

# Gender Differences in Personal Financial Literacy Among College Students

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## Abstract

Surveying financial literacy among college students, we find that women generally have less knowledge about personal finance topics. Gender differences remain statistically significant after controlling for other factors such as participants' majors, class rank, work experience, and age. We do find, however, that education and experience can have a significant impact on the financial literacy of both men and women. We observe that women generally have less enthusiasm for, lower confidence in, and less willingness to learn about personal finance topics than men do. College women (men) rate English and humanity (Mathematics and science) courses more important. We argue that the study paves the way for future research and has important policy implications given the women tend to outlive men. © 2002 Academy of Financial Services. All rights reserved.

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## 1. Introduction

Prior studies have found that Americans have little knowledge about personal finance and consequently have managed their finances poorly. One of the acute problems found in these studies is that women know less about financial management than men (Harris/Scholastic

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Research, 1993; Volpe et al., 1996; Goldsmith & Goldsmith, 1997a, b; Chen & Volpe, 1998). In comparison to men, women share a larger burden of raising families, start to work later and earn less during their careers, live longer, have inadequate pension or survivors' benefits, and face more challenges in financial management (Alcon, 1999; Anthes & Most, 2000; Timmermann, 2000). Recent studies have also found that women are less risk seeking than men (Bajtelsmit & Bernasek, 1996; Powell and Ansic, 1997; Bajtelsmit et al., 1999). Risk averse behavior of women in their retirement planning will likely result in significantly lower pension wealth than men. This issue of women and their money management has been widely discussed in the media (Martinez, 1994; Genasci, 1995; Lewin, 1995; Pasher 1996). Recently, Hira and Mugenda (2000) reported that women are more likely to be dissatisfied with their finances than men. A woman's concerns about her personal finances are more likely to affect her work performance.

While previous studies suggest that in general women know less about personal finance than men, they have provided limited evidence of the areas of personal finance where women's knowledge is inadequate (Volpe et al., 1996; Chen & Volpe, 1998). Danes and Hira (1987) found that males know more about insurance and personal loans, but know less about overall financial management than females. Their findings suggest that men may know more in certain areas of personal finance than women and less in other areas. Furthermore, there is little research on how general education, income, and other factors will affect people's financial literacy (Alcon, 1999). Finally, even if there are real gender differences in financial literacy, we need to analyze why women are less financially literate than men. These important issues have not been thoroughly investigated and warrant further research. One of the weaknesses of the prior studies is that most of them use a convenience sample from a single university (Danes & Hira, 1987; Volpe et al., 1996; Goldsmith & Goldsmith, 1997a, b).

Using a large sample from multiple colleges and universities in various states in the U.S., this study seeks to answer the following questions: Are there differences in financial literacy between men and women? In what areas are the differences, if they exist, most evident? What are the factors that affect men and women's financial literacy? Why are there gender differences in knowledge of personal finance? Since one's knowledge is closely tied with the individual's education, we focus our analysis on people's interest in personal finance issues, sources of personal finance education, and their college education.

## **2. Methodology**

This study uses a comprehensive survey to determine participants' personal finance knowledge in the areas of general knowledge of personal finance, savings and borrowing, insurance, and investments. To cover the domain of the key areas of personal finance, we have thoroughly reviewed related literature and generated hundreds of questions in these areas. We reduced the number of questions because it is not practical to use all of the questions in one survey. The validity and clarity of the survey questions were evaluated by experts knowledgeable in personal finance and improved through pilot studies. The final survey questionnaire includes multiple-choice questions covering the participants' knowledge of personal finance, their opinions about personal finance knowledge, their education,

and other demographic information. The survey instrument is available upon request from the authors.

The responses from each participant are used to calculate the mean percentage of correct scores for each question; each section of General Knowledge, Savings and Borrowing, Insurance, and Investments; and the entire survey. The scores are then analyzed by gender, areas of personal finance as listed in the above-mentioned sections, and categories of scores. The scores are grouped into three categories according to mean percentage of correct scores of all participants of the survey. The first category includes the scores from 0 to 39% (low level of knowledge), the second 40 to 59% (around the average of correct responses, medium level of knowledge), and the third 60 to 100% (relatively high level of knowledge). Analysis of variance is used to determine the differences in personal finance knowledge between male and female participants.

We then analyze how various factors impact participants' level of knowledge in personal finance. The participants are classified into two subgroups using the median percentage of correct answers for each section and the entire survey. Participants with scores higher than the median are classified as those with a relatively high level of knowledge, coded as "1," otherwise a relatively low level of knowledge, coded as "0." This dichotomous variable is then used in logistic regressions as the dependent variable. We first test the gender difference in personal finance using gender and other independent variables. We then conduct logistic regression analyses for male and female participants separately to detect if the independent variables have different effects on their financial literacy.

As suggested in the literature (Danes & Hira, 1987; Volpe et al., 1996; Chen & Volpe, 1998), the independent variables used in this study include participants' academic discipline, class rank, ethnic background, nationality, years of work experience, age, and annual income. The coefficients represent the effect of each subgroup compared with a reference group, which is arbitrarily selected. For example, academic discipline (MAJOR) is coded as "1" if a participant is a non-business major, "0" otherwise. The reference group is business majors. If the logistic coefficient of the variable is negative and statistically significant, then it indicates that compared with business majors, the non-business majors are more likely to be less knowledgeable about personal finance. For class rank (CLASS1 to 4), the reference group is graduate students. For work experience (EXP1 to 4), the reference category is participants with more than six years of work experience. For age (AGE1 to 4), the reference group is participants who are 40 or older. For ethnic background (RACE1 to 4), the reference group is participants with an Asian background. For nationality (NATION), the reference category is U.S. citizens. For family annual income (INCOME1 to 3), the reference group is participants with an annual income of \$50,000 or more. For gender (GENDER), the reference group is female participants.

