

The Impact of Personal Finance Education Delivered in High School and College Courses

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Abstract This study investigates the impact of personal finance education delivered in high school and college. Outcomes of interest were investment knowledge and household savings rates measured years after the financial education was delivered. A web-based survey with questions about participation in financial education, financial experiences, income and inheritances, and demographic characteristics was administered to 1,039 alumni from a large midwestern university. Participation in a college level personal finance course was associated with higher levels of investment knowledge. Experience with financial instruments appeared to explain more of the variance in both investment knowledge and savings rates. No significant relationship between taking a high school course and investment knowledge was found. Financial experiences were found to be positively associated with savings rates.

Keywords College students · Financial literacy · Household savings · Personal finance

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Introduction

Alarmingly low personal savings rates and a shift in retirement policy toward personal responsibility have amplified the calls for personal finance education. While a majority of parents leave their children's financial education to the formal education system (American Savings Education Council, 2001), only seven states require a high school course with personal finance content for graduation (National Council on Economic Education [NCEE], 2005). More reassuringly, 38 states maintain personal finance education standards and 21 of these states mandate implementation of these standards (NCEE, 2005).¹ As education policy continues to develop, the need for evidence linking curriculum programming to increased knowledge, changed attitudes, and most importantly, improved financial behaviors has never been greater.

To date, studies evaluating personal finance education delivered through school curriculum have shown that the financial competency (i.e., behavior, attitude, and knowledge) of secondary school students is positively impacted by widely delivered consumer and financial education (National Endowment for Financial Education, 1998; Langrehr, 1979; Tennyson & Nguyen, 2001). For example, students enrolled in a high school curriculum designed to teach financial management were tested immediately following and three months after taking a course in personal financial management. Evaluators found increased financial knowledge (e.g., understanding the cost of credit), improved financial behavior (e.g., budgeting) and higher levels of financial efficacy (e.g., greater confidence in money management) resulting from participating in the High School Financial Planning Program (Danes, Huddleston-Casas, & Boyce, 1999).

Although previous research suggests that early exposure to financial concepts has positive effects on money management skills of high school students (Huddleston, Danes, & Boyce, 1999) and positive lasting effects on financial knowledge and savings behavior when students reach adulthood (Bernheim, Garrett, & Maki, 2001), research on the impact of college level personal finance education on knowledge and behavior has received limited attention. Examining how participating in a high school and/or college personal finance course influences investment knowledge, and ultimately how their investment knowledge relates to savings rates is of critical importance to financial educators, advisors, and education policy makers. The goal of the current study is to evaluate outcomes from personal financial education delivered in high school and university settings. Unique to this study is the inclusion of both high school and college level education courses within the same sample. In most cases the education was delivered years ago—making this an assessment of the longer term impacts of personal finance courses.

The purpose of the current research is to better inform financial educators and policy makers as standards, course curricula, and education mandates are developed. Specifically, we hope to enhance our understanding of the financial learning process by studying the effects of participating in a high school and/or university personal finance course on financial knowledge and personal savings.

¹ For detailed information on policies and development of personal finance education for each state, see National Council on Economic Education (2005) and Tennyson and Nguyen (2001).

Literature Review

While many excellent education programs are delivered in a wide range of settings, few evaluation studies are followed through to publication. In the college setting, Chen and Volpe (1998) surveyed 924 students from 13 different campuses to study financial literacy levels and financial decision making. The authors highlighted the need for personal finance education among college students based on the failing median score on a financial knowledge test of 55.56%. Educational background made an impact on the average financial knowledge score, with business majors (vs. non-business majors) and students with higher class rank (vs. lower ranks) scoring better on the test of financial knowledge. Demographic differences emerged with respect to test scores, with males scoring higher than females, older students scoring higher than younger students, and students with six or more years of work experience scoring higher than those with no work experience. Students' poor knowledge of personal financial management led to incorrect and expensive decisions in the areas of general knowledge, savings and borrowing, and investments. Perhaps the most significant contribution of the Chen and Volpe (1998) study was the finding that financial decisions were highly influenced by financial knowledge. Approximately 89% of students with higher levels of financial literacy made good spending decisions in a hypothetical situation; whereas, only 68% of students with lower levels of financial knowledge made the correct choices. This tenuous link between knowledge and behavior has not been widely confirmed in the financial education literature.

Hayhoe, Leach, Turner, Bruin, and Lawrence (2000) studied gender differences in credit card behavior and financial practices among college students. Females used some financial practices more than males, such as saving regularly, budgeting, and paying bills. No gender differences were found for other financial practices, such as paying interest, making minimum payments, and how they felt about managing their finances. Female college students tended to use credit cards mostly for clothing items, whereas males tended to use credit cards for purchases for electronics, entertainment, and food away from home. Though behavior differences among college students were well documented in Hayhoe et al. the efficacy of a personal finance course was not examined among this college sample.

