at 1%*	Pseudo $R^2 = 0.72$
** = *significant at 5%*	Prob > $chi^2 = 0.00$
*** = *significant at* 10%	
n=124	

Students' final grade during grade six showed a positive relationship with students' probability of failing. Meaning, if a child's final grade during Grade 6 is less than or equal to 84, the probability of failing in the current year is increased. Probably because high school years consist of relatively harder subjects which

require stronger foundation of basic lessons in Math, Science, English, etc. Also, high school years have more extra-curricular activities that might lessen student's time for studying.

Number of siblings has a positive relationship with probability of getting a failing mark. Having more children in the family increases the probability of the student to get a failing mark. According to the interview, students from bigger families, especially females, need to look after younger siblings and do household chores thus reducing time for assignments, etc.

The quantity of teachers in a school is an apparent factor for students' performance. The greater the number of teachers employed by the school, the probability that students will fail is reduced. This is simply because another entity will help students understand the lesson more. This explains the negative relationship between the numbers of teachers and students' grades.

An obvious negative relationship between the number of hours devoted on studying and probability of failing was observed. If a child decides to spend more hours on doing assignments, projects, etc. the probability of getting a failing mark is reduced. The result was confirmed by the significance of the number of hours spent playing. That is, more hours devoted for playing increases the probability that a student will get a failing grade. An additional hour devoted to playing computer games will mean lesser hours devoted for other activities such as doing household chores, assignments, extra-curricular activities, etc.

The distance between the respondent's house and the computer shop, in the absence of a computer at home, and the probability that the student will fail is positive. In the interview, majority of the students who do not have computers at home tend to go to the nearest computer shop to play.

The exact value of the probability that a computer gamer will get a failing mark was also computed using the equation below:

$$\mathbf{F} = 3.47 + 3.70\ \text{NO_SIBLINGS} + 2.81\ \text{PROX}_H - 2.12\ \text{TIME}_S - 1.96\ \text{NoTe} + 3.27\ \text{Gr6} + 4.50\ \text{TIME}_P$$

$$\mathbf{F} = 3.47 + 3.70\ (1) + 2.81\ (.222) - 2.12\ (2.2) - 1.96\ (9) + 3.27\ (1) + 4.50\ (2.4)$$

$$\mathbf{Z = \ln\ (p/1-p) = -0.44}$$

$$\mathbf{P_F} = \frac{\mathbf{e^z}}{\mathbf{(1+e^z)}} = \mathbf{0.39}$$

Based on the computations, the probability of a computer gamer to get a failing grade is 0.39. This is true if the student: (1) has greater than four siblings, (2) has a final grade 6 rating of at most 84, (3) has lesser teachers at school, (4) spends fewer hours per day on studying, (5) living near a computer shop, and (6) spends more hours per day on playing computer games.

4-5 Average costs incurred by computer gamers

Results from the survey showed that on the average, a computer gamer who plays in computer shops spends about 60% of daily allowance or PhP 39 on playing. The amount is a significant portion since only 40% is left

for more important expenses such as food, transportation, savings, etc. Given that 78 students (32.5%) spend PhP 39 on playing, the estimated total effect on the demand for computer games is PhP 1,267.50.

Food comprises 56% of the displaced expenses. This means that 56% of those who spend part of the allowance on computer games sacrificed their food consumption. Savings cover 31%, a relatively significant percentage. Given that food is the most displaced expenses, a negative impact on student's academic achievement could be observed. According to Behrman (1996), better health and nutrition are positively associated with gains in schooling in many areas: enrollment at younger ages, less grade repetition, less absenteeism, more grades completed and better performance on test scores.

Some observations in the study showed that the money spent on computer gaming exceeds daily allowances of the respondents. So, aside from the daily allowance, some respondents have other means of acquiring money just to be able to play.

5. Conclusion

Computer gaming, measured by number of hours spent playing, contributes to the probability of a student to fail. The study of Mañugo (2007, 45-46) proved that the number of subjects failed increases the probability of a LBNHS student to drop out. Thus, computer gamers also have the tendency to drop out of school; either repeat one academic year or stop schooling.

Because computer gaming poses negative effect on student's performance in school, there is a possibility that education in high school would have a tendency to deteriorate. As computer gaming industry continues to grow, bigger number of students will lose interest for studies. This might mean that investment on higher education will lead to lower rate of return among students. Thus resources such as money, time, school inputs, etc. are probably go to waste.

Number of books was also found to be a significant factor affecting student's grade. Adding one more book per student increases student's grade. However, it is apparent that public schools lack books compared to private schools. Thus, the government should place serious attempts in giving more books especially to public schools where inadequacy of books is apparent. Also, the government should allocate the national budget such that it caters to the needs of the people, most especially human capital development through education.

With higher allowance, students are most likely to become computer gamers. A student with higher daily allowance tend to play more which leads to higher demand for computer games. This will give wider market for computer shop owners and an opportunity to increase revenues. Likewise, child/children from rich families, capable of giving higher allowances to children, are more prone to computer gaming, and eventually failing.

Based on the opportunity cost of the student's expenses on computer games, some implication might be

observed on the nutritional and health status of high school students. Aside from food, savings is also greatly affected when a student spends money on computer games.

It was also proven that the quantity of teachers affect student's probability of failing. More teachers would mean lower probability of failing. However, due to the demand of teachers abroad, many teachers decide to go out of the country because of higher income and greater job opportunities. This resulted in less number of teachers which can lead to higher probability of students' failing. Thus, a greater allocation of resource for teachers would potentially help upgrade the seemingly deteriorating quality of education. Providing greater incentives would keep teachers in their jobs so as to prevent brain drain in the country.

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