The logistic model takes on the following functional form:

$$\begin{aligned} \log [p/(1-p)] = & B_0 + B_1(\text{GENDER}) + B_2(\text{MAJOR}) + B_3(\text{CLASS1}) + B_4(\text{CLASS2}) \\ & + B_5(\text{CLASS3}) + B_6(\text{CLASS4}) + B_7(\text{EXP1}) + B_8(\text{EXP2}) + B_9(\text{EXP3}) + B_{10}(\text{EXP4}) \\ & + B_{11}(\text{AGE1}) + B_{12}(\text{AGE2}) + B_{13}(\text{AGE3}) + B_{14}(\text{RACE1}) + B_{15}(\text{RACE2}) \\ & + B_{16}(\text{RACE3}) + B_{17}(\text{RACE4}) + B_{18}(\text{NATION}) + B_{19}(\text{INCOME1}) + B_{20}(\text{INCOME2}) \\ & + B_{21}(\text{INCOME3}) + e_i \end{aligned} \quad (1)$$

where

$p$  = the probability of a participant with relatively more knowledge about personal finance,

GENDER = 1 if a participant is a male, 0 otherwise,

MAJOR = 1 if a participant is a non-business major, 0 otherwise,

CLASS1 = 1 if a participant is a freshman, 0 otherwise,

CLASS2 = 1 if a participant is a sophomore, 0 otherwise.

CLASS3 = 1 if a participant is a junior, 0 otherwise,

CLASS4 = 1 if a participant is a senior, 0 otherwise,

EXP1 = 1 if a participant has no experience, 0 otherwise,

EXP2 = 1 if a participant has more than 0 to less than 2 years of experience, 0 otherwise,

EXP3 = 1 if a participant has 2 to less than 4 years of experience, 0 otherwise,

EXP4 = 1 if a participant has 4 to less than 6 years of experience, 0 otherwise,

AGE1 = 1 if a participant is in the age group of 18 to 22, 0 otherwise,

AGE2 = 1 if a participant is in the age group of 23 to 29, 0 otherwise,

AGE3 = 1 if a participant is in the age group of 30 to 39, 0 otherwise,

RACE1 = 1 if a participant is White, 0 otherwise,

RACE2 = 1 if a participant is Black, 0 otherwise,

RACE3 = 1 if a participant is Hispanic, 0 otherwise,

RACE4 = 1 if a participant is Native American, 0 otherwise,

NATION = 1 if a participant is a citizen of foreign country, 0 otherwise,

INCOME1 = 1 if a participant earns less than \$10,000 annually, 0 otherwise,

INCOME2 = 1 if a participant earns \$10,000 to \$29,999 annually, 0 otherwise, and

INCOME3 = 1 if a participant earns \$30,000 to \$49,000 annually, 0 otherwise.

To detect if these independent variables will affect participants' financial literacy equally between genders, we then estimate the model separately for male and female participants. Finally, we analyze the participants' own opinions about personal finance, their sources of personal finance education, and college education. Cross-tabulations and  $\chi^2$  tests are used to determine differences between male and female participants.

The questionnaires were sent to about 1,800 students from 14 college and university campuses in California, Florida, Kentucky, Massachusetts, Ohio, and Pennsylvania. They include both public and private colleges and universities, main and branch campuses of large universities, and small community colleges.

### 3. Results

There were 924 useable responses collected, representing a response rate of 51%. In terms of gender, male participants account for about 44% of the sample, female participants 56%. About 53% of the participants are business majors, the other 47% non-business majors. The largest proportion of the participants (36%) is senior. The rest are evenly distributed among freshman, sophomore, junior, and graduate students. Most of the participants are white

Table 1  
Characteristics of the sample

	Male participants		Female participants		Entire sample	
	Frequency	%	Frequency	%	Frequency	%
<b>A. Education</b>						
1. Academic disciplines						
a) Business majors	200	53.6	228	53.0	431	52.6
b) Non-business majors	173	46.4	202	47.0	389	47.4
2. Class rank						
a) Freshman	57	14.4	95	19.2	156	17.2
b) Sophomore	58	14.7	97	19.6	157	17.3
c) Junior	84	21.3	72	14.5	160	17.7
d) Senior	145	36.7	179	36.2	326	36.0
e) Graduate	51	12.9	52	10.5	106	11.7
<b>B. Experience</b>						
1. Years of work experience						
a) None	15	4.0	15	3.5	32	3.9
b) Less than 2 years	37	9.9	35	8.1	78	9.5
c) 2 to less than 4 years	53	14.1	79	8.4	134	16.3
d) 4 to less than 6 years	98	26.1	92	21.4	194	23.6
e) 6 years or more	172	45.1	209	48.6	384	46.7
2. Years of age						
a) 18 to 22	184	46.6	204	41.3	395	43.7
b) 23 to 29	154	39.7	127	25.7	289	32.0
c) 30 to 39	30	7.6	120	24.3	151	16.7
d) 40 and over	24	6.1	43	8.7	69	7.6
<b>C. Demographic characteristics</b>						
1. Race						
a) White	336	85.7	424	86.2	763	85.0
b) Black	25	6.4	28	5.7	59	6.6
c) Hispanic	6	1.5	5	1.5	14	1.5
d) Native American	6	1.5	7	1.4	15	1.6
e) Asian	19	4.8	28	5.7	47	5.1
2. Nationality						
a) U.S.	335	92.5	392	94.7	740	93.4
b) Foreign	27	7.5	22	5.3	52	6.6
<b>D. Income</b>						
1. Annual income						
a) Under \$10,000	72	18.5	108	24.4	184	21.7
b) \$10,000 to \$29,999	103	26.5	117	26.5	224	26.4
c) \$30,000 to \$49,999	80	20.6	107	24.2	192	22.6
d) \$50,000 or more	134	34.4	110	24.9	248	29.2