Fox and Bartholomae (1999) evaluated college students' academic performance in a personal finance class. Students were classified by learner type with Kolb's Learning Style Inventory. Those learning personal finances best (as measured by course grade) were learners with a preference for concrete experience and active experimentation. Based on the findings, teaching and learning techniques which catered to all learning styles were recommended within the context of personal finance. Unfortunately, no follow-up study of the lasting impact of personal finance education has been reported for this sample of college students. Based on the limited empirical work on the effectiveness of college level financial education, the current study attempts to address this weakness in the literature.

At the high school level, mixed findings have been reported with regard to financial education programming. Over the last several decades, many states have adopted personal financial programs on topics such as money management and credit and debt management for delivery to high school students. A few published studies have examined the effectiveness of these programs and have collectively shown that personal finance courses have varied impact on students' financial

knowledge and behavior. Moschis and Churchill (1978) found that the amount of formal consumer education was not significantly related to seven core consumer skills, including financial management.

More recently, the Jump\$tart Coalition administered a national financial literacy examination to 4,074 high school seniors from 215 high schools and found that students answered only 52.3% of basic personal finance questions correctly (Mandell, 2004). In this sample students who had taken a high school personal finance course performed somewhat better on the examination than those who did not take such a course. Surprisingly, the positive relationship between the course and test scores was not found in earlier years of the biennial survey. Jump\$tart survey respondents have consistently reported learning about money management primarily at home, and previous experience with finances has not translated directly into better understanding of finances (Mandell, 1998; 2004). For example, experience with credit cards actually correlates negatively with credit knowledge; however, having a savings account correlates positively with savings knowledge. Despite being neither *strong nor consistent*, Mandell (2004) concludes that recent results show a trend in the direction of linking financial experiences to higher scores on the 31-item Jump\$tart measure of financial literacy.

An additional analysis of the 1997 Jump\$tart dataset was performed by Tennyson and Nguyen (2001). Their study examined the impact of state mandated consumer and financial education on financial literacy test scores. Higher scores on a financial literacy test were not associated with general state mandated economic education; however, a required course with personal finance content was associated with higher literacy scores. In particular, the improvements in knowledge appeared to be in the questions targeting saving and investing knowledge. Moreover, those who took a personal financial management course did better on both factual and analytical questions; 60.71% vs. 57.76%, and 59.36% vs. 56.85%, respectively. States with testing mandates only did better than average on factual questions alone, not the analytical questions. Tennyson and Nguyen concluded that mandates requiring courses in personal financial management showed the most significant increases in test scores and, thus, improvement in financial literacy.

Huddleston et al. (1999) used a five-tiered approach to evaluate the impact of the High School Financial Planning Program (HSFPP) Curriculum on high school students' financial behaviors. The results of this study demonstrated that personal financial programs had a positive impact on students' financial literacy, behavior and self-efficacy levels.

Bernheim et al. (2001) provide perhaps the strongest evidence of the lasting effects of financial education. Using a nationally representative cross-sectional household survey of adults they attempt to determine the effects of the financial education mandates implemented in high school. Notable in this research is the fact that the education treatment took place long ago for most of the sample and differences in knowledge, savings rates and wealth accumulation could be observed between those educated in high school personal finance and the group who did not have a personal finance class. Bernheim et al. show first that financial education mandates had a significant positive impact on financial education exposure. Then, adults who were exposed to education mandates and financial education during high school were shown to have higher savings rates and to have accumulated more wealth than adults who were not exposed to financial education during high school. The present study serves in part as a replication of

Bernheim et al. where a relatively large portion of the sample has taken a college level personal finance course.

Modeling Financial Knowledge and Savings

The analysis of the impact of financial education in high school and college on knowledge and savings follows from previous studies. Our models each contain the following four categories of variables known to associate with investment knowledge and savings: (a) financial education received, (b) financial experience, (c) income and inheritances, and (d) demographic characteristics. When explaining variance in investment knowledge (our measure of financial knowledge) we are most interested in the independent impact of personal finance education delivered in high school and/or college. Subsequently, when modeling savings rates, we are most interested in the impact of investment knowledge on savings rates.

Education Factors

As this study is primarily an investigation of the impact of formal education, indicators of education and financial knowledge are entered first into our models to explain levels of knowledge or savings. Based on previous studies and the intent of the courses themselves, we would expect to observe a positive correlation between financial education received (both in high school and college) and financial knowledge. Similarly, higher levels of knowledge are expected to correlate with improved financial decisions. Similar to Bernheim et al. (2001), improved financial decisions are reflected in this study as higher savings rates.

