Abstract: This article describes an investigation that made a comparative analysis of the influence of the use of technology for non-academic activities on the reading performance of students in 21 countries within the Organisation for Economic Co-operation and Development (OECD), as measured by the Program for International Student Assessment (PISA). To do this, we coded the SumIC001-008-010 variables (“Devices available at home” and “How often do you use digital devices for the following activities outside school”) in the PISA survey and quantified the effect by the proportion of variance explained of each variable in the model for each country. The results show that the reading score increases according to the variable for type and quantity of devices at home but falls drastically in all 21 countries when the “SumIC001” variable exceeds 15 points. Our research also found that the two activities that most negatively impacted reading performance if done on a regular basis were “playing online games via social networks” and “uploading your own created contents.” These results would seem to confirm that the non-sustainability and prolonged use of technology outside school is objectively negative for the development of reading competence in young people.

Keywords: ICT; reading performance; reading competence; PISA; digital devices; outside of school; non-academic activities; frequency of use

1. Introduction

Results of studies show that the influence of the use of technology inside and outside school on students’ academic performance worldwide is contradictory and hard to determine [1–3]. For example, in 2012, 96% of 15-year-old students in OECD (Organisation for Economic Co-operation and Development) countries stated that they had a computer at home, and 72% said they used a digital device at school. More and more studies show that the use of technology and digital devices in the classroom does not directly correlate to improvements in students’ academic results and can have a negative effect on their educational performance [4]. It has been shown that students who use computers at school in moderation and strictly for educational purposes achieve better results than students who hardly ever use them, but if computer use is more pronounced, the results in reading, maths, and the sciences worsen across all OECD countries regardless of the students’ socio-educational
context [3]. Educational policies and didactic and pedagogical trends increasingly advocate the use of technology inside and outside the classroom as a support mechanism for teaching and learning. However, caution is needed before doing so, and an analysis should be undertaken to examine and reflect on the supposed benefits of technology use inside and outside the classroom, and to identify those academic and non-academic activities, and corresponding didactic approaches, that can help improve students’ academic performance and level of competence. The aim of this study is to examine if the use of technology for non-academic activities outside school can have an objectively negative impact on reading performance and, if so, to define the type of activity responsible for this deficit and determine the extent to which possession and use of a device is prejudicial for the development of students’ reading skills.

2. Ict outside School and Their Influence on Students’ Academic Results and Reading Performance

The use of technology has transformed the way we access texts and culture from parameters whose audiovisual elements have acquired a prominent role [5–9]. The Program for International Student Assessment (PISA) study has shown that students spend far more time online outside school than during the school day. According to data from this study, students in OECD countries spend more than two hours a day, seven days a week, connected, and this time is spent mainly on fun and leisure activities. The most common online activities that students indulge in are social networking (83%); downloading music, films, and games (70%); and chatting (69%). Half the students use the Net at least once a week to search for information of a more practical nature (66%), to read or send emails (64%), or read news (63%). In addition, 40% are gaming online on their own, and 36% in groups; 31% of students use the computer at least once a week to upload self-created content (music, videos, photos, etc.) [3].

Recent scientific literature has identified the negative impact of the time adolescents spend in front of the screen of their digital devices on areas that include sleep [10,11], physical activity [12], and social welfare [13]. This has led public authorities in several countries to raise the alarm about the potentially negative consequences of the continuous use of technology (e.g., [14]), recommending a reduction in the time children and teenagers spend on the Net during their free time to less than two hours a day [15,16]. In this day-to-day adolescent context mediated by digital devices and technology, reading competence appears to be conditioned by the student’s own previous culture and the context and the purpose of the students’ reading [17]. Students’ reading performance is measured by considering the purpose of the reading, social relations, type of text, and subject area [17,18]. In recent PISA studies, assessment has focused on students’ acquisition of skills [19] and reading competence [18,20].

Reading competence increases when the reader is challenged by new types of text, formats and contexts, and measures these new situations against previous ones [21,22]. The growing presence of digital devices at home raises many questions about their influence on adolescents’ reading and writing competence [23]. The use of technology is undoubtedly a source of motivation for the majority of adolescents, and some studies have demonstrated a positive relation between technology use and academic results [24,25]. Nevertheless, the use of technology mainly arouses controversy, with its supporters and detractors in terms of the effect on students’ academic performance [26,27]. Some researchers view technology as causing the destruction of traditional literacy [28], while others see it new possibilities for boosting reading competence [5,9,29,30]. Some state that the digital revolution by no means signals the end of the habit of reading; rather, it provides new forms to promote it [31]. Indeed several studies have shown that the integration of technology in schoolwork is a two-way relationship; for example, a gamer can pick up a printed book because he/she is interested in a story on which the game is based or on an event related to it [32–34].

Young people use technological devices in non-academic situations or actions mainly for leisure activities, gaming, chatting or interacting on social networks [35]. Results on, and interpretations of, the influence of this non-academic digital activity on students’ educational performance vary. Fuchs and Woessmann [36] used the PISA 2000 results to show that students who never read an email or
browsed a website for their own pleasure scored six points lower in reading, whereas students who did so several times a week scored six points higher in maths and nine in reading. The authors also demonstrated a positive correlation between using a home computer to access websites and email and students’ academic performance. Gumus and Altamis [37] showed that the use of computers for non-academic activities helped students get better results, particularly in reading ($\beta_1 = 0.370$ for females and $\beta_1 = 0.379$ in males, $p < 0.001$). Moran et al. [38] stated that technology could have a positive effect on reading comprehension (an effect measure of 0.489). Likewise, Thompson and De Bortoli [39] noted that students with access to computers at home scored 61 score points higher on the PISA mathematics assessment than those without similar access (average score 514). Fuchs and Woessmann [36] also found that students who had the Internet at home scored five points higher on the PISA in math and about four points higher in reading.

The results of studies on the impact technology use on students’ reading performance are contradictory, which had led investigators to call for a solid theoretical framework supported by practical evidence that addresses the issue of reading didactics from the digital society perspective, and which involves connected devices [40]. Research in this field is complex, given that reading competence is polyhedral and draws in other learning dimensions such as comprehension, metacognition, motivation, strategic and situated use, family and socio-cultural background, etc., all of which would have an important influence on any theoretical and interventional models for inside and outside the classroom. We also know that that traditional printed book reading is enriched by new audiovisual support like images, icons, and sounds, which share the reading space with print and interfere in a positive sense by facilitating interpretations and meanings in the texts [30,41]. International organizations have long been alerting to us to this new sociodigital context and its influence on reading. The National Reading Conference (NRC) drew up a white paper on “Effective Literacy Instruction for Adolescents” [32], which explicitly recognized the complexity of addressing reading in this 21st century media context. The International Reading Association [42] raised similar concerns and made the following recommendations: (a) ensuring access to a wide variety of reading materials, (b) building skills and desire to read complex materials, (c) modeling and giving explicit instruction, and (d) developing an understanding of the complexities of individual adolescent readers. What is clear is that students use technology for both academic and leisure activities [35]. Also evident is that, when students use digital devices in moderation, they get better academic results than those who hardly use them, and that those who use these devices in excess score badly in reading. What remains to be studied in depth is the type of activities with digital devices that can negatively impact on the development of reading competence and where that threshold begins.