(85%), U.S. citizens (93%), from 18 to 29 years of age (76%), and have more than two years of work experience (87%).

Table 1 shows characteristics of the sample by gender. There are three noticeable differences. First, a slightly higher proportion of male participants are in higher class ranks than female participants. About 71% of male participants are juniors, seniors, or graduate students, while only about 61% of female participants are in the same class ranks. Second, more male participants earn higher income than female participants. For example, 34% of men earn an annual income of \$50,000 or more, while only 25% of women are in the same

income group. About 19% of men earn less than \$10,000 compared with 24% of women. Third, female participants are older than male participants. About 33% of female participants are in the 30 or over age group, and 67% in the 18 to 29 group, while only 14% of male participants are in the former group, and 86% in the latter group. The descriptive statistics reported in Table 1 seem to be consistent with observations that women start their career later and earn less than men (Alcon, 1999; Anthes & Most, 2000; Timmermann, 2000). There are no obvious differences in terms of male and female participants' major field of study, ethnic background, years of work experience, and nationality.

### *3.1. Gender differences in personal financial literacy*

Table 2 summarizes the survey responses and shows differences in financial literacy by gender. The first column presents the section number of the financial literacy topic designated by a Roman numeral, the question number in the survey, and a short description of the survey question. The results are presented by topical section of the survey. The first section is on general personal finance knowledge (9 questions), the second on savings and borrowing (9 questions), the third on insurance (6 questions), and the fourth on investments (12 questions). The results for each section and entire survey are also presented. The order of questions in each section is by average scores of participants, with the highest score presented first. The average score of male participants is under a column labeled "M," and that of female participants under "F." The F statistic and level of significance are also presented.

In Section I: General Knowledge, we find that men's average scores are higher than those of women's (by 7–15 percentage points) for 5 out of 9 questions. Women earn a higher score only once (by 9 percentage points). For the entire section, men perform better than women (68 vs. 62) and the difference is statistically significant. In Section II: Savings and Borrowing, men receive higher scores for 5 out of 9 questions (by 6 to 16 percentage points). For the section, men earn a score of 59, while women 52. The difference of 7 points is significant at the level of 0.01.

For the insurance related questions in Section III, men score higher in 4 out of 6 occasions by a margin of 5 to 8 percentage points. For the entire section, men receive 63, while women 58. Again, the difference is statistically significant at the level of 0.01. In the Investments section, men outperform women in 8 out of 12 questions. It is noteworthy that the participants of both genders as a whole perform worst in this section with many scores below 40. Male participants' scores are significantly higher than female participants by a large margin (the largest being 16). It suggests that although both men and women have a low level of knowledge in the area of investments, women's knowledge is grossly inadequate.

Table 2 also shows differences between genders by level of financial literacy across various sections. The low level of knowledge includes the scores from 0 to 39, medium level 40 to 59, and relatively high level 60 to 100. Most of the higher scores (60–100) are found in Section I, General Knowledge, and the lowest scores (0 to 39) in Section IV, Investments. Medium scores are evenly distributed among all sections. In the high level of knowledge range, men receive higher scores in 10 out of 15 cases (about 67%), women in 1 out of 15 (about 7%), and male and female participants earn similar scores in the other 4 cases (about

Table 2  
Mean percentage of correct responses by gender and results of ANOVA

Section #, Question #, and summary of each question	Mean percentage of 39 and lower			Mean percentage between 40 and 59			Mean percentage between 60 and 100		
	M	F	F Test	M	F	F Test	M	F	F Test
I, 1. Personal Finance Literacy							86	78	9.02***
I, 8. Legal Requirements for Apartment Lease							80	73	6.19**
I, 7. Cost of Apartment Leasing							75	75	0.09
I, 3. Asset Liquidity							77	72	2.48
I, 6. Overspending							76	68	6.39**
I, 9. Checking Account Reconciliation							58	69	10.04***
I, 4. Net Worth Calculation				65	51	17.95***			
I, 2. Personal Financial Planning				61	46	19.56***			
I, 5. Tax Credit vs. Tax Deduction	30	26	1.77						
Entire Section I							68	62	13.96***
II, 17. Creditworthiness							84	74	12.50***
II, 14. Sources of Credit Report							75	72	1.16
II, 10. Deposit Insurance							79	63	25.23***
II, 16. Checking Account Overdrafts							68	62	3.56*
II, 11. Compound Interest				64	52	13.52***			
II, 12. Certificate of Deposit				55	47	4.58**			
II, 18. Loan Co-Sign Consequences				47	44	0.91			
II, 13. Annual Percentage Rate	35	32	1.19						
II, 15. Credit Card Use	26	22	1.57						
Entire Section II				59	52	21.48***			
III, 19. Auto Insurance Rate Determination							92	85	10.95***
III, 20. Reason to Buy Insurance							80	72	7.44***
III, 21 Health Insurance Characteristics							66	66	0.02
III, 24 Insurance Conflict Resolution				53	47	3.72*			
III, 22. Homeowners' Insurance				52	47	2.32			
III, 23. Term Insurance Characteristics	35	30	2.86*						
Entire Section III							63	58	10.68***
IV, 34. Mutual Fund Selection							75	68	5.74**
IV, 27. Goals for Stock Investing							70	62	7.18***
IV, 31. Retirement-Benefits of Early Investment				61	49	11.89***			
IV, 33. Mutual Fund Investment Return				49	48	0.18			
IV, 29. High Risk-Return Investment Suitability				55	39	23.29***			
IV, 25. Interest Rate Changes and Treasury Bond Price	38	37	0.28						
IV, 35. Municipal Bond Investment	43	29	18.40***						
IV, 26. Dollar-cost-averaging	38	30	6.93***						
IV, 28. Investment Diversification	37	26	14.56***						
IV, 32. Mutual Fund Charges	38	23	25.58***						
IV, 36. Foreign Exchange Rates	28	31	0.90						
IV, 30. Mutual Fund Ownership Characteristics	12	13	0.19						
Entire Section IV				46	38	33.93***			
Entire Survey				57	51	31.01***			