Financial Experience Factors

Beyond the classroom, a second explanation of differences in knowledge and behavior comes from personal experience and the learning process itself. According to Kolb (1984), learning begins and perpetuates through personal involvement in the subject matter. Kolb describes learning as a cycle of four elements based on two dimensions of learning: the concrete-abstract dimension and the active-reflective dimension. The learning model describes how experience is translated into concepts that can be applied to new experiences in the future. The circular learning process begins with *concrete experience* and progresses through *reflective observation* to *abstract conceptualization* and culminates in *active experimentation*. The learning process feeds back onto itself with active experimentation providing additional concrete experience, generating another cycle of learning. Examples of concrete experiences which are critical to the learning process described by Kolb are plentiful in the personal finance arena. Owning a stock or a bond, having a savings account, observing parental savings habits, owning a business and many other activities and experiences related to one's finances are likely to initiate learning cycles. Therefore, we expect financial experience to positively correlate with both knowledge and behavior.

Income and Inheritance Factors

The third set of factors in our model is derived from the motivation and incentives to learn. Cost-benefit analysis of a learning decision will imply greater expenditure of time and effort in learning areas with higher expected returns. In personal finance, higher income and wealth levels should increase the absolute returns to investment in financial education and associate with higher levels of financial knowledge. Higher income and wealth levels are also known to associate with higher savings rates. Consequently, we include household earnings and inheritance in our models.

Demographic Factors

Finally, our models of investment knowledge and savings rates contain a set of demographic control variables. Though factors such as age, occupation, race, gender and marital status are known to associate with financial knowledge and savings rates, these items are included in this model as alternate explanations beyond formal education, experience and economic factors.

Method

Study Design

This study relies on a primary dataset compiled through a 46-question web-based survey. The survey instrument was similar to that used by Bernheim et al. (2001) measuring past financial experiences, current financial experiences, income, savings, and demographic characteristics. While this study is an attempted replication of Bernheim et al. with the addition of college level financial education treatments, it was not reasonable to adopt their instrument in its entirety. In particular, the financial knowledge test included several items which were dated (e.g. Dow Industrials levels in 1995) and validity and reliability of the measure was not readily apparent. Therefore, we adopt a widely used and tested measure of investment knowledge (Dhar & Zhu, 2006; Hira & Loibl, 2005) developed by the National Association of Securities Dealers (NASD, 2003). Beyond this measure of investment knowledge, our survey follows closely with that described in Bernheim et al.

Subjects

Response to the on-line survey was sought via e-mail sent to 12,000 randomly-selected alumni of a large midwestern university. Out of the 12,000 alumni, a pilot survey was conducted on 200 alumni. After small administrative and technical errors were corrected, 11,800 alumni were e-mailed the survey link in early 2005. As an incentive, participants were informed that they would be entered into a random drawing for a \$50 gift card to a popular department store. A 12.4% response rate was achieved with 1,492 surveys submitted. From these responses, 1,039 cases were used in the current study. Cases were excluded if complete data were not available for

all items in our unrestricted model containing education, experience, income and inheritance, and demographic factors. As with other surveys of this kind, respondents were least likely to provide income (331 missing values) and saving (353 missing values) information.

Measures

Investment Knowledge

Among the 46 survey questions was a ten-question investment knowledge test. The test, covering mainly issues related to personal investing, was designed by the NASD for the purpose of determining financial or investor literacy and was originally conducted during April of 2003 on individuals who made at least one stock, bond, or mutual fund transaction. For a somewhat abbreviated version of the investment test and the distribution of answers, see Appendix 1. The knowledge score has a potential range from zero to ten. Reliability analysis produced a Cronbach's alpha of .80 for our sample.

Savings

Savings behavior was measured with the following question: *Not including income you earn on your assets and investments, what percentage (0–100%) of your yearly household earnings are you currently—saving—in all forms, including contributions you make to retirement plans but not contributions made by your employer?*

Financial Education

The variables of critical interest in this study were those indicating previous financial education in a formal classroom setting (high school or college). As the sample frame for this study is university alumni, education treatment in high school would have been delivered at least 4 years ago and personal financial education in college would have been delivered at least one year ago. For both high school and college personal finance education, respondents were first asked: *In high school (In college...), did you take any courses covering consumer education?* Respondents who answered “yes” were then asked if these *courses specifically covered topics in household or personal finances, such as the use of budgets, credit, savings accounts, checking accounts, investments, and so forth?* If respondents answered “yes” to this second question on personal finance education they were classified as having participated in a personal finance class in the respective setting (high school or college). This classification by formal personal finance education experience leads to four possible outcomes and thus four groups of interest. The four groups are: (a) no formal education, (b) personal finance education in high school only, (c) personal finance education in college only, and (d) personal financial education in both high school and college. Respondents were also asked about any continued education beyond a bachelor's degree (advanced degree) which is used as an indicator of general education in both the knowledge and savings models. As the base population for the sample was the alumni from a large midwestern university there were few cases with education levels below a

bachelor's degree and this dichotomous variable characterized those with and without education beyond the undergraduate level.

