

# Improving collegiate financial literacy via financial education seminars

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## Abstract

This paper describes a personal finance program (PFP) developed at a private liberal arts university aimed to improve financial literacy. We provide a program overview, with details about recruiting, program structure, and curriculum. Using a multivariate framework, we examine program effectiveness at improving students' financial knowledge and confidence in their financial future. Our findings demonstrate that financial knowledge and confidence improve. Additionally, women (minorities) narrow their financial knowledge and confidence gaps when compared with men (Caucasians) and the control group. Finally, follow-up analyses show that increases in confidence appear justified (vs. misplaced) in that they are calibrated to increases in knowledge. © 2021 Academy of Financial Services. All rights reserved.

*JEL classifications:* G0; G5; I3

*Keywords:* Financial literacy; Education; Retirement planning; Personal finance

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## 1. Introduction

As this paper was being written, the coronavirus disease 2019 (COVID-19) pandemic was ravaging the globe, bringing with it not only illness but significant economic uncertainty. In

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the United States, state and local governments closed businesses deemed “non-essential.” World-wide responses were similar, as countries placed travel restrictions on their citizens and enacted various economic restrictions (<https://www.aljazeera.com/news/2020/03/coronavirus-travel-restrictions-border-shutdowns-country-200318091505922.html>). The closures brought massive unemployment and income loss.

While much about the pandemic was and remains uncertain, one consistent issue was and is apparent: most individuals and families were unprepared for such an economic shock. One likely explanation for the lack of preparedness is low financial literacy levels, which has been documented in a variety of studies (Lusardi & Mitchell, 2014). It is imperative that tools be developed to improve personal financial literacy and that these tools be implemented quickly and in as many forums as possible.

Although this study began well before the COVID-19 pandemic, the pandemic serves as an important reminder that financial literacy is essential for a highly functioning society. Each day, individuals and households make financial decisions that have greater and further-reaching consequences. Households must manage their consumer credit levels (currently over \$4 trillion in the United States, see <https://www.federalreserve.gov/releases/g19/current/> as of April 2020), including credit cards, student loans, car payments, and other miscellaneous debt finances, as well as mortgage debt. Households must manage savings and spending decisions and decide what investment types should be utilized. Finally, households must plan for, set aside money for, and make investment decisions about retirement, a responsibility unheard of a generation ago. Therefore, while households are advantaged by increased access to financial markets, they must first have the financial knowledge necessary to interact with such markets or risk potentially drastic financial consequences.<sup>1</sup>

Additionally, individuals must have confidence in their ability to make these decisions effectively and manage their financial future. For example, research (Farrell, Fry, & Risse, 2016) shows that women’s confidence in their financial capabilities predicted positive financial behaviors (i.e., they were more likely to have financial products related to saving and investing funds). At the same time, other research suggests that if confidence is overblown and not commensurate with knowledge, this could lead to poor decision making and engaging in costly behaviors (Krueger & Dunning, 1999; Toker Asad, 2015).

Unfortunately, existing research shows that generally, people lack financial knowledge and confidence. For example, the 2004 Health and Retirement Study (HRS) finds that among older individuals, financial knowledge is quite low, with only 34.3% of respondents correctly answering a series of three questions regarding financial calculations, and only 70% answering two of the three questions correctly (Lusardi & Mitchell, 2011). These same three questions have been used in other studies gauging financial knowledge (e.g., the RAND American Life Panel; Lusardi & Mitchell, 2011, 2017; Lusardi, Mitchell, & Curto, 2010). All of these studies report findings similar to the HRS study: financial knowledge in the United States is quite low. For an exhaustive literature review documenting low financial knowledge levels, see Lusardi and Mitchell (2014).

Thus, in our research, we presume that financial knowledge is low and that it needs to improve. As such, the current study explores the effectiveness of a financial education program for graduating seniors at a liberal arts university intended to improve participant financial literacy. The program was developed because the institution had limited offerings of a for-credit Personal Finance

course. On average, there was annual capacity for approximately 25 students in the for-credit course, but it was common for the course to be oversubscribed by 100 or more students. The personal finance program (PFP) was developed to address the gap in offering this kind of course and provide a controlled opportunity to assess its effectiveness in increasing financial literacy.

We define financial literacy as “people’s ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions” (Lusardi & Mitchell, 2014). This definition encompasses two critical dimensions: knowledge *and* behavior. Most research focuses on knowledge or attempts to infer behavior from data such as the Survey of Consumer Finances. Or, previous research associates higher knowledge with “better” behaviors (e.g., Fox, Bartholomae, & Lee, 2005; Henager & Cude, 2016; Lusardi, 2008), but due to the correlational nature of that research, the conclusions are inferences at best. To our knowledge, there is no work directly examining programs aimed at improving knowledge and any subsequent behavioral changes that follow. The current study addresses the first step in increasing financial literacy. That is, we measure baseline levels of financial knowledge for a treatment group and a control group, then expose the treatment group to the PFP, and then measure financial knowledge again for both groups.

We also measure changes in confidence level. As described above, there are competing predictions about the potential benefits of increasing confidence along with knowledge. Nonetheless, research seems to agree upon the notion that increased confidence is a benefit, as long as it is matched with increased knowledge. Indeed, Toker Asad (2015) summarized, that “financial literacy initiatives should focus not only on factual knowledge, but on helping individuals achieve a healthy dose of confidence.” Thus, we ask participants how confident they are in managing their financial future (not how confident they are in their answers or knowledge) and can assess if this increases alongside actual financial knowledge.