3. Materials and Methods

The main objective of this research was to quantify how the variables associated to the “Use of ICT outside of school” can influence students’ reading score in PISA. To do so, the following two macrovariables in the PISA study were used [3]: “Are any of these devices available for you to use at home?” (IC001) and “How often do you use digital devices for the following activities outside of school?” (IC008-IC010), which correspond to the “ICT (Information and communications technolog) Familiarity Questionnaire” (use of ICT “Information and communications technology” outside of school and attitudes towards computers), (see Appendix A for the description of the variables used in this study). The sample analyzed, consisting of 21 countries (Belgium, Bulgaria, Czech Republic, Denmark, Spain, Estonia, Finland, France, Greece, Hungary, Ireland, Iceland, Italy, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, and Sweden) and 257,624 students.

To develop the methodology, it was calculated a univariate linear model on the variable “Read1,” which is the compilation of the means of the plausible reading scores in the PISA database. Therefore, the “SumIC001” variable was coded, created to transform the various “IC001” variables into one, firstly by recoding the variables. “IC001” consisted of a series of questions that enabled us to establish the use and availability of digital devices outside school. We then used this information to create a variable
that could quantify the number of devices available and their use by the students. For example, the IC001QTA1 variable “availability of desk-top PC” when recoded would be “Does not have one = 0; Has one but does not use it = 1; Has one and uses it = 2.” Following this logic, the results of all the questions were added to obtain the variable “SumIC001,” which is the sum of the quantity of devices available and their use by the students; the higher the score, the greater the availability and use of these digital devices outside school. This approach enabled us to establish various correlation analyses.

On checking that the IC008 variable then divided into 13 nominal question variables, it was decided to evaluate the variables separately. As a result, the first model included the effect of the “IC001, IC002, IC003, IC004, IC006, and IC007” variables, and the second comprised the effect of all the “IC008” question “subvariables.” Later, the size of the effect was quantified by the proportion of variance explained (the size from the “eta” to the partial square) of each of the variables in the model for each country. That value, multiplied by 100, gave the variation percentage in “Read1” that can be explained by the variables. To implement this, a sum of the total effect of the variables on “Read1” was made for both models. Later, the mean of these two effects was calculated to obtain an effect variable of the “IC” variables relating to the “Reading Score” for each country. A mean of the effect totals on each model was calculated by considering that it was mathematically incorrect to add the effects of different models, and by proposing a “final total effect” based on this assumption. Finally, a further analysis based on variable “SumIC001” was performed; taking into account that a series of categorical variables (the “IC001” variable questions) had been converted into a scale variable (SumIC001), it was interesting to make a correlation analysis between “Read1” and “SumIC001” to evaluate the presence of linear relations between such variables. Does the greater availability and use of digital devices mean better result values in the Reading Score?

4. Results

First, the results of the multi-factor ANOVA on the “Read1” (Reading Score) are presented. Effect Variables: IC001, IC002, IC003, IC004, IC006, IC007 (Table 1).

### Table 1. Within-subject effects tests. Variable dependent: “Read1.”

| Country Code 3-Character | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|--------------------------|-------------------------|----|-------------|---|------|---------------------|
| Belgium                  |                         |    |             |   |      |                     |
| Corr. M.                 | 10,874,406,872          | 44 | 247,145,611 | 39,940 | 0.000 | 0.189              |
| Intercept                | 16,926,317,516          | 1  | 16,926,317,516 | 2,735,412 | 0.000 | 0.266              |
| SumIC001                 | 2,709,259,958           | 22 | 123,148,180 | 19,902 | 0.000 | 0.055              |
| Bulgaria                 |                         |    |             |   |      |                     |
| Corr. M.                 | 9,928,004,922           | 43 | 230,883,835 | 29,691 | 0.000 | 0.226              |
| Intercept                | 15,692,644,176          | 1  | 15,692,644,176 | 2,018,055 | 0.000 | 0.315              |
| SumIC001                 | 2,893,903,317           | 21 | 137,804,920 | 17,722 | 0.000 | 0.078              |
| Czech Republic           |                         |    |             |   |      |                     |
| Corr. M.                 | 8,213,412,954           | 43 | 191,009,604 | 27,088 | 0.000 | 0.167              |
| Intercept                | 19,522,620,377          | 1  | 19,522,620,377 | 2,768,647 | 0.000 | 0.323              |
| SumIC001                 | 3,336,812,837           | 21 | 158,895,849 | 22,534 | 0.000 | 0.075              |
| Republic Czech           |                         |    |             |   |      |                     |
| Corr. M.                 | 8,213,412,954           | 43 | 191,009,604 | 27,088 | 0.000 | 0.167              |
| Intercept                | 19,522,620,377          | 1  | 19,522,620,377 | 2,768,647 | 0.000 | 0.323              |
| SumIC001                 | 3,336,812,837           | 21 | 158,895,849 | 22,534 | 0.000 | 0.075              |
| Denmark                  |                         |    |             |   |      |                     |
| Corr. M.                 | 4,370,257,290           | 42 | 104,053,745 | 19,311 | 0.000 | 0.132              |
| Intercept                | 7,861,263,708           | 1  | 7,861,263,708 | 1,458,915 | 0.000 | 0.214              |
| SumIC001                 | 1,413,265,127           | 20 | 70,663,256 | 13,114 | 0.000 | 0.047              |
| Spain                    |                         |    |             |   |      |                     |
| Corr. M.                 | 5,090,867,677           | 44 | 115,701,538 | 22,606 | 0.000 | 0.144              |
| Intercept                | 10,937,391,685          | 1  | 10,937,391,685 | 2,136,954 | 0.000 | 0.265              |
| SumIC001                 | 1,172,414,416           | 22 | 53,291,564 | 10,412 | 0.000 | 0.037              |
Table 1. Cont.