Notes: Roman numerals represent sections. I = General Knowledge, II = Savings and Borrowing, III = Insurance, and IV = Investments. Numbers following the Roman numerals represent number of question in the survey.

Mean Percentages are ranked by those of male and female participants combined.

M = Male participants, F = Female participants, F Test = F Statistic, and \* = significant at the 0.1 level, \*\* = significant at the 0.05 level, and \*\*\* = significant at the 0.01 level or greater.

27%). In the low level of knowledge range, men perform better than women in 5 out of 11 occasions (about 45%), and male and female participants earn similar scores on the remaining 6 questions (about 55%). The pattern suggests that in the high level of knowledge category, in most cases, men perform better than women. The advantage over women declined in areas where both sexes are less knowledgeable. The exception is in the Investments section where men perform much better than women even if they all score low in the section.

We also examine the questions where men's scores are higher than those of women by a large margin (10 percentage points or more). We find that 8 of these questions are about fact, terminology, or concepts of personal finance. It seems that women have little knowledge about these issues. In the other 2 cases, the questions are number oriented, suggesting that math skills are a weak area for women.

Overall, we find that out of 36 questions, male participants score higher than female participants in 22 occasions, female participants score higher once, and for the remaining 13 questions both groups have similar scores. The differences in financial literacy between male and female participants are statistically significant. On average female participants answer 51% of the questions correctly compared with 57% for male participants. The value of the F statistic suggests that the difference is significant at the 0.01 level or better. The results show that there is a substantial difference in financial literacy between men and women, with the latter being less knowledgeable.

### **3.2. Determining factors of personal financial literacy**

The ANOVA results in the previous section show the gender differences in financial literacy. However, the analysis of the differences has not controlled effects of other determining factors such as how general education, income, and other factors will affect people's financial literacy (Alcon, 1999). Furthermore, there is little research on whether any of these factors affect male and female participants' financial literacy differently. In this section, the relationship between personal financial literacy and the participants' gender, education, work experience, income and other demographic background are examined. Table 3 reports means, standard deviations, and correlation coefficients of the independent variables. As shown, the correlation coefficients among the independent variables are low. All of them are below 0.30 except for that between RACE and NATION being  $-0.497$  and EXP and AGE being  $0.362$ . The low correlations suggest that multi-collinearity is not a problem in our analysis. Typically, the correlation coefficients of 0.60 or higher would indicate a serious multi-collinearity problem.

Table 4 reports the results of logistic regressions. Columns 1 and 2 incorporate various independent variables used in the literature. They show the financial literacy difference between male and female participants while controlling effects of other factors. Columns 3 and 4 present results of logistic regressions for male (Column 3) and female participants (Column 4) separately. They show the effects of various factors on male and female participants' financial literacy. As suggested by the high Chi-square values, the models have high explanatory power. Another widely used measure of the overall fit of the model is to

Table 3  
Summary statistics and correlation coefficients

Variable	Mean	S.D.	LITERACY	GENDER	MAJOR	CLASS	EXP	AGE	RACE	NATION	INCOME
LITERACY	0.4675	0.4992	1.000								
GENDER	1.5562	0.4971	-0.161	1.000							
MAJOR	0.5256	0.4996	0.276	-0.006	1.000						
CLASS	3.0762	1.2991	0.294	-0.076	0.203	1.000					
EXP	3.9976	1.1669	0.309	0.015	0.165	0.240	1.000				
AGE	1.8827	0.9469	0.211	0.143	0.136	0.277	0.362	1.000			
RACE	1.3563	0.9950	-0.018	0.005	0.021	0.127	-0.210	0.021	1.000		
NATION	1.9343	0.2478	0.065	0.045	-0.040	-0.170	0.298	-0.020	-0.497	1.000	
INCOME	2.5943	1.1231	0.105	-0.095	0.087	0.125	0.072	0.051	0.017	-0.013	1.000