Financial Experience

Financial experiences are divided into two main types: past (or childhood) experiences and current practices. Past experiences include parent modeling of savings, bank account management and stock or bond ownership. Current experiences are indicators of stock or bond ownership, business ownership, and home ownership.

Parents' saving habits were measured with the question: *Thinking back to your childhood, do you think your parents saved a lot more than other families, somewhat more, the same as other families, somewhat less, or saved a lot less than other families?* Responses have a potential range from 1 to 5 with 1 representing parents perceived to have saved a lot less than other families and 5 representing parents who saved a lot more than other families. Whether the respondent held a bank account before age 18, containing their own money and at least partially in their own name, is represented by an indicator variable where 1 relates to those having had an account as a minor and 0 for those not having an account before age 18. Similarly, respondents were asked: *Prior to age 16, did you own any stocks or bonds yourself or jointly with your parents?* Those having the experience of holding stock prior to age 16 were coded as 1 and those not holding stocks or bonds in their youth are coded as 0. For current experiences, stock or bond holders are coded as 1 and those not owning these assets are coded as 0. Business and home ownership is coded similarly with 1 corresponding with ownership and 0 otherwise.

Income and Inheritance

Income level was collected by asking about earned income. Respondents were asked: *How much do you earn in an average year before taxes, including ONLY what you make at your jobs and through self-employment, before taxes, and NOT INCLUDING any income earned on your investments or any other sources?* Responses are continuous and could range from \$0 to \$9,999,999. Inheritance was measured with a simple indicator variable generated through responses to: *Have you, in the past, received any large gifts, inheritances, legal settlements or court awards exceeding one-quarter of your annual income?* For those answering yes, the inheritance variable is coded as 1 and 0 is recorded for those not receiving a sizable gift or inheritance.

Demographics

Demographic information included age, gender, race, occupation and marital status. Actual age was entered by the respondents. Race was selected from the following categories: White, Black, Asian, Hispanic, Native American, and Other. Occupation was selected from a list of 14 occupation categories and later collapsed into one category for business and professional occupations and one including all other occupations (mainly services, sales, office and administrative support, small business

owner, not working). Marital status is coded 1 for those who were married and 0 for divorced, separated, widowed or single.

Statistical Analysis

A comparison across education received (high school, college, both, or none) was conducted for the mean investment knowledge scores and savings rates. An *F* test was used to identify significant differences in means across the four education categories. To determine the independent relationship between educational experience and investment knowledge, a hierarchical multiple regression was estimated with investment knowledge regressed on four sets of factors entered in the order of financial education, financial experience, income and inheritances, and demographics. We chose this order of predictors so we could account for the unique contribution of each group of factors, after accounting for education factors. Through estimating four successive and cumulative models we are able to observe which factors (if any) dominate the explained variance of education on investment knowledge. In a multivariate model we account for factors that would not be addressed in a pure treatment-control group study where only mean differences in scores or savings outcomes may be observed over time. Similarly, four models were estimated for savings with investment knowledge entered first and experience, income and inheritance, and demographics added in turn. The stability of the regression coefficients on the education and knowledge variables, or lack thereof, is telling in this approach and provides significant grounds for discussion.

Results

Descriptive Statistics

Among the total sample of 1,039 alumni, 19.9% participated in a college level personal finance course and 17.4% participated in a high school personal finance course. Of these *educated* respondents 47 reported attending a personal finance course in both college and high school. Nearly two-thirds of the sample obtained some formal education beyond an undergraduate degree; however, among the college only group, less than half (43.6%) had pursued graduate degrees.

Table 1 provides the summary statistics for all variables used in our models. Differences between groups described below are all statistically significant as indicated by the *F* test for continuous variables and Chi-square test for dummy variables. Investment knowledge scores were significantly different across each education group as indicated by an *F* test for a comparison of multiple means. Those attending only a college class performed over a full point (or letter grade in academic terms) better than alumni who had taken only a high school personal finance class. Somewhat surprisingly, alumni taking the college course scored significantly higher than those who took a personal finance course in both high school and college.