| Country Code 3-Character | Type III Sum of Squares | df | Mean Square | F       | Sig. | Partial Eta Squared |
|--------------------------|-------------------------|----|-------------|---------|------|---------------------|
| Estonia                  | Corr. M.                | 42 | 116,727,142 | 21,396  | 0.000| 0.157              |
|                          | Intercept               | 1  | 14,350,477,582 | 2,630,390 | 0.000| 0.353              |
|                          | SumIC001               | 20 | 104,793,737  | 19,208  | 0.000| 0.074              |
| Finland                  | Corr. M.                | 41 | 118,167,628  | 20,129  | 0.000| 0.140              |
|                          | Intercept               | 1  | 9,185,033,882 | 1,564,576 | 0.000| 0.235              |
|                          | SumIC001               | 19 | 103,801,207  | 17,681  | 0.000| 0.062              |
| France                   | Corr. M.                | 43 | 196,924,418  | 25,733  | 0.000| 0.185              |
|                          | Intercept               | 1  | 22,598,088,382 | 2,953,018 | 0.000| 0.378              |
|                          | SumIC001               | 21 | 115,854,274  | 15,139  | 0.000| 0.061              |
| Greece                   | Corr. M.                | 44 | 109,363,015  | 19,965  | 0.000| 0.151              |
|                          | Intercept               | 1  | 14,547,905,684 | 2,925,249 | 0.000| 0.353              |
|                          | SumIC001               | 22 | 88,070,717   | 11,670  | 0.000| 0.055              |
| Hungary                  | Corr. M.                | 43 | 156,571,906  | 25,242  | 0.000| 0.185              |
|                          | Intercept               | 1  | 3,981,461,486 | 641,877  | 0.000| 0.118              |
|                          | SumIC001               | 21 | 81,855,201   | 13,196  | 0.000| 0.055              |
| Ireland                  | Corr. M.                | 44 | 109,363,015  | 19,965  | 0.000| 0.151              |
|                          | Intercept               | 1  | 14,547,905,684 | 2,925,249 | 0.000| 0.353              |
|                          | SumIC001               | 22 | 88,070,717   | 11,670  | 0.000| 0.055              |
| Iceland                  | Corr. M.                | 44 | 129,391,694  | 29,021  | 0.000| 0.199              |
|                          | Intercept               | 1  | 929,3062,456 | 1,474,184 | 0.000| 0.223              |
|                          | SumIC001               | 22 | 122,505,507  | 21,729  | 0.000| 0.082              |
| Italy                    | Corr. M.                | 44 | 28,051       | 5,225 763 | 0.000| 0.113              |
|                          | Intercept               | 1  | 30,917,514,999 | 5,225,763 | 0.000| 0.351              |
|                          | SumIC001               | 22 | 98,838,856   | 16,706  | 0.000| 0.037              |
| Lithuania                | Corr. M.                | 44 | 32,156       | 7,563 44 | 0.000| 0.208              |
|                          | Intercept               | 1  | 20,195,893,415 | 3,582,162 | 0.000| 0.399              |
|                          | SumIC001               | 22 | 122,505,507  | 21,729  | 0.000| 0.082              |
| Luxembourg               | Corr. M.                | 43 | 23,906       | 1,176,668 | 0.000| 0.182              |
|                          | Intercept               | 1  | 174,64,448,043 | 2,314,182 | 0.000| 0.356              |
|                          | SumIC001               | 21 | 88,070,717   | 11,670  | 0.000| 0.055              |
| Netherlands              | Corr. M.                | 37 | 24,426       | 623,940 | 0.000| 0.163              |
|                          | Intercept               | 1  | 37,441,422,672 | 5,623,940 | 0.000| 0.547              |
|                          | SumIC001               | 16 | 129,471,768  | 19,447  | 0.000| 0.063              |
| Poland                   | Corr. M.                | 42 | 17,534       | 5,573 29 | 0.000| 0.155              |
|                          | Intercept               | 1  | 4,436,208,747 | 782,792   | 0.000| 0.163              |
|                          | SumIC001               | 20 | 93,025,926   | 16,415  | 0.000| 0.076              |
| Portugal                 | Corr. M.                | 43 | 37,546       | 8,837,022 | 0.000| 0.207              |
|                          | Intercept               | 1  | 51,815,548,221 | 8,837,022 | 0.000| 0.588              |
|                          | SumIC001               | 22 | 181,153,789  | 30,895  | 0.000| 0.099              |
| Slovak Republic          | Corr. M.                | 44 | 29,021       | 3,007,462 | 0.000| 0.199              |
|                          | Intercept               | 1  | 929,3062,456 | 1,474,184 | 0.000| 0.223              |
|                          | SumIC001               | 22 | 129,556,593  | 20,352  | 0.000| 0.081              |
| Slovenia                 | Corr. M.                | 43 | 25,469       | 6,176,668 | 0.000| 0.172              |
|                          | Intercept               | 1  | 6,737,791,298 | 1,176,668 | 0.000| 0.182              |
|                          | SumIC001               | 21 | 130,235,926  | 22,744  | 0.000| 0.083              |
| Sweden                   | Corr. M.                | 42 | 17,907       | 69,879   | 0.000| 0.148              |
|                          | Intercept               | 1  | 6,265,377,227 | 69,879   | 0.000| 0.182              |
|                          | SumIC001               | 20 | 90,743,202   | 14,033  | 0.000| 0.061              |
It can be observed that the influence of the “SumIC001” add variable on the result for reading is significant in the 21 countries analyzed (Sig.000). The countries where the percentage of the variance explained by the variable “SumIC001” in students’ reading performance is higher is mainly in Eastern Europe: Bulgaria = 7.8%; Slovenia = 8.3%; Slovak Republic = 8.1%; Lithuania = 8.2%; Poland = 7.6% and Portugal = 9.9%. Later, the point at which the “SumIC001” variable and the effects start to have a negative effect on “Reading Score” was calculated (Table 2).

Table 2. “SumIC001” variable and the effects on “Reading Score.”