Note: MAJOR = Participants' major field of study. It is coded "1" if a participant is a non-business major, "0" business major.  
 CLASS = Participants' grade. It is coded "1" if a participant is a freshman, coded "2" a sophomore, "3" a junior, "4" a senior, and "5" a graduate student.  
 EXP = Participants' work experience. It is coded "1" if a participant has no experience, "2" more than 0 to less than 2 years of experience, "3" 2 to less than 4 years of experience, "4" 4 to less than 6 years of experience, and "5" more than 6 years of experience.  
 AGE = Participants' age group. It is coded "1" if a participant is in the age group of 18–22, "2" in the age group of 23–29, "3" in the age group of 30–39, and "4" in the age group of 40 or older.  
 RACE = Participants' ethnic background. It is coded "1" if a participant is White, "2" Black, "3" Hispanic, "4" American Indian, and "5" Asian.  
 NATION = Participants' nationality. It is coded "1" if a participant is a citizen of a foreign country, and "2" a U.S. citizen.  
 INCOME1 = Participants' annual income. It is coded "1" if a participant earns less than \$10,000, "2" \$10,000–\$29,999, "3" \$30,000–\$49,000, and "4" \$50,000 or more.

Table 4  
Logistic regression results of factors influencing participants' financial literacy

	1.	2.	3.	4.
GENDER	0.6522***	0.6331***		
MAJOR		-0.8965***	-0.4456*	-1.4040***
CLASS1		-1.8613***	-2.3113***	-1.5511***
CLASS2		-1.6071***	-2.1175***	-1.4051***
CLASS3		-1.1107***	-1.1153**	-1.2205**
CLASS4		-0.6697**	-0.8304	-0.7231
EXP1		-1.0620*	-1.4709*	-0.8169
EXP2		-0.6611*	-0.6401	-0.5880
EXP3		-0.9343***	-0.7696**	-0.9726***
EXP4		-0.6306***	-0.9252***	-0.3738
AGE1		-1.4867***	-1.5992*	-1.7590***
AGE2		-1.1914***	-1.5808*	-1.1020**
AGE3		-0.6407	-1.3435	-0.5134
RACE1		0.4667	1.6441	-0.2234
RACE2		-0.1846	0.9137	-1.0984
RACE3		0.7166	0.8995	0.6324
RACE4		1.3456	3.5179**	-1.0200
NATION		-0.7156	-0.1222	-1.1189
INCOME1		-0.0459	0.4550	-0.2790
INCOME2		-0.1905	0.0083	-0.3389
INCOME3		-0.1664	-0.0019	-0.3302
Constant	-0.3719***	2.4888***	2.1002*	3.4544***
-2 log Likelihood	1209.294	842.955	401.808	415.159
Overall Chi-square	23.05***	215.65***	85.05***	144.11***
Adjusted R <sup>2</sup>	0.034	0.328	0.284	0.400
Correct Classification	58.20%	71.47%	71.51%	73.89%
Chance Classification	50.08%	50.03%	51.31%	50.44%

Note: \* = significant at the 0.1 level, \*\* = significant at the 0.05 level, and \*\*\* = significant at the 0.01 level or greater.

examine its ability to correctly classify observations. For every model, the observations that are correctly classified are much higher than the chance classification of about 50%.

Consistent with the ANOVA results presented in Table 2, the GENDER variable is positive and statistically significant in Columns 1 and 2. The results indicate that male participants are more likely to be more knowledgeable about personal finance than female participants before and after controlling the effect of other variables. Results in column 2 suggest that people's financial literacy is related to two groups of variables: education (major field of study and class rank) and experience (work experience and age). The coefficients of MAJOR are negative and statistically significant indicating that non-business majors are more likely to be less knowledgeable about personal finance than business majors. The significant negative coefficients of CLASS1, CLASS2, CLASS3, and CLASS4 indicate that participants who are freshmen, sophomores, juniors, and seniors are more likely to be less knowledgeable than those from graduate classes.

Regarding experience related variables, coefficients of EXP1, EXP2, EXP3, and EXP4 all carry negative signs and are statistically significant, indicating that those with less experience are more likely to be less knowledgeable. Coefficients of AGE1 and AGE2 are negative and

significant, suggesting that participants under age 30 are more likely to be less knowledgeable than those who are 40 or older. Although the coefficient of AGE3 exhibits a negative sign, it is not statistically insignificant. The insignificance indicates that there is little difference between those who are in their thirties and those in their forties or older. We also find that RACE, NATION, and INCOME have little impact on financial literacy.

It is noted that the overall Chi-Square, Adjusted  $R^2$ , and classification measures all show significant improvements when education and experience related variables are introduced. Results reported in Table 4 provide strongly support to the statement that there are gender differences in personal financial literacy among college students.

To find out if male and female participants are not different in the way they respond to variations in the determining factors, we run the analysis separately for male and female participants. Columns 3 and 4 report results for male and female participants respectively. We first examine education related factors. The coefficients of MAJOR for both men and women are negative and statistically significant. The results suggest that for both male and female participants, non-business majors are more likely to be less knowledgeable about personal finance than business majors. The significant negative coefficients of CLASS1, CLASS2, and CLASS3 indicate that participants who are freshmen, sophomores, and juniors are more likely to be less knowledgeable than those from graduate classes. Although coefficients of CLASS4 carries the same negative signs, they are not statistically significant, suggesting there is little difference in the level of financial knowledge between seniors and graduates. Again, the findings apply to both male and female participants.