Using a similar *F* test for differences, the mean values for savings rates were not significantly different across the education groups. As a whole, the sample reported a relatively high savings rate of 15%. Across education groups there is little variance in the mean value of savings. Those respondents who attended a class in both

Table 1 Summary statistics (means and percentages) by financial education received^a

Variable	Total sample (N = 1,039)	High school class only (N = 113)	College class only (N = 78)	Both (N = 47)	No financial education (N = 801)
<i>Dependent variables</i>					
Average investment knowledge score	5.6	5.4	6.6	5.8	5.7
Average household savings rates	15.4	15.0	14.1	16.7	15.5
<i>Education</i>					
Participated in high school personal finance class	15.4	100	0	100	0
Participated in college personal finance class	12.0	0	100	100	0
High school and college course	4.5	0	0	100	0
Education beyond undergraduate	63.1	63.7	43.6	63.8	64.9
<i>Experience</i>					
Average parents' saving habits (1–5 scale)	2.8	2.7	2.9	2.6	2.8
Held a bank account before age 18	88.3	94.7	89.7	85.1	87.4
Held stocks or bonds before age 16	27.6	31.9	28.2	21.3	27.3
Currently hold stocks or bonds	82.6	82.3	91.0	76.6	82.1
Business owners	15.6	20.4	21.8	17.0	14.2
Home owners	77.0	77.0	79.5	80.9	76.5
Renters	20.1	20.4	16.7	19.1	20.5
Live with parents or others rent free	2.9	2.7	3.8	0.0	3.0
<i>Income and inheritance</i>					
Average earned income	\$69,017	\$69,034	\$67,440	\$75,921	\$68,763
Earnings < \$25,000	6.7	11.5	9.0	4.3	6.0
\$25,000 ≤ Earnings < \$50,000	32.3	29.2	38.5	29.8	32.3
\$50,000 ≤ Earnings < \$75,000	30.9	23.9	25.6	31.9	32.3
\$75,000 ≤ Earnings < \$100,000	16.7	21.2	14.1	21.3	16.1
Earnings ≥ \$100,000	13.3	14.2	12.8	12.8	13.2
Inherited or gift > 25% of income	11.6	11.5	7.7	12.8	12.0
<i>Demographics</i>					
Occupation—Business or professional	70.1	66.4	65.4	70.2	71.0
White	89.1	92.9	91.0	91.5	88.3
Black	2.9	0.9	3.8	0.0	3.2

Table 1 Continued^a

Variable	Total sample (N = 1,039)	High school class only (N = 113)	College class only (N = 78)	Both (N = 47)	No financial education (N = 801)
Asian	5.7	3.5	3.8	8.5	6.0
Other races	2.3	2.7	1.3	0.00	2.5
Male	49.3	51.3	56.4	44.7	48.6
Average age	34.7	34.7	34.1	35.0	34.7
Married	64.7	74.3	57.7	68.1	63.8

Note. ^a Figures reported are percentages unless otherwise noted in variable name

settings reported the highest savings rate (16.7%) and those attending only a college level class reported the lowest savings rate (14.1%).

Investment Knowledge

The results from the investment knowledge test were similar to those obtained in the original test conducted by the NASD. Performance as a whole was quite poor and falls in line with results obtained through other measures of financial literacy (namely the Jump\$tart series of surveys beginning in 1997). The average quiz score for the entire sample was 5.63 out of a possible score of 10, meaning that most respondents answered just over half of the questions correctly.

Financial Experience

Experiences, such as observing parent savings habits, holding bank accounts or investment assets, and owning businesses and homes, appear to be similar across education groups. On a scale of 1–5, those who took only a college class rate their parents as slightly more thrifty than other groups; however, the overall rating for the sample indicated that parents were not saving more than other families. Nearly 9 in 10 respondents had a bank account before they turned age 18 with almost 95% of the high school education group leading the way with account ownership. The high school only education group also reported the highest level of stock or bond ownership prior to age 16. Youth stock ownership rates range from 21% to 32% across education groups. Most of the sample currently holds either a stock or a bond, with 91% of the college only education group reporting stock/bond ownership and 76.6% of the smaller group who attended both a high school and college personal finance class. Nearly 16% of the sample was comprised of business owners and nearly 80% own their own homes.

Income and Inheritance

The income and inheritance/gift indicators also appear to be similar across education groups. The group with both high school and college finance courses had somewhat higher annual income, nearly \$76,000, but the average income values for the entire sample and individual groups cluster around \$69,000, with no statistically significant difference. Just under 12% of the sample had received some sort of inheritance or gift in excess of one-quarter of their annual income. While those who had only a college class appeared to have received relatively fewer large gifts or inheritances (7.7%), no other group had received significantly more or less in terms of inheritances.

Demographics

The education groups do show some variability in demographic characteristics. Respondents with no formal financial education were employed in the business or professional arena. Men were more predominant in the college only class group and married respondents were more prevalent among the high school class only group. Across education groups, average age and racial composition appears to be similar.

The average age for the sample was relatively low (approximately 34), ranging from 18 to 74 years old.