| Country Code 3-Character | Mean   | Std. Deviation | N    |
|--------------------------|--------|----------------|------|
| Belgium                  | Read1  | 501.7655       | 93.83249 | 9651 |
|                          | SumIC001 | 16.4671       | 3.00231  | 7861 |
| Bulgaria                 | Read1  | 434.6840       | 107.14943  | 5928 |
|                          | SumIC001 | 15.0693       | 4.33790   | 4719 |
| Czech Republic           | Read1  | 498.4047       | 97.01967    | 6894 |
|                          | SumIC001 | 15.0489       | 3.33931    | 5973 |
| Denmark                  | Read1  | 487.2601       | 85.31990    | 7161 |
|                          | SumIC001 | 15.2956       | 2.95768    | 5568 |
| Spain                    | Read1  | 499.8391       | 80.13852    | 6736 |
|                          | SumIC001 | 15.5671       | 3.42434    | 6131 |
| Estonia                  | Read1  | 520.8162       | 81.80146    | 5587 |
|                          | SumIC001 | 14.4388       | 3.46931    | 4959 |
| Finland                  | Read1  | 527.6467       | 87.52816    | 5882 |
|                          | SumIC001 | 15.0658       | 3.22040    | 5261 |
| France                   | Read1  | 503.6678       | 105.21670   | 6108 |
|                          | SumIC001 | 16.0263       | 3.24531    | 5092 |
| Greece                   | Read1  | 476.8011       | 88.44407    | 5532 |
|                          | SumIC001 | 14.9942       | 3.82079    | 4800 |
| Hungary                  | Read1  | 477.2513       | 89.79812    | 5658 |
|                          | SumIC001 | 14.9406       | 3.91130    | 4948 |
| Ireland                  | Read1  | 520.7476       | 81.06800    | 5741 |
|                          | SumIC001 | 15.9122       | 3.21401    | 5093 |
| Iceland                  | Read1  | 482.4179       | 92.66222    | 3371 |
|                          | SumIC001 | 15.3186       | 3.12144    | 3032 |
| Italy                    | Read1  | 492.8792       | 83.92693    | 11,583 |
|                          | SumIC001 | 16.0274       | 3.42233    | 10,005 |
| Lithuania                | Read1  | 465.5506       | 88.47107    | 6525 |
|                          | SumIC001 | 14.5931       | 3.97098    | 5616 |
| Luxembourg               | Read1  | 482.2881       | 101.00371   | 5299 |
|                          | SumIC001 | 16.7355       | 3.43491    | 4446 |
| Netherlands              | Read1  | 504.9517       | 95.81925    | 5385 |
|                          | SumIC001 | 16.8562       | 2.66413    | 4744 |
| Poland                   | Read1  | 506.5414       | 83.32806    | 4478 |
|                          | SumIC001 | 15.7399       | 3.65607    | 4114 |
| Portugal                 | Read1  | 486.5672       | 87.63613    | 7325 |
|                          | SumIC001 | 15.7748       | 3.59541    | 6417 |
| Slovak Republic          | Read1  | 454.5665       | 98.02650    | 6350 |
|                          | SumIC001 | 15.3105       | 3.74695    | 5366 |
| Slovenia                 | Read1  | 485.9434       | 87.86514    | 6406 |
|                          | SumIC001 | 15.1942       | 3.48792    | 5505 |
| Sweden                   | Read1  | 500.1882       | 94.93591    | 5458 |
|                          | SumIC001 | 15.2221       | 3.49772    | 4571 |
The results in Figure 1 (as an example of two countries) show, when the value exceeds 14.5 points, the reading result begins to fall.

![Dispersion graphs of the mean in reading in accordance with the influence of the “SumIC001” variable.](image1)

**Figure 1.** Dispersion graphs of the mean in reading in accordance with the influence of the “SumIC001” variable.

Later, a correlation analysis between the “Read1” and “SumIC001” variables was carried out, but only for individuals with SumIC001 values greater than 14.5 (Table 3). All the correlations were significant and negative. The Pearson value showed the extent of the effect of SumIC001 on Read1 for extreme SumIC001 values.

As an example, Figure 2 shows the countries where the effect is more negative, namely in Slovenia (−0.359 **) and the Slovak Republic (−0.353 **).

![Correlation between “SumIC001” and “Read1” (Slovenia and the Slovak Republic).](image2)

**Figure 2.** Correlation between “SumIC001” and “Read1” (Slovenia and the Slovak Republic).
Table 3. Correlation between “SumIC001” and “Read1.”

| Country Code 3-Character | SumIC001 | Read1 | Country Code 3-Character | SumIC001 | Read1 |
|--------------------------|----------|-------|--------------------------|----------|-------|
| Belgium                  | SumIC001 | Pearson C. 1 | −0.245 ** | Sig. (2-tailed) 0.000 | N 6007 0.007 |
| Bulgaria                 | SumIC001 | Pearson C. 1 | −0.320 ** | Sig. (2-tailed) 0.000 | N 2463 2463 |
| Czech Republic           | SumIC001 | Pearson C. 1 | −0.330 ** | Sig. (2-tailed) 0.000 | N 3280 3280 |
| Denmark                  | SumIC001 | Pearson C. 1 | −0.228 ** | Sig. (2-tailed) 0.000 | N 3414 3414 |
| Spain                    | SumIC001 | Pearson C. 1 | −0.135 ** | Sig. (2-tailed) 0.000 | N 4031 4031 |
| Estonia                  | SumIC001 | Pearson C. 1 | −0.334 ** | Sig. (2-tailed) 0.000 | N 2332 2332 |
| Slovak Republic          | SumIC001 | Pearson C. 1 | −0.353 ** | Sig. (2-tailed) 0.000 | N 3093 3093 |
| Finland                  | SumIC001 | Pearson C. 1 | −0.321 ** | Sig. (2-tailed) −0.000 | N 2942 2942 |
| France                   | SumIC001 | Pearson C. 1 | −0.282 ** | Sig. (2-tailed) 0.000 | N 3526 3526 |
| Greece                   | SumIC001 | Pearson C. 1 | −0.304 ** | Sig. (2-tailed) 0.000 | N 2602 2602 |
| Hungary                  | SumIC001 | Pearson C. 1 | −0.283 ** | Sig. (2-tailed) 0.000 | N 2676 2676 |
| Ireland                  | SumIC001 | Pearson C. 1 | −0.209 ** | Sig. (2-tailed) 0.000 | N 3510 3510 |

** Correlation is significant at the 0.01 level (2-tailed).

In Figure 2, it can be observed that reading score falls dramatically when a value of 16–17 points is reached in the “SumIC001” variable. These results are systematic in all the countries analyzed. Thus, it could be stated that evidence shows that extensive contact with digital media has a negative effect on the development of young people’s reading capacity. Table 4 shows the Pearson correlation coefficient for activities that impact negatively on the reading performance of the students from the 21-country sample analyzed.

The results in Table 4 show that the average of variables 7 and 12 is the highest in the countries analyzed. “Playing online games via social networks” (0.037) and “uploading your own created contents for sharing (e.g.,: music, poetry, videos, computer programs)” (0.031) are activities that have a negative effect on students’ reading capacity when done on a daily basis.
Table 4. Non-academic activities and correlation with reading performance.

