# Computer Literacy of Adolescents in Grades 9 to 12: An Exploratory Study

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**Abstract**

This study conducted with 84 students in a small Christian high school examined gender differences in computer literacy skills. Males in general outperformed females. Recommendations for practice are included.

**Keywords:** Computer literacy, adolescents

## 1.1 Introduction

This study investigated potential gender differences in computer literacy among high school students. Several studies have been conducted on this topic before; however, none that we could locate specifically examines this issue in small private Christian high schools. Newburger (2000) reported on a study by the US Census Department, where males apparently spent more time (hours) on their home computers than females. Boys largely used the computer for recreational purposes. High school males also employed the computer more at school than females, suggesting that boys tend to use computers for academic aims more than adolescent girls.

More recently, in 2003, McBell of the US Department of Education studied the rates of computer use by children up to 12th grade, reporting that 91% of each gender used the computer on a consistent basis and at about the same rate. The report failed to discuss which gender spent more time on different computer applications, nor did it examine computer literacy issues between genders.

## 2.1 Method

### 2.2 Research Hypotheses

Essentially previous research suggested that there will be a statistically significant difference in overall computer literacy scores between male and female high school students. Significant differences will also be found between boys and girls on various subdimensions of the computer literacy survey.

### 2.2 Design and Participants

A survey research method was used to test these suppositions using intact groups of $9^{th}$ ($n$ = 27), $10^{th}$ ($n$ = 22), $11^{th}$ ($n$ = 20), and $12^{th}$-graders ($n$ = 15) in a single small private faith-based high school ($N$ = 104) in a suburban area of Seattle, WA. About 81% ($N_{valid}$ = 84; 43 females; age range 14-19) of the entire school population completed the survey. Gender frequency for each grade was largely similar.

### 2.3 Instrumentation

A researcher-constructed 21-item "fill in the blank" computer literacy measure was designed to test six key dimensions of adolescent school and home computer skill sets (word processing, Internet knowledge, instant messaging[IM]/email use, downloading music, gaming, and computer programming). We assumed based on anecdotal evidence that these areas would best discriminate between different male and female computer literacy skill levels. Participants answered items which were arranged into four sections: (1) basic demographic information; (2) general computer usage; (3) 5-point Likert-scale (1 *very limited skills* to 5 *very strong skills*) items asking for estimates of computer skill level in each of six areas above; and (4) the 21 computer literacy test items.

Each of the computer literacy skill dimensions (i.e., six specific areas and one general skill dimension) were comprised of one simple (s), intermediate (i), and difficult (d) question. A correct answer was allotted 2 points, 1 point for a partially correct response, and 0 points for an incorrect answer. Each intermediate and difficult item was then weighted as follows: i = raw score X 2 pts and d = raw score X 3 pts. For instance, a correct answer on a simple question received a score of 2 and a correct answer on a difficult question would receive 6 points ($2_{[raw\ score]}$ x $3_{[weighting]} = 6$). Weighted scores on each dimension could range from 0 to 12. Thus, students received a total (General Computer Literacy) score and 6 dimension scores. An earlier version of the instrument was piloted with a random sample of six junior high school students and five high school teachers, including the instructor for the computer lab.

### 2.4 Data Collection Procedures

Tests were largely individually administered to participants by one of three trained student researchers. About 10 of the surveys were group-administered in the computer lab or in the library/study hall room. Most students required 5 to 10 minutes to complete the test.

### 3. 1 Results

To determine students' current patterns of computer usage, background questions were asked. All respondents possessed a home computer. The majority of students ($n$ = 74, 88%) used their home computer most frequently (10 used school computers most often). Section 2 asked respondents to estimate how much time they spent in each of the six skill areas by rank ordering which of the six areas they used from the greatest (1) to the least amount of time (6). Not surprisingly, for males and females combined, those dimensions marked *most often* used, Internet was ranked first ($n$ = 45), instant messenger/email second ($n$ = 17), word processing third ($n$ = 3), gaming fourth ($n$ = 8), downloading music fifth ($n$ = 1), and programming sixth ($n$ = 0). Some gender specific rankings were found. For example, girls reported that they did more music downloading than boys. Frequency counts further suggested that boys and girls are relatively similar in their Internet use, emailing/instant messaging, gaming, and programming. Both genders do minimal programming.

Items from section 3 asked for students' perceptions of their skill level in word processing, Internet use, instant messenger/emailing, downloading music, gaming, programming, and general computer literacy. By aggregating male and female rankings across grade levels a common trend was found: overall students were most confident in their instant messaging and emailing skills, followed by Internet usage, word processing, gaming, general skills, and finally, programming. Gender specific frequency analyses of computer skill levels indicated that males in general were more confident than females. The latter group rated themselves as possessing *very strong skills* more frequently than females in these skill areas: Internet, downloading music, gaming, and general computer literacy. Girls and boys indicated similar levels of emailing/instant messaging proficiencies. Not unexpectedly, no students reported that programming was a very strong skill area.