The experience related variable, EXP has some impact on financial literacy. Coefficients of EXP1, EXP2, EXP3, and EXP4 all carry negative signs, suggesting that those with less experience are more likely to be less knowledgeable. Among them, EXP1, EXP3, and EXP4 for men and EXP3 for women are statistically significant. AGE1 and AGE2 are negative and significant, suggesting that participants under age 30 are more likely to be less knowledgeable than those who are 40 or older. Although the coefficient of AGE3 exhibits a negative sign, it is not statistically significant. The insignificance indicates that there is little difference between those who are in their thirties and those in their forties or older. RACE, NATION, and INCOME have little impact on financial literacy for both male and female participants.

We further conduct a test of equality of the estimated coefficients in the two regressions. The results (not shown for brevity) indicate that the estimated coefficients for the education and experience related variables carry same signs in both models and have same magnitude except for one variable, MAJOR. The  $t$ -statistic for MAJOR is  $-2.6359$ , which is significant at the level of 0.0086 (a two-tail test). The finding suggests that being a business or a non-business major has more effect on female participants' literacy than on that of male participants. More specifically, female participants would be more likely to be more knowledgeable about personal finance if they select business as their major than male participants.

In sum, the results support previous research findings that there are gender differences in financial literacy. Women are less knowledgeable than men. The gender effect is statistically significant after we control other variables in the regressions. Further, we find that for both men and women education will improve people's financial literacy. Women's literacy is more likely to be improved by studying more business related courses than men. Experience based variables also have positive influence on people's financial knowledge. Other demo-

Table 5  
Participants' opinions of personal finance and their knowledge by gender

		Strongly agree	Agree	Not Sure	Disagree	Strongly disagree
1. Personal finance important for your quality of life						
Male		<b>242</b> <b>61%</b>	101 26%	31 8%	15 4%	5 1%
Female		<b>269</b> <b>55%</b>	172 35%	35 7%	12 2%	3 1%
Chi-square = 10.462, significant at the 0.03 level.						
		Very knowledgeable	Somewhat knowledgeable	Not sure	Not very knowledgeable	Not knowledgeable at all
2. Ranking your knowledge of personal finance						
Male		44 11%	<b>191</b> <b>49%</b>	71 18%	71 18%	16 4%
Female		22 5%	<b>209</b> <b>43%</b>	98 20%	85 17%	78 16%
Chi-square = 44.084, significant at the 0.001 level.						

graphic variables such as income, nationality, and ethnic background have little effect on financial literacy.

### 3.3. Gender differences in opinions and education

#### 3.3.1. Opinions on personal finance by gender

Goldsmith and Goldsmith (1997b) suggest that women have lower scores than men because women in general are less interested in the topics of Investments and Personal Finances. They (1997a) find that people's financial literacy is related to their self-perception of their knowledge in personal finance. Men have higher self-perceived knowledge of Investments than women and men are found more knowledgeable than women. In this study, we first ask participants to answer two questions to evaluate their interest in personal finance and their self-evaluation of their knowledge in the subject. The first question is "Do you agree that personal finance literacy and planning will help you improve your and your family's quality of life?" The second is to ask them to rank their own knowledge of personal finance. Table 5 reports frequency and percentage of participants' opinion and their own evaluation of personal finance knowledge by gender. The highest frequency and percentage are highlighted by boldface.

As shown in Table 5, most participants realize that personal finance is important to their quality of life. About 87% of the male participants and 90% of the female participants answer "Strongly Agree" or "Agree." A larger proportion of men (61%) select "Strongly Agree" than women (55%) and a smaller proportion of men (26%) select "Agree" than women (35%). The difference in opinions is statistically significant. The pattern suggests that although both male and female participants feel that personal finance is important, men's feeling is stronger than that of women's.

Eleven percentage of men rate themselves "Very Knowledgeable" and 49% "Somewhat Knowledgeable," while only 5% of women rate themselves "Very Knowledgeable" and 43%

“Somewhat Knowledgeable.” The rest of men (40%) and women (53%) lack confidence in their knowledge. Sixteen percentage of women rank themselves “Not Knowledgeable At All” compared with only 4% for men. The gender difference in rating their own knowledge is statistically significant. The results show that the participants understand that their knowledge about personal finance is relatively low. Participants’ own evaluation of their knowledge is consistent with the finding of this study, which shows on average people answer about 50% of questions correctly. The second finding is that 60% of male participants rank themselves very knowledgeable or somewhat knowledgeable about personal finance, while only 48% of female participants rate themselves knowledgeable. The finding is again consistent with the findings of this survey that women are less knowledgeable about personal finance than men. From these self-evaluations, we find that female participants know that they are less knowledgeable about personal finance than male participants.

### 3.3.2. *Gender differences in personal finance and college education*

Results in Table 6 show people’s sources of personal finance education. When asked where they acquire personal finance knowledge, 74% of women and 68% of men answer that they obtained the knowledge from their parents. The next most frequent answer is that they learned from their own mistakes (70% for women vs. 63% for men). Chi-square tests indicate that the differences are statistically significant. Sixty-three percentage of women and 66% of men indicate that they learned from their own readings, 62% of women and 63% of men from college courses, 59% of women and 63% of men from other peoples’ mistakes. There are no statistically significant differences between men and women in these areas. The least likely sources for their personal finance education are employers (about 36%), high school courses (about 30%), and seminars (about 15%). The findings suggest that more female participants learn from their parents and from their own mistakes than male participants.

Table 7 reports how participants’ college education affects their financial literacy. More male participants (58% vs. women’s 54%) feel that their college education helps improve their knowledge of personal finance. A larger proportion of female participants (32%) believe that they get little help from college courses while the proportion is 24% for male participants. When asked of their awareness of personal finance class offerings, more male participants (46%) indicate that they are aware while only 30% of female participants are aware. There is no difference in terms of male (61%) and female participants’ (60%) willingness to take a personal finance class as an elective.