| Countries        | IC008 | Q03TA | Q07NA | Q10TA | Q12TA | Q13NA |
|------------------|-------|-------|-------|-------|-------|-------|
| Belgium          | 0.034 | 0.033 | 0.035 | 0.026 | 0.031 |
| Bulgaria         | 0.008 | 0.043 | 0.027 | 0.032 | 0.017 |
| Czech Republic   | 0.038 | 0.054 | 0.015 | 0.028 | 0.029 |
| Denmark          | 0.022 | 0.009 | 0.026 | 0.041 | 0.034 |
| Spain            | 0.032 | 0.023 | 0.028 | 0.017 | 0.031 |
| Estonia          | 0.044 | 0.034 | 0.017 | 0.041 | 0.029 |
| Finland          | 0.014 | 0.011 | 0.033 | 0.018 | 0.036 |
| France           | 0.038 | 0.029 | 0.032 | 0.037 | 0.043 |
| Greece           | 0.015 | 0.043 | 0.015 | 0.023 | 0.008 |
| Hungary          | 0.023 | 0.047 | 0.013 | 0.034 | 0.029 |
| Ireland          | 0.014 | 0.035 | 0.035 | 0.032 | 0.040 |
| Iceland          | 0.007 | 0.012 | 0.019 | 0.043 | 0.041 |
| Italy            | 0.044 | 0.035 | 0.016 | 0.022 | 0.025 |
| Lithuania        | 0.015 | 0.046 | 0.003 | 0.034 | 0.023 |
| Luxembourg       | 0.031 | 0.051 | 0.021 | 0.055 | 0.031 |
| Netherlands      | 0.033 | 0.031 | 0.039 | 0.028 | 0.026 |
| Poland           | 0.013 | 0.061 | 0.018 | 0.032 | 0.019 |
| Portugal         | 0.021 | 0.070 | 0.007 | 0.037 | 0.010 |
| Slovak Republic  | 0.032 | 0.036 | 0.022 | 0.025 | 0.018 |
| Slovenia         | 0.032 | 0.045 | 0.025 | 0.045 | 0.018 |
| Sweden           | 0.029 | 0.032 | 0.015 | 0.015 | 0.018 |
| Total / Mean     | 0.025 | 0.037 | 0.021 | 0.031 | 0.026 |

$p < 0.01$ IC008Q03TA Using email. IC008Q07NA Playing online games via social networks (e.g., <Farmville®>, <The Sims Social>). IC008Q10TA Obtaining practical information from the Internet (e.g., locations, dates of events). IC008Q12TA Uploading your own created contents for sharing (e.g., music, poetry, videos, computer programs). IC008Q13NA Downloading new apps on a mobile device.

5. Discussion

The results of this investigation show that intensive use of technology, when exceeding 15 points in the “SumIC001” variable (possession and use of digital devices and technology at home) has a negative impact on the results for reading performance of all students in the 21 OECD countries analyzed in PISA. The PISA 2009 survey also indicated that excessive use of digital devices correlated negatively to results for reading performance [43]. This supports other results that show that the students who most use technologies score worse for reading, according to PISA [44–47]. This coincides with other studies that state that the use of technology in itself does not improve academic outcomes [48]. Other researchers have related intensive technology use among adolescents to poor academic results and personal and family problems, and even low physical performance [1,32,49]. Studies that have analyzed the influence of the use of technology on students’ competence in subjects like maths show that intensive contact with digital devices undermines academic performance [36,50,51].

In contrast, this negative effect on reading competence is reversed if technology is used in moderation (those students whose scores do not exceed 15 points in the “SumIC001” variable); they also have better results than students who never use digital devices outside school. The positive effect of the judicious use of technology has also been documented in other studies, such as Leino [8], which showed that restrained use of technology can boost reading competence, especially among male students. A possible explanation for this could be that surfing Internet requires reading online texts, and those students who rarely pick up a printed book do their reading indirectly when Net surfing. Our findings, that moderate use of technology impacts positively on reading performance, better than those students who do not use digital devices at all, also fit with other studies that have shown that confidence in handling ICT reflects positively on students’ reading capacity.

The results of our investigation show that intensive use of digital devices during the week to perform non-academic activities such as “playing online games via social networks” and “uploading your own created contents for sharing (e.g., music, poetry, videos and computer programs)” is
prejudicial for students’ reading competence, as measured by PISA. This negative effect on the reading performance and social lives of students who are heavily involved in social networking has also been identified in other studies [34,36,52]. The negative effect of online social networking has been demonstrated in students’ study habits and ability to develop tasks [53]. The OECD itself [3] has indicated that when students spend more than six hours a day online, they begin to show signs of isolation, tend to arrive late at school, or fail to turn up altogether. This could be due to that fact that the development of competences and learning requires a close teacher–student relationship that a student’s intensive technology use inhibits. Results from the “Second International Adult Literacy Survey (SIALS)” in Finland also show that users of ICT who are active and versatile make for better and more active readers [17].

If the student is educated to use technologies in a suitable and productive way, this can increase their capacity to capture the main ideas and arguments put forward in a written text [54,55]. Several studies confirm that the positive effect of technology use on reading performance is conditioned by how digital devices are used [36,44,46,56,57] and where the type of activity carried out with a computer or digital device has the most impact [36,44,46,56,57]. It seems that the use of educational software has a negative influence on students’ reading competence [44,47]. In contrast, moderate technology use for activities such as searching for information, reading and writing emails, and reading news online has a curvilinear relation to the results for digital reading, proving that users who make sensible and specific use of technology score better than those who spend hours surfing the Net [43].

In the context of Latin American and reading in the Spanish language, evidence that technology use improved academic results in general was not demonstrated (for example, in Colombia [58]). Teachers in Peru stated that the influence of technology use on digital reading competence existed, according to the activities carried out online. Net surfing for leisure and the use of email correlated to greater digital reading competence, whereas group gaming impacted negatively [59]. It is also important to take into account that the results of the influence of technology on students’ reading performance are conditioned, first by the fact that those students who read most away from Internet are the ones who score highest in reading (i.e., higher than those who use technology moderately) [3]. It seems clear that the intensive use of technology does not help students improve their reading competence, especially if the reading in question consists of the more traditional printed material. Empowering students to read better requires applying activities in which critical judgement, text interpretation, and analysis play a key role in enabling them to understand what they are reading and to analyze the arguments put forward, activities that should encompass discursive strategies of pragmatic interpretation such as irony, double meanings, etc. There is also a need for didactic strategies to encourage reading both inside and outside the classroom, with the understanding that the use of technology in itself does not substantially improve students’ reading skills [33].

6. Conclusions

The most significant contribution of this investigation is a methodological procedure for determining the extent to which the use of technology can have a negative impact on students’ performance in reading. We have coded two variables from the PISA 2015 [3] study (IC001, IC008) that ask students which type of digital device they used at home and what they used it for. The results for all the OECD countries analysed showed that a score of more than 14.5 for use of technology meant that all correlations were significant and negative, and the students’ reading scores fell drastically. “Playing online games via social networks” and “uploading your own created contents for sharing (e.g., music, poetry, videos, computer programs)” were the activities that had an adverse effect on students’ reading skills when done a daily basis.