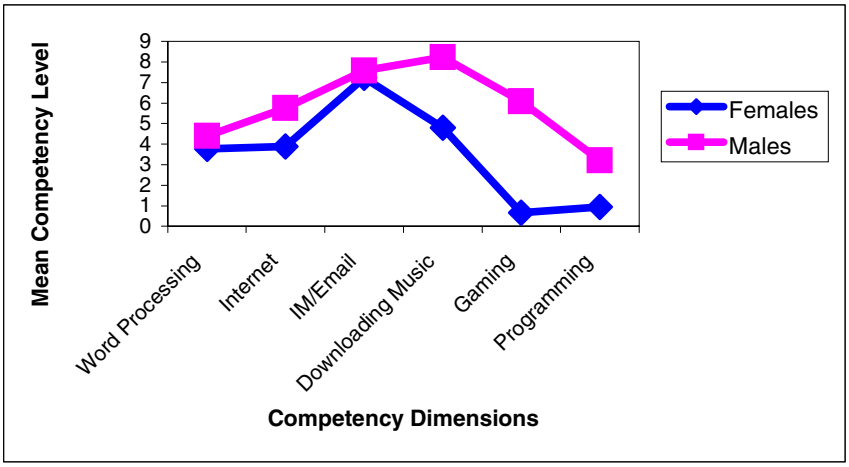
Descriptive statistics calculated for each computer literacy survey dimension are summarized below in Table 1 and on the line graph (see Figure 2). Clear gender differences are evident, especially for downloading music, gaming, and programming. Because of the unreliability of the general skills dimension, it was dropped from subsequent analyses. Overall, the questions designated as "simple" ones were almost universally correct, while the difficult questions were largely incorrect. This observation provided further evidence that weighting item responses was needed

Table 1: Descriptive Statistics and T-Tests Results for Computer Literacy Survey Dimensions

| **Survey Areas** | **Word Processing** | | **Internet Use** | | **IM/ Emailing** | | **Downloading Music**** | | **Gaming**** | | **Programming **** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | M | F | M | F | M | F | M | F | M | F | M | F |
| ***Mean*** | 4.41 | 3.76 | 5.77 | 3.88 | 7.59 | 7.24 | 8.23 | 4.81 | 6.08 | 0.67 | 3.21 | 0.95 |
| ***SD*** | 3.03 | 3.12 | 3.80 | 3.64 | 4.17 | 4.32 | 3.62 | 3.45 | 4.65 | 1.86 | 3.77 | 1.65 |

*Note*. ** $p < .001$. M = Male, F = Female; t-tests (two-tailed) were computed for each of these six dimensions with the alpha levels ($p < .008$) corrected for possible Type I error using the Bonferroni method.

Figure 1: Descriptive Statistics Plotted by Gender



To examine whether these differences were statistically significant, six t-tests (two-tailed) were computed using the formula that assumes unequal variances. The family-wise alpha level was adjusted using the Bonferroni method from .05 to .008 in an attempt to correct for possible Type I errors. Significant gender differences favoring males were found for these dimensions: downloading music, $t(82) = 4.23$, $p < .001$, Cohen's $d = .99$; gaming, $t(82) = 7.01$, $p < .001$, Cohen's $d = 1.53$; and programming, $t(82) = 3.54$, $p < .001$, Cohen's $d = 0.82$.

Results from the correlational analyses by gender are presented in Table 2. Correlations near zero were nonsignificant; otherwise most correlations were positive in direction and statistically significant ($p < .05$). Male students more than female respondents who appear to be knowledgeable at one area tend be proficient in one or other dimensions. Data derived from the male sample generally produced higher correlations

### 4.1 Discussion and Concluding Remarks

The supposition underlying this research project was that high school male students (ages ranged from 14 to 19) would have higher computer literacy scores than their female peers. The results presented above suggest that this hypothesis was substantiated. The boys had on average higher scores across each of the computer literacy categories. This trend was especially evident in the programming category, which was the most difficult, as well in the gaming and downloading music dimensions. The findings here support earlier gender-related computer research conducted in other educational settings, where girls seem to lag behind boys in certain computer skills (McBell, 2003; Newburger, 2000). Moreover, the results tentatively suggest that adolescent females do not explore the full range of computer applications as much as males seem to do.

In conclusion, the findings provide evidence that the computer classes at this particular high school should concentrate more on improving the computer literacy skill base of students, especially female learners. In a critical skill area, female programming scores were significantly lower than the male scores. However, both groups would benefit from further instruction and practical experience in this subject matter. In order to better prepare for college-level technology courses and demands, the school might consider offering higher-level computer courses and teach students helpful tips and shortcuts for better computer fluency (Stone, Hoffman, Madigan, & Vance, 2006). Limitations inherent in this causal comparative study with intact groups diminish the generalizability of its findings.

### References

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Table 2: Intercorrelation Matrix Among Computer Literacy Survey Dimensions

| Literacy Survey Dimensions | Word Processing | | Internet | | IM/Email | | Downloading Music | | Gaming | | Programming | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F |
| Word Processing | -- | -- | .05 | -.04 | .53 | .41 | .42 | .19 | .68 | -.08 | .39 | .28 |
| Internet | | | -- | -- | .57 | .14 | .62 | .36 | .67 | .53 | .48 | .19 |
| IM/Email | | | | | -- | -- | .42 | .18 | .42 | .11 | .32 | .02 |
| Downloading Music | | | | | | | -- | -- | .63 | -.04 | .46 | .09 |
| Gaming | | | | | | | | | -- | -- | .49 | .23 |
| Programming | | | | | | | | | | | -- | -- |

*Note*. For non-zero *r*s, $p < .05$; IM = instant messaging; M = Male, F = Female.