Table 7 also shows participants’ ranking of how important college level courses are to improve their quality of life. The most highly ranked subject is presented first and the least important last. About 84% of male participants and 76% of female participants rate Personal Finance as “Very Important” or “Somewhat Important.” This ranking is much higher than the rest of college-level subjects except for English and Mathematics. It shows that participants understand the importance of personal finance. We again find a difference in degree between men and women. More men (84%) believe Personal Finance is important than women (76%). A Chi-square test shows that the difference in opinion is significant. The results also show that more male participants rank subjects such as Mathematics, Personal Finance, Economics, and Science more important, while more female participants rate English, Psychology,

Table 6  
Sources of participants' personal finance education by gender

		Yes	No
1. Acquired personal finance knowledge from parents	Male	262 68%	124 32%
	Female	350 74%	123 26%
Chi-square = 3.886, significant at the 0.049 level.			
2. Acquired personal finance knowledge from own mistakes	Male	246 63%	144 37%
	Female	339 70%	144 30%
Chi-square = 4.933, significant at the 0.026 level.			
3. Acquired personal finance knowledge from own readings	Male	257 66%	132 34%
	Female	292 63%	169 37%
Chi-square = 0.686, significant at the 0.408 level.			
4. Acquired personal finance knowledge from college	Male	248 63%	143 37%
	Female	297 62%	184 38%
Chi-square = 0.260, significant at the 0.610 level.			
5. Acquired personal finance knowledge from others' mistakes	Male	244 63%	143 37%
	Female	259 59%	183 41%
Chi-square = 1.714, significant at the 0.190 level.			
6. Acquired personal finance knowledge from employers	Male	141 36%	248 64%
	Female	160 36%	280 64%
Chi-square = 0.001 significant at the 0.972 level.			
7. Acquired personal finance knowledge from high school	Male	121 31%	266 69%
	Female	128 27%	342 73%
Chi-square = 1.674, significant at the 0.196 level.			
8. Acquired personal finance knowledge from seminars	Male	67 17%	323 83%
	Female	60 13%	402 87%
Chi-square = 2.931, significant at the 0.087 level.			

Table 7  
Participants' education in college by gender

1. College education helps improve your personal finance knowledge		A great deal of help	Moderate help	Not sure	Very little help	No help at all
	Male	89 23%	138 35%	73 19%	54 14%	41 10%
	Female	95 19%	172 35%	65 13%	117 24%	41 8%
Chi-square = 17.604, significant at the 0.001 level.						
2. Your college offers personal finance classes		Yes	No	Not sure		
	Male	181 46%	50 13%	161 41%		
	Female	147 30%	79 16%	263 54%		
Chi-square = 24.195, significant at the 0.001 level.						
3. If offered, you will take the class as an elective		Very likely	Somewhat likely	Not sure	Somewhat unlikely	Very unlikely
	Male	125 32%	114 29%	84 21%	27 7%	44 11%
	Female	132 27%	162 33%	106 22%	46 9%	47 10%
Chi-square = 5.144, significant at the 0.273 level.						
4. Ranking of importance of the college level subject, English		Very important	Somewhat important	Not sure	Somewhat unimportant	Very unimportant
	Male	210 53%	138 35%	17 4%	17 4%	13 3%
	Female	329 67%	140 28%	11 2%	11 2%	4 1%
Chi-square = 22.674, significant at the 0.001 level						
5. Ranking of importance of the college level subject, mathematics		Very important	Somewhat important	Not sure	Somewhat unimportant	Very unimportant
	Male	252 64%	113 29%	16 4%	9 2%	5 1%
	Female	274 56%	142 29%	51 10%	17 3%	10 2%
Chi-square = 15.801, significant at the 0.003 level.						
6. Ranking of importance of the college-level subject, personal finance		Very important	Somewhat important	Not sure	Somewhat unimportant	Very unimportant
	Male	179 45%	155 39%	41 10%	15 4%	5 1%
	Female	208 42%	168 34%	83 17%	21 4%	12 2%
Chi-square = 10.320, significant at the 0.035 level.						
7. Ranking of importance of the college-level subject, economics		Very important	Somewhat important	Not sure	Somewhat unimportant	Very unimportant
	Male	139 35%	173 44%	57 14%	17 4%	9 2%
	Female	145 29%	210 42%	59 12%	60 12%	21 4%
Chi-square = 21.585, significant at the 0.001 level.						