This negative influence of the use of technology outside school has been documented in earlier studies [44–47], but no study had set out to establish the point at which the use of technology begins to have a damaging effect on the reading competence of students in the PISA area. The type of activities that students undertake with technology has a significant influence on reading performance;
for example, the use of technology for educational purposes, such as searching for information on the Net, and the reading and writing of emails, have been shown to have a positive effect on digital reading competence. Therefore, a way forward could be teachers and families guiding students in their use of technology outside the classroom, and the students themselves committing to using digital devices online less for play and more for learning [60]. The school should be a place where students are educated in the critical and responsible use of technology, thereby avoiding the dangers of exposure to material unsuitable for their age. The school should also instruct families on their children’s responsible use of technology, by making parents aware that unsupervised use of digital devices can lead to psychological damage as a result of online harassment, addiction, poor educational performance, absenteeism and abandonment of studies, as well as sleep and avoidant personality disorders [61–66].

The results also suggest that the relation between students, digital devices, and learning is neither clear nor direct; it requires an intervention that is clearly didactic, that recognizes that technology in itself, far from implying an improvement in students’ academic results, can hinder academic achievement and make it difficult for students to acquire and perfect competences as important as reading. The educational policies implemented in OECD countries that insist on investing considerable sums in computer equipment and digital resources should justify that expense beforehand by investigating whether it guarantees a clear improvement in academic performance and attitude in students in primary and secondary education. Rigorous research is, therefore, needed to determine how and why technology is to be used inside and outside the classroom in terms of efficacy and academic outcomes.

Furthermore, it would be advisable to reflect on and analyze, whether incorporating 21st-century technologies into pedagogical and didactic models framed in the previous century has a negative rather than a positive effect on students. It is essential to consider whether teacher training should be the key to integrating technology into the classroom before providing students with digital devices, without a clearly established educational plan and without knowing how technology links to and integrates with, the various subjects in the overall curriculum. These approaches will also have profound consequences on the digital reading and writing and digital competences of future University students [67,68]. It would be desirable to build on International Reading Association [42] proposals by boosting teacher training to integrate technology effectively in the development of reading, as well assessing and disseminating the most effective practices to promote reading and writing with digital media, in order to ensure that access to technology is equal and non-discriminatory for all students.

Finally, in line with Goal 4 (Sustainable Development Goals): Quality education. Affordable, reliable and context-sensitive digital education, can promote equal opportunities for girls and boys and reduce inequalities by ensuring every child has access to high quality content. Digital education technologies improves fundamental skills such as collaboration, problem solving and global awareness. It can easily connect boys and girls from different parts of the world with the possibility of sharing their content with peers living kilometres away. Equally important, learning technology can open future job opportunities [69]. So the didactics approaches inside and outside the classroom have to ensure a sustainable use of digital devices in order to foster inclusive and equitable quality education and promote lifelong learning opportunities for all.

Author Contributions: Conceptualization, E.V.-C. and A.I.-M.; methodology, J.G.-G. and E.L.-M.; validation, J.G.-G. and E.L.-M.; formal analysis, J.G.-G. and E.L.-M.; investigation, E.V.-C., J.G.-G., A.I.-M., and E.L.-M.; data curation, E.V.-C., J.G.-G., A.I.-M. and E.L.-M.; writing—original draft preparation, E.V.-C., J.G.-G., A.I.-M., and E.L.-M.; writing—review and editing, E.V.-C. and A.I.-M.; supervision, E.V.-C. and A.I.-M. All authors have read and agreed to the published version of the manuscript.

Funding: This research has been developed with the support of the I+D+I Project entitled: “Gamification and ubiquitous learning in Primary Education. Development of a map of teaching, learning, and parental competences and resources “GAUBI” (RTI2018-099764-B-100) (MICINN/FEDER) financed by FEDER (the European Regional Development Fund) and the Ministry of Science, Innovation and Universities of Spain.

Conflicts of Interest: The authors declare no conflict of interest.
Appendix A

Table A. IC001 Are any of these devices available for you to use at home?
(Please select one response in each row.)
Yes, and I use it/Yes, but I don’t use it/No
IC001Q01TA Desktop computer
IC001Q02TA Portable laptop, or notebook
IC001Q03TA Tablet computer (e.g., <iPad®>, <BlackBerry® PlayBookTM>)
IC001Q04TA Internet connection
IC001Q05TA Video games console, e.g., <Sony® PlayStation®>
IC001Q06TA Cell phone (without Internet access)
IC001Q07TA Cell phone (with Internet access)
IC001Q08TA Portable music player (Mp3/Mp4 player, iPod® or similar)
IC001Q09TA Printer
IC001Q10TA USB (memory) stick
IC001Q11TA Ebook reader, e.g., <Amazon® KindleTM>

Table B. IC008. How often do you use digital devices for the following activities outside of school?
(Please select one response in each row.)
Never or hardly ever/Once or twice a month/Once or twice a week/Almost every day/Every day
IC008Q01TA Playing one-player games
IC008Q02TA Playing collaborative online games
IC008Q03TA Using email
IC008Q04TA Chatting online (e.g., <MSN®>)
IC008Q05TA Participating in social networks (e.g., <Facebook>, <MySpace>)
IC008Q07NA Playing online games via social networks (e.g., <Farmville®>, <The Sims Social>)
IC008Q08TA Browsing the Internet for fun (such as watching videos, e.g., <YouTube™>)
IC008Q09TA Reading news on the Internet (e.g., current affairs)
IC008Q10TA Obtaining practical information from the Internet (e.g., locations, dates of events)
IC008Q11TA Downloading music, films, games or software from the internet
IC008Q12TA Uploading your own created contents for sharing (e.g., music, poetry, videos, computer programs)
IC008Q13NA Downloading new apps on a mobile device

References
1. Corder, K.; Sharp, S.J.; Atkin, A.J.; Griffin, S.J.; Jones, A.P.; Ekelund, U.; Van Sluijs, E.M.F. Change in objectively measured physical activity during the transition to adolescence. *Br. J. Sports Med.* 2015, 49, 730–736. [CrossRef] [PubMed]
2. OECD. *The Protection of Children Online, Recommendation of the OECD Council;* OECD Publishing: Paris, France, 2012.
3. OECD. *Students, Computers and Learning: Making the Connection, PISA;* OECD Publishing: Paris, France, 2015.
4. Ravizza, S.M.; Uitvlugt, M.G.; Fenn, K.M. Logged In and Zoned Out: How Laptop Internet Use Relates to Classroom Learning. *Psychol. Sci.* 2017, 28, 1–10. [CrossRef] [PubMed]
5. Cope, B.; Kalantzis, M. *Multiliteracies-Literacy Learning and the Design of Social Futures;* Routledge: London, UK, 2000.
6. Gilster, P. *Digital Literacy;* Wiley and Sons: New York, NY, USA, 1997.
7. Gómez Galán, J. Educational Research and Teaching Strategies in the Digital Society: A Critical View. In *European Innovations in Education: Research Models and Teaching Applications;* López Meneses, E., Sirignano, F., Reyes, M., Cunzio, M., Gómez Galán, J., Eds.; AFOE: Seville, Spain, 2017; pp. 105–119.
8. Leino, K. The Relationship between ICT Use and Reading Literacy: Focus on 15-Year-Old Finnish Students in PISA Studies. Ph.D. Thesis, 2014. (Unpublished doctoral dissertation).
9. Reinking, D.; McKenna, M.C.; Labbo, L.D.; Kieffer, R.F. *Handbook of Literacy and Technology: Transformations in a Post-Typographic World*; Erlbaum: Mahwah, NJ, USA, 1998.