Linking Education with Investment Knowledge

Using hierarchical multiple regression, the relationship between personal finance education in high school and college and an individual's investment knowledge was analyzed. The independent variables were organized by category including education related variables, saving and investment related experiences, income and inheritance, and demographic characteristics. The dependent variable for each of the four models reported in Table 2 is the total score on the NASD investment test. Across all models, participation in a college level course with personal finance content was associated with higher levels of investment knowledge. Participating in a college financial education class correlates with scores three-quarters of a point higher than those taking no personal finance class. There was no significant relationship (though estimated coefficients tend toward a significant and inverse relationship) between taking a high school course and investment knowledge. Likewise, those taking a personal finance course in both settings did not perform any better on the NASD investment knowledge measure. Education beyond a bachelor's degree was found to be positively associated with investment knowledge in Models 1 and 2; however, with the addition of income, inheritance and demographic variables, the association with continued formal education is muted and the relationship is no longer statistically significant.

Financial experiences appear to have a positive and robust relationship with investment knowledge. The investment knowledge score improved by 0.59 points (over 5%) if the respondent held a bank account before age 18. Current investment behavior also appears influential. The variable representing current ownership of stocks or bonds had a positive and significant relationship with investment knowledge as test scores for stock holders were 1.62 points higher.

Variability in income and demographic characteristics also associated with variability in investment knowledge. As expected, the higher the level of one's earned income, the higher the investment knowledge score. Alumni working in business or professional settings were more knowledgeable of investments. The gender variable had a relatively large and significant relationship with investment knowledge (estimated coefficient of 1.75), indicating that males score nearly 18 percentage points higher than their female counterparts on the investment knowledge test.

Linking Investment Knowledge with Savings

Table 3 presents a hierarchical multiple regression of household savings rates regressed on four categories of explanatory factors. In these models we are exploring the empirical relationship between knowledge and savings rates—testing whether investment knowledge links to savings behavior. In Model 1, with only education variables entered, higher levels of investment knowledge were associated with higher savings rates. However, the impact of investment knowledge is not robust. As experience, income and inheritance, and demographic variables were added to the model the relationship between knowledge and behavior becomes blurred and other factors tell the story of savings.

Table 2 OLS regressions: investment knowledge score regressed on financial education, financial experience, income and inheritance and demographic characteristics

Variable	Model 1		Model 2		Model 3		Model 4	
	β	Standard Error	β	Standard Error	β	Standard Error	β	Standard Error
<i>Constant</i>	5.40	.16***	2.51	.39	2.12	.38***	1.14	.52
<i>Education</i>								
High school class (No education as reference group)	-.23	.28	-.33	.27	-.30	.26	-.32	.25
College class	1.01	.34***	.78	.32**	.82	.31**	.73	.29**
High school and college class	-.61	.59	-.15	.57	-.33	.55	-.14	.52
Graduate school	.37	.18**	.36	.17**	.19	.17	.13	.17
<i>Experience</i>								
Parents' saving habits			-.05	.07	-.04	.06	-.01	.06
Held bank account before 18			.83	.26**	.72	.25**	.59	.25**
Held stock or bond before 16			.26	.19	.19	.18	.21	.18
Held stock or bond currently			2.13	.22***	1.89	.21***	1.62	.21***
Business owner			-.26	.23	.01	.22	-.00	.21
Home owner (Renter and live at home as reference group)			.21	.20	-.12	.20	-.04	.21
<i>Income and inheritance</i>								
Earned income (thousands)					.016	.001***	.011	.001***
Inheritance or Gift					.02	.25	.14	.24
<i>Demographic</i>								
Occupation—Business or professional							.69	.17***
Black (White as reference group)							-.13	.46
Asian							-.18	.34
Other races							-.58	.51
Male							1.75	.16***
Age							.01	.01
Married (Divorced, separated, widow as reference group)							.05	.17
<i>N</i>	1,039		1,039		1,039		1,039	
Adjusted <i>R</i> ²	0.009		0.107		0.164		0.258	
<i>F</i> -value [†]			18.78***		34.94***		18.42***	

* $p < .1$; ** $p < .05$; *** $p < .01$. [†] *F* value if for comparison of restricted and unrestricted models, for example Model 1 (restricted) compared to Model 2 (unrestricted)

Table 3 OLS regressions: household savings rate regressed on financial education, financial experience, income and inheritance, and demographic characteristics