Table 7  
Continued

		Very important	Somewhat important	Not sure	Somewhat unimportant	Very unimportant
8. Ranking of importance of the college-level subject, science						
Male		130 33%	176 45%	47 12%	27 7%	13 3%
Female		139 28%	212 43%	61 12%	68 14%	13 3%
Chi-square = 12.017 significant at the 0.017 level.						
9. Ranking of importance of the college-level subject, health/physical education						
Male		89 23%	156 40%	69 18%	43 11%	38 10%
Female		119 24%	203 41%	62 13%	77 16%	34 7%
Chi-square = 9.595, significant at the 0.048 level.						
10. Ranking of importance of the college-level subject, psychology						
Male		66 17%	144 37%	82 21%	68 17%	34 9%
Female		116 23%	240 49%	60 12%	61 12%	18 4%
Chi-square = 35.430, significant at the 0.001 level.						
11. Ranking of importance of the college-level subject, literature						
Male		62 16%	143 36%	95 24%	70 18%	25 6%
Female		108 22%	202 41%	75 15%	89 18%	19 4%
Chi-square = 17.375, significant at the 0.002 level.						
12. Ranking of importance of the college-level subject, political science						
Male		51 13%	158 40%	99 25%	62 16%	25 6%
Female		54 11%	200 41%	109 22%	98 20%	33 7%
Chi-square = 3.719, significant at the 0.445 level.						
13. Ranking of importance of the college-level subject, sociology/anthropology						
Male		50 13%	120 30%	93 24%	95 24%	37 9%
Female		57 12%	167 34%	131 27%	109 22%	30 6%
Chi-square = 5.335, significant at the 0.255 level.						
14. Ranking of importance of the college-level subject, philosophy						
Male		40 10%	110 28%	94 24%	97 25%	53 14%
Female		52 11%	182 37%	114 23%	104 21%	43 9%
Chi-square = 11.197, significant at the 0.024 level.						

Literature, and Philosophy more important. The finding suggests that male participants believe that number-oriented science subjects are more important while female participants believe that non-math related humanity subjects are more important.

#### **4. Summary and conclusion**

Examining gender differences in personal finance knowledge, we find that on average women know less about personal finance than men. Women score lower than men in 22 out of 36 questions and earn a higher score in only 1 question. We examine 10 questions where the differences between men's and women's financial literacy scores are more than 10 percentage points and find that women score lower in these cases because they either do not know the basic fact, terminology, or concept of personal finance or they do not perform well in mathematics related questions. We find supporting evidence that gender is associated with financial literacy. Even after controlling the impact of other factors, we find that the gender factor is still statistically significant, indicating women are less knowledgeable about finance than men. The weight of evidence leads us to conclude that women are less knowledgeable about personal finance than men.

Further, we find that participants' financial literacy is related to education and experience related factors. For both men and women, coefficients of major field of study for the entire sample are significant, showing that business majors are likely to know more about personal finance than non-business majors. College major of business and non-business has a stronger effect on female participants' level of financial literacy than that of male participants'. Participants with more years of college education are more likely to know more about personal finance. It is not surprising that business majors perform better in the survey because they have many opportunities to learn elements of personal finance or concepts from other business fields that are related to finance in their curriculum. Participants who are more senior in class rank earn higher scores in the survey. We speculate that they are interested in money management issues and acquire personal finance knowledge through economics or business courses, seminars, their own or other people's mistakes, and other sources. It is difficult to believe that one who is not interested in personal finance can become knowledgeable about the subject by spending more years in college to learn subjects unrelated to personal finance. A similar line of reasoning would apply to why the participants who are older or have more years of work experience earn high scores in the survey. They must have prior exposure to personal finance because they must deal with finance issues or they are interested in the subject and acquire the knowledge through various sources. They cannot be more literate than others just because they are older.

We also find there are differences in opinions between gender. More men (61%) select "Strongly Agree" that personal finance is important than women (55%). More men (60%) rank themselves more knowledgeable about personal finance than women (48%). More men (84%) rank Personal Finance as an important subject than women (76%). The higher level of enthusiasm and confidence in personal finance issues may be the contributing factors that explain why men are more knowledgeable than women.

We find that many of the participants do not learn financial knowledge through formal education, but informal channels. About 70% learn from their parents. Only about 60% learn from college and merely 30% from high school. Given the lack of formal personal finance education in K-12 institutions, children seek personal finance knowledge from their parents. Yet, there is evidence that American adults are themselves not knowledgeable in this area. In this study, we find that more women state that they learn personal finance from their parents than men, yet women are less knowledgeable than men. It seems to suggest that parents are not knowledgeable or that the informal teaching and learning process between parents and children is ineffective.

When we examine participants' college education, we find that more male participants rank Mathematics and other number-oriented science subjects important, while more female participants rank English and word-oriented liberal arts subjects important. As a mostly number-oriented subject, Personal Finance is not very attractive to women. Compared with men, women have less interest in finance, and their preparation for the subject may not be appropriate. It is not surprising that we find female participants score much lower than men when questions require them to process numerical information.

This study has its limitations. Specific limitations will be discussed in conjunction with future research directions. First, the sample was drawn from graduate and undergraduate students from colleges and universities. The findings may not be applicable to other groups such as business executives. Further studies using participants from a broader sample may be warranted. Second, while this study attempts to explain why there is a gender difference in personal financial literacy, its results should be considered preliminary. Additional research is needed to further advance our understanding in this area. As we know more about why American people, especially women, have a low level of financial literacy, we can develop more effective programs to help them improve their knowledge.

The study also presents interesting opportunities for policy discussion. Space limitation prevents us from examining the consequences of low level of financial literacy, for example, how people's knowledge and opinions on personal finance affect their financial planning and management. More research focusing on financial planning and management processes would shed new light on gender differences in personal finance knowledge. This could be especially important to women as they tend to outlive men, and often must face financial decisions late in life alone.

Lastly, future studies should focus on how to improve both women and men's knowledge of personal finance, and their ability to handle their personal finances. Given that personal finance plays such an important role in improving people's quality of life, educators need to think seriously and take effective measures to improve people's knowledge about personal finance. Realizing that women have less interest and confidence in personal finance, and they may be ill prepared for mathematics intensive subjects, we need to design curriculum for and deliver personal finance courses to women with additional care. When designing what and how to teach them, we should consider female participants' educational background, life experience, and social-economic status, and make materials suitable for them to absorb.

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