10. Cain, N.; Gradisar, M. Electronic media use and sleep in school-aged children and adolescents: A review. *Sleep Med.* 2010, 11, 735–742. [CrossRef] [PubMed]

11. Hysing, M.; Pallesen, S.; Stormark, K.M.; Jakobsen, R.; Lundervold, A.J.; Sivertsen, B. Sleep and use of electronic devices in adolescence: Results from a large population-based study. *BMJ Open* 2015, 5, 1–8. [CrossRef] [PubMed]

12. Melkevik, O.; Torsheim, T.; Iannotti, R.J.; Wold, B. Is spending time in screen-based sedentary behaviors associated with less physical activity: A cross national investigation. *Int. J. Behav. Nutr. Phys. Act.* 2010, 7, 46. [CrossRef] [PubMed]

13. Richards, R.; McGee, R.; Williams, S.M.; Welch, D.; Hancox, R.J. Adolescent screen time and attachment to parents and peers. *Arch.Pediatrics Adolesc. Med.* 2010, 164, 258–262. [CrossRef]

14. House of Commons Health Committee. *HC 342-Children’s and Adolescents; Mental Health and CAMHS*, The Stationery Office: London, UK, 2014.

15. Council on Communications and Media. *Readers, adolescents, and the media*. *Pediatrics* 2013, 132, 958–961. [CrossRef]

16. Population Health Division. *Australia’s Physical Activity and Sedentary Behaviour Guidelines* (Australian Government Department of Health). Available online: www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#apa1317 (accessed on 15 September 2019).

17. Linnakylä, P. Reading literacy in a society of knowledge and learning. In *Language, Discourse and Community*; Sajavaara, K., Pirainen, A., Eds.; Soveltavankielentutkimuskeskus: Jyväskylä, Finland, 2000; pp. 107–132.

18. OECD. *Measuring Student Knowledge and Skills: A New Framework for Assessment;* Organisation for Economic Co-Operation and Development: Paris, France, 1999.

19. Sulkunen, S. PISAn tekstit opetussuunnitelman näkökulmasta. In *Tulevaisuuden Lukijat. Suomalaisten nuorten lukutaito*. Linnakylä, T., Sulkunen, S., Arffman, I., Eds.; University of Jyväskylä, Institute for Educational Research: Jyväskylä, Finland, 2004; pp. 23–48.

20. Sulkunen, P.; Sulkunen, S. Millainen on suomalaisten nuorten lukutaito. In *Tulevaisuuden Luenutaja*. *PISA 2000 Suomessa*; Va’lija’rvi, J., Linnakylä, P., Eds.; OECD and Opetushallitus: Jyväskylä, Finland, 2002; pp. 9–39.

21. Barton, D. *Literacy: An Introduction to the Ecology of Written Language*; Blackwell Publishers: Oxford, UK, 1994.

22. Tyner, K. *Literacy in a Digital World: Teaching and Learning in the Age of Information*; Erlbaum: Mahwah, NJ, USA, 1998.

23. Vázquez-Cano, E.; Mengual-Andrés, S.; Roig-Vila, R. Análisis lexicométrico de la especificidad de la escritura digital del adolescente en Whastapp. *Rev. De Lingüística Teórica Y Apl.* 2015, 53, 83–105. [CrossRef]

24. Chen, Y.-F.; Peng, S.S. University students’ internet use and its relationships with academic performance, interpersonal relationships, psychosocial adjustment, and self-valuation. *Cyberpsychol. Behav. Soc. Interact.* 2008, 11, 467–469. [CrossRef]

25. Mallan, K.; Foth, M.; Greenaway, R.; Young, G.T. Serious playground: Using Second Life to engage high school students in urban planning. *Learn. Media Technol.* 2010, 35, 203–225. [CrossRef]

26. Hakoama, M.; Hakoyama, S. The impact of cell phone use on social networking and development among college students. *Am. Assoc. Behav. Soc. Sci. J.* 2011, 15, 1–20.

27. Shelton, J.T.; Elliott, E.M.; Lynn, S.D.; Exner, A.L. The Distracting Effects of a Ringing Cell Phone: An Investigation of the Laboratory and the Classroom Setting. *J. Environ. Psychol.* 2009, 29, 513–521. [CrossRef] [PubMed]

28. Birke, S. *The Gutenberg Elegies: The Fate of Reading in an Electronic Age*; Faber and Faber: London, UK, 1996.

29. Nunnberg, G. *The Future of the Book*; University of California Press: Berkeley, CA, USA, 1996.

30. Vázquez-Cano, E. Mobile learning with Twitter to improve linguistic competence at Secondary Schools. *New Educ. Rev.* 2012, 29, 134–147.

31. Herkman, J.; Vainikka, E. *Uudet Lukemisyhteisöt, Uudet Lukutavat*; Tampereen Yliopisto: Tampere, Finland, 2012.

32. Alvermann, D.E. Reading adolescents’ reading identities: Looking back to see ahead. *J. Adolesc. Adult Lit.* 2001, 44, 676–690.

33. Gómez Galán, J. New perspectives on integrating social networking and internet communications in the curriculum. *Elearning Pap.* 2011, 26, 1–7.
34. Uusitalo, N.; Vehmas, S.; Kupiainen, R. Naamattisten Verkossa. Lasten Ja Nuorten Mediaympäristön Muutos, Osa 2; University of Tampere: Tampere, Finland, 2011.

35. Lenhart, A.; Purcell, K.; Smith, A.; Zickuhr, K. Social Media & Mobile Internet Use among Teens and Young Adults; Millennials; Pew Internet & American Life Project: Washington, DC, USA, 2010.

36. Fuchs, T.; Woessmann, L. Computers and Student Learning: Bivariate and Multivariate Evidence on the Availability and Use of Computers at Home and at School; CESifo Working Paper: Munich, Germany, 2004.

37. Gumus, S.; Atalmis, E. Exploring the relationship between purpose of computer usage and reading skills of Turkish students: Evidence from PISA 2006. Turk. Online J. Educ. Technol. 2011, 10, 129–140. [CrossRef]

38. Moran, J.; Ferdig, R.E.; Pearson, P.D.; Wardrop, J.; Blomeyer, R.L. Technology and reading performance in the middle-school grades: A meta-analysis with recommendations for policy and practice. J. Lit. Res. 2008, 40, 6–58. [CrossRef]

39. Thompson, S.; De Bortoli, L. PISA 2003 Australia: ICT Use Familiarity at School and Home; ACEReSearch: Queensland, Australia, 2007.