Variable	Model 1		Model 2		Model 3		Model 4	
	β	Standard Error	β	Standard Error	β	Standard Error	β	Standard Error
<i>Constant</i>	13.00	.85***	14.05	1.64***	13.13	1.63***	11.44	2.21***
<i>Education</i>								
Investment knowledge score	.35	.12***	.16	.12	-.01	.13	.08	.13
Graduate school	.670	.69	.96	.68	.53	.68	.17	.71
<i>Experience</i>								
Parents' saving habits			-.98	.26***	-.94	.26***	-.91	.26***
Held bank account before 18			-.56	1.03	-.70	1.01	.20	1.03
Held stock or bond before 16			1.50	.75**	1.37	.74*	1.83	.74***
Held stock or bond currently			3.88	.92***	3.62	.91***	3.52	.89***
Business owner			.04	.90	-.57	.90	-.44	.90
Home owner (Renter and live at home as reference group)			-.72	.79	-1.56	.79***	-1.11	.86
<i>Income and inheritance</i>								
Earned income (thousands)					.043	.001***	.047	.001***
Inheritance or Gift					1.22	1.01	1.35	1.01
<i>Demographic</i>								
Occupation—Business or Professional							-.17	.73
Black (White as reference group)							2.87	1.92
Asian							6.95	1.42***
Other races							8.48	2.14***
Male							-1.66	.71**
Age							.00	.05
Married (Divorced, separated, widow as reference group)							-.01	.72
<i>N</i>							1,039	1,039
Adjusted <i>R</i> ²							0.043	0.068
<i>F</i> -value [†]							6.27***	13.77***

* $p < .1$; ** $p < .05$; *** $p < .01$. [†] *F*-value if for comparison of restricted and unrestricted models, for example Model 1 (restricted) compared to Model 2 (unrestricted)

With the addition of experience variables in Model 2 through Model 4, observed parental savings behavior and investment asset ownership prove to be important factors in savings rates. The explanatory power of the investment knowledge score appears to be moderated by these experience variables. Interestingly, parents being observed as saving more than other families associated negatively with savings rates. For each increase in the 1–5 rating of parent savings, respondents appear to save almost 1% less. Holding stocks early (before age 16) relates to an approximate increase in the savings rate of 1.5%; whereas, currently holding stocks was associated with over a 3.5% increase in the household savings rate. Higher levels of income were also related to higher savings rates. Asians and other races appeared to save more compared to Whites, and men saved almost 2% less, on average, than their female counterparts.

Discussion and Implications

The current study replicates the Bernheim et al. (2001) study with the key addition of a college level personal finance course as an indicator variable. Whereas Bernheim et al. report the effects of high school personal finance education on savings rates, the current study examines the impact of both high school and college level personal finance education on investment knowledge and savings rates.

Findings from the hierarchical regressions lend support to the notion that participating in a college personal finance class improves investment knowledge. Participants who took a college course performed better on the investment knowledge test. Interestingly, participating in a personal finance class in college appears more effective in terms of enhancing one's investment knowledge than participating in a high school personal finance course.

This finding could be attributed to two important factors. First, it is much more likely that details on investment topics will be presented in a college level course than in a high school level course. Thus, it is somewhat expected that the college group would show higher knowledge in investments. Continued research in this area should use a more general measure of financial knowledge to account for known differences in curricula at the high school and college level.

Second, our results could be partially explained by the *teachable moment* maxim. It is reasonable to expect that as college students take on higher levels of personal financial responsibility, their interest in personal finances heightens and learning takes place. It is also likely that college age students are experiencing more challenges with finances as they pay bills, use credit cards, work more, consider savings, and manage student debt. These financial experiences are what Kolb (1984) describes as the fuel in the learning process. As college students face more financial challenges in conjunction with relevant instruction, the learning process may be enhanced.

More directly, Kolb's (1984) experiential learning model proposes that the most effective learning outcomes will be enhanced through personal involvement and concrete experiences in the subject at hand. Our results further corroborate this approach to learning as experience with bank accounts and investment assets proved to be strongly associated with both higher levels of investment knowledge and savings. Consequently, the link between one's investment knowledge and savings

rate remains tenuous. Knowledge, as a predictor in our savings rate models, lost its significance once experience, income and inheritance, and demographic variables were added to the model. Indisputably, more work needs to be done in order to improve individuals' knowledge of basic market and investment related issues; however, the results reported here do not support a strong link between investment knowledge and saving behavior.

Overall, and similar to the JumpStart surveys (Mandell, 2004), the results reported here again demonstrate a failing grade in our understanding of personal finance and investments. More well-designed personal finance courses can be introduced to college students and outcomes of improved knowledge appear attainable. Continued research needs to evaluate the lifetime impact of taking a personal finance course (either in college, high school, workplace or other setting) on the many dimensions of financial knowledge and other aspects of financial behavior beyond savings rates.

Finally, it is interesting to note that there was no significant relationship between investment knowledge and what amounts to essentially a double dose of financial education. Surprisingly, taking a class both in high school and college was not correlated with higher scores in investment knowledge. The fact that there was such a small number of respondents in the sample who had this double dose of education ($n = 47$) could explain this lack of association.

Cautions and Conclusions

Several limitations of this study should be acknowledged. First, the current study is based on a sample of alumni from a large midwestern university. Therefore, this sample does not mirror the general population with respect to educational, experiential, economic and/or demographic characteristics. Second, the use of a web-based survey, where participation was solicited by e-mail, precluded alumni who did not have an e-mail address on record with the alumni office. Unintended elimination of those with no e-mail address on file introduces a sample selection bias, though there is no clear reason why this bias would impact either the college or high school sample more than the other.

Furthermore, e-mail solicitation of survey participation typically leads to low response rates. Our response rate of approximately 12% was in line with expectations given the fact that the survey asks for financial information and could have been easily dismissed as junk e-mail by the targeted population. Alumni concerned about identity theft and online financial fraud may have been less likely to respond. Moreover, these non-respondents may be more financially knowledgeable than our respondents, biasing results in favor of those with lower levels of financial knowledge.

A third limitation relates to the actual content of the personal finance education received at the high school and college level. As no information on course content was collected, differences in course content somewhat blur the effects reported in the current study. Continued research should attempt to control for curriculum differences across settings.

Despite these limitations, the findings reported here corroborate what we know to be the multiple factors involved in explaining household savings. Of particular note

is the apparent impact of parent modeling of savings behavior, holding stocks before age 16, currently holding stocks, earned income and being either male or Asian. Though the association between investment knowledge and savings appears to be positive, the effect was moderated by financial experiences, income and demographic variables.

The main goal in this study was to examine the effect of high school and college personal finance courses on investment literacy. Upon establishing the link between courses and investment knowledge we explore the link between investment knowledge and savings behavior. The key findings show that personal finance courses offered in college improve adults' investment literacy. The findings indicate that greater investment knowledge was gained from a college personal finance class compared to a high school personal finance class. As an additional note of caution, one possible reason could be that many high school programs only take a few weeks, while college courses typically last entire quarters or semesters. Since the majority of financial education programs are aimed at helping high school students rather than college students, we believe the results of this paper can help increase awareness of the benefits of teaching personal finance in college and other settings (e.g. the workplace) with captive and engaged adult learners. With the national savings rate setting new record lows and student debt levels reaching record highs, it is important to study strategies for improvement. Based on the findings of this study, it appears that college level personal financial education classes may be one of the better available education based solutions.

Appendix

Ten-item NASD investment knowledge test

Test questions	Responses	
1. If you buy a company's stock...	a. The company will return your original investment to you with interest	3.1%
	b. You are liable for the company's debts	0.5%
	c. You own a part of the company	73.3%
	d. You have lent money to the company	4.6%
	e. Don't know/Not sure	18.5%
2. If you buy a company's bond...	a. You can vote on shareholder resolutions	2.9%
	b. You own a part of the company	1.5%
	c. You are liable for the company's debts	1.2%
	d. You have lent money to the company	62.9%
	e. Don't know/Not sure	31.6%
3. Which type of bond is the safest?	a. US Treasury bond	78.7%
	b. Municipal bond	1.7%
	c. Corporate bond	0.0%
	d. Don't know/Not sure	19.6%
4. Which of the following is the best definition for a "junk bond"?	a. A bond rated as "below investment-grade" by rating agencies	47.2%
	b. A bond that has declined dramatically in value	3.6%
	c. A bond that has defaulted	1.8%
	d. A bond that is not regulated	9.4%
	e. Don't know/Not sure	38.0%

Test questions	Responses	
5. In general, if interest rates go down, bond prices...	a. Go down	19.0%
	b. Go up	40.2%
	c. Are not affected	8.0%
	d. Don't know/Not sure	32.7%
6. A "no load" mutual fund is one that...	a. Carries no fees	28.6%
	b. Carries no sales charges	23.6%
	c. Does not contain high-risk securities	1.2%
	d. Has no limits on the period of time in which it can be bought and sold	3.1%
	e. Don't know/Not sure	43.4%
7. True or false? In general, investments that are riskier tend to provide higher returns over time than investments with less risk.	a. True	71.3%
	b. False	17.9%
	c. Don't know/Not sure	10.8%
8. Over the last 20 years in the US, the best average returns have been generated by...	a. Stocks	60.2%
	b. Bonds	3.0%
	c. CDs	1.1%
	d. Money market accounts	6.0%
	e. Precious metals	0.7%
	f. Don't know/Not sure	29.1%
9. What is a reasonable average annual return that can be expected from a broadly diversified US stock mutual fund over the long run?	a. 5%	15.7%
	b. 10%	47.3%
	c. 15%	8.7%
	d. 20%	1.9%
	e. 25%	0.6%
	f. Don't know/Not sure	25.9%
10. Which of the following organizations insures you against your losses in the stock market?	a. NASD (National Association of Securities Dealers)	0.60%
	b. SIPC (Securities Investor Protection Corporation)	4.60%
	c. FDIC (Federal Deposit Insurance Corporation)	6.20%
	d. SEC (Securities and Exchange Commission)	10.80%
	e. None of the above	52.90%
	f. Don't know/Not sure	24.90%

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