40. Reinking, D. Multimedia and engaged reading in a digital world. In Creating a World of Engaged Readers; Verhoeven, L., Snow, C., Eds.; Erlbaum: Mawhah, NJ, USA, 2003; pp. 195–221.

41. Holum, A.; Gahala, M.A. Critical Issue: Using Technology to Enhance Literacy Instruction; North Central Regional Educational Laboratory, Learning Point Associates: Naperville, IL, USA, 2001.

42. Association International Reading Association. What Is Evidence-Based Reading Instruction? International Reading Association: Newark, DE, USA, 2002.

43. OECD. PISA 2009 Results: Students on Line—Digital Technologies and Performance; OECD: Paris, France, 2011.

44. Leino, K. Computer usage and reading literacy. In Well Prepared for the Future. PISA 2000 in Finland, Välijärvi, J., Linnakylä, P., Eds.; Kouluutuksen tutkimuslaitos: Jyväskylä, Finland, 2002; pp. 167–180. (In Finnish)

45. OECD. Knowledge and Skills for life. First Results from PISA 2000; OECD: Paris, France, 2001.

46. OECD. Are Students Ready for a Technology-Rich World? What PISA Studies Tell Us; OECD: Paris, France, 2006.

47. Sweet, R.; Meates, A. ICT and low achievers: What does PISA tell us? In Promoting Equity Through ICT in Education: Projects, Problems, Prospects; Karpati, A., Ed.; Hungarian Ministry of Education and OECD: Budapest, Hungary, 2004; pp. 1–42.

48. Kramarski, B.; Feldman, Y. Internet in the Classroom: Effects on Reading Comprehension, Motivation and Metacognitive Awareness. Educ. Media Int. 2000, 37, 149–155. [CrossRef]

49. Park, S.; Kang, M.; Kim, E. Social relationship on problematic Internet use (PIU) among adolescents in South Korea: A moderated mediation model of self-esteem and self-control. Comput. Hum. Behav. 2014, 38, 349–357. [CrossRef]

50. Leino, K. Use of information technology. In A High Standard of Learning. PISA 2003 in Finland; Kupari, P., Välijärvi, J., Eds.; University of Jyväskylä, Institute for Educational Research: Jyväskylä, Finland, 2005; pp. 173–182.

51. Wenglinsky, H. Does It Compute? The Relationship between Educational Technology and Student Achievement in Mathematics; Educational Testing Service: Princeton, NJ, USA, 1998.

52. Kabre, F.; Brown, U.J. The influence of Facebook usage on the academic performance and the quality of life of college students. J. Media Commun. Stud. 2011, 3, 144–150.

53. Flad, K. The Influence of Social Networking Participation on Student Academic Performance Across Gender Lines. Master’s Thesis, Master of Science in Education (MSEd), The College at Brockport, New York, NY, USA, 2010.

54. Hobbs, R.; Frost, R. Instructional practices in media literacy education and their impact on students’ learning. Atl. J. Communn. 1998, 6, 123–148. [CrossRef]

55. Leu, D.J.; McVerry, J.G.; O’Byrne, W.J.; Zawilinski, L.; Castek, J.; Hartman, D.K. The new literacies of online reading comprehension and the irony of No Child Left Behind: Students who require our assistance the most, actually receive it the least. In Handbook of Research on Literacy Instruction: Issues of Diversity, Policy, and Equity; Morrow, L.M., Rueda, R., Lapp, D., Eds.; Guilford: New York, NY, USA, 2009; pp. 173–194.

56. Bussiere, P.; Gluszynski, T. The Impact of Computer Use on Reading Achievement of 15-Year-Olds: Final Report; Learning Policy Directorate, Strategic Policy and Planning, Human Resources and Skills Development: Gatineau, QC, Canada, 2004.

57. De la Serna-Tuya, A.S.; González-Calleros, J.M.; Navarro, Y. Las Tecnológicas de Información y Comunicación en el preescolar: Una revisión bibliográfica. Campus Virtuales 2018, 7, 19–31.
58. Barrera-Osorio, F.; Linden, L.L. The Use and Misuse of Computers in Education: Evidence from a Randomized Experiment in Colombia; World Bank Policy Research Working Paper Series; World Bank: Washington, DC, USA, 2009.

59. Beuermann, D.W.; Cristia, J.; Cueto, S.; Malamud, O.; Cruz-Aguayo, Y. One laptop per child at home: Short-term impacts from a randomized experiment in Peru. Am. Econ. J. Appl. Econ. 2015, 7, 53–80. [CrossRef]

60. Infante-Moro, A.; Infante-Moro, J.; Gallardo-Pérez, J. The Importance of ICTs for Students as a Competence for their Future Professional Performance: The Case of the Faculty of Business Studies and Tourism of the University of Huelva. J. New Approaches Educ. Res. 2019, 8, 201–213. [CrossRef]

61. Sevillano, M.L.; Vázquez-Cano, E. The impact of digital mobile devices in Higher Education. Educ. Technol. Soc. 2015, 18, 106–118.

62. Fombona Cadavieco, J.; Vázquez-Cano, E. Possibilities of using geolocation and augmented reality in education. Educ. XXI 2017, 20, 319–342. [CrossRef]

63. Sayans-Jiménez, P.; Vázquez-Cano, E.; Bernal-Bravo, C. Influence of family wealth on student reading performance in PISA. Rev. Educ. 2018, 380, 129–155. [CrossRef]

64. Vázquez-Cano, E. Teachers’ difficulties to plan, coordinate and evaluate key competencies. An analysis from the education inspection. Rev. Complut. Educ. 2016, 27, 1061–1083. [CrossRef]

65. Ruiz-Terroba, R.; Vázquez-Cano, E.; Sevillano-García, M.L. The rubric of evaluation of the competence in written expression. Perception of the students about its functionality. OcNOS 2017, 16, 106–117. [CrossRef]

66. Vázquez-Cano, E. Analysis of Difficulties of Spanish Teachers to Improve Students’ Digital Reading Competence. A Case Study within the PISA Framework. Pedagogika 2017, 125, 175–194. [CrossRef]

67. Vázquez-Cano, E. Mobile Distance learning with Smartphones and Apps in Higher Education. Educ. Sci. Theory Pract. 2014, 14, 1–16. [CrossRef]

68. Vázquez-Cano, E.; Holgueras, A.I.; Sáez-López, J.M. An analysis of the orthographic error found in university students’ asynchronous digital writing. J. Comput. High. Educ. 2018, 31, 1–20. [CrossRef]

69. Sustainable Development Goals Fund. Goal 4: Quality Education. Available online: https://www.sdgfund.org/goal-4-quality-education (accessed on 4 January 2020).

© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).