To summarize, the current research gauges the PFP’s efficacy in improving financial knowledge and increasing confidence in the ability to manage one’s financial future. Using multivariate regression techniques, our analysis finds that program participants improve both financial knowledge and confidence about their financial future, after controlling for other factors that might influence these outcomes for college students. The results suggest that, although PFP and control group participants do not differ in knowledge at baseline, PFP participants show significantly higher financial knowledge levels from the pre- to the post-test, as well higher financial knowledge than control subjects after completing the PFP. The findings for participants’ confidence in their ability to manage their financial future are similar; participants are more confident about their financial outlook compared with before the PFP, and the control group shows no change in confidence over time. On the surface, the finding about improved confidence may seem suspect, given that people are often overconfident about their financial future. However, additional analysis demonstrates that seminar participants not only increase their confidence, but that this increase is calibrated with increases in knowledge level, a result not found for the control group.

A particularly encouraging set of findings relate to participant gender and minority classification. According to pre-PFP survey results, and consistent with prior work (Lusardi & Mitchell, 2014 and others), individuals who are female or represent a minority group scored significantly lower on the financial knowledge test. However, participation in the PFP program largely eliminates the knowledge gap between women and men and between

minorities and Whites. Additionally, women and minorities significantly improve their confidence in managing their financial future after completing the PFP.

These findings suggest that this program (1) is a valid tool for improving financial knowledge that others should consider employing and (2) provides evidence that a follow-up study linking increased knowledge and confidence more directly to financial behaviors is worthwhile. As such, the PFP series is the first step in a long-term research program in which students will be surveyed after graduation to ascertain whether students participating in the PFP demonstrate better financial behaviors than students who do not. That research is currently underway.

The remainder of this paper is organized as follows: Section 1 overviews the PFP, including the recruitment process, seminar structures, and curriculum. Section 2 reviews the literature regarding financial knowledge and literacy. Section 3 details the survey instruments used in the study. Section 4 discusses hypothesis development, introduces the empirical model and provides a preliminary analysis of data. Section 5 empirically evaluates the effectiveness of the PFP in a multivariate framework. Section 6 provides conclusions.

## **2. Section 1: PFP overview and research method**

The PFP was developed and has been taught by a team of faculty for seniors at a private liberal arts college over the 2017-2019 period.<sup>2</sup> The program consists of six individual sessions (the curriculum is described below) and is strictly voluntary, with students attending as many or as few sessions as they wish. Programs are normally offered during the fall and spring semesters, one night per week for six weeks in a face-to-face format.

Senior-class student participants are solicited at the beginning of each semester via an email outlining the program content and voluntary time commitment. Additionally, an email is sent to the parents of seniors detailing the program. Only seniors are recruited for the program because they are about to face the challenges of real-world financial choices. Anecdotally, program developers found that seniors begin to take financial issues more seriously as they realize that they will soon be in the “real world.” Indeed, students generally report that they sign-up for the program because they believe learning the information is important (i.e., a question on the seminar participant presurvey asks if students are attending because “My parents ‘gently’ encouraged me,” “I heard about it from past participants,” or “I recognize that I need to know about these topics.” Almost 75% report that they participate because they recognize that they need to know about the topics). Students have approximately two weeks to register and several reminder emails are sent out as the deadline approaches.

From the seniors not participating in the PFP, a control sample is recruited. Before the first seminar session, both control and treatment groups are introduced to the logistics and purpose of the research portion of the program, and are asked to complete two on-line surveys (for students in the PFP, these occur before and after they take the course). The control group receives a survey approximately six weeks after the initial survey. In addition to demographic information, a series of 20 questions is used to assess financial knowledge levels. When participants indicate they want to participate, they complete the presurvey online.

Each PFP session has a lecture format, but students are encouraged to ask questions. Although there is some curriculum variance across program offerings each semester, it is minimal, as the same slides are used during each program offering to maintain curriculum consistency. The curriculum covers budgeting, credit management, risk and return, mutual funds, retirement planning, and risk management (insurance). These topics were chosen based on their relevance to this particular age group and their relationship to the four areas identified by Huston (2010) as being critical to financial literacy. A summary of each module is provided in Appendix. The underlying theme across each module is to develop the students' knowledge necessary to maximize their "net worth" or their "wealth" over their lifetime. This message is stressed at the beginning and end of each session. Additionally, faculty discuss how each topic relates to net worth. Each session begins with a review of the previous week's session and time to ask questions about prior material. Sessions end with a summary of the current week's information, along with more time to ask questions.

Shortly after the last session, students (participants and control students) are asked to voluntarily complete the postsurvey containing approximately 50 questions, including the same questions in the presurvey measuring financial knowledge. Thus, the change in score on this knowledge survey determines the efficacy of the instructional program. Participants and control students receive \$10 in compensation for each survey they complete.

### 3. Section 2: Literature review

The focus of the current study is to test whether students participating in the PFP improve what many prior studies refer to as financial literacy—what we refer to as financial knowledge. Huston (2010) demonstrates that in prior research, terms such as financial knowledge, financial education, and financial literacy have been used interchangeably. Beginning with the National Endowment for Financial Education summit in 2005, a consensus began to develop that financial literacy has two distinct elements: a financial knowledge component *and* the measurement of actions/behavior based on that financial knowledge.<sup>3</sup> In other words, to truly evaluate financial literacy, one must evaluate knowledge *and* behavior. Furthermore, most academic literature measures financial behavior or knowledge independently from one another, or infers a relationship between financial knowledge and current financial behaviors (e.g., see Allgood & Walstad, 2013; Gerardi, Goette, & Meir, 2013; Henager & Cude, 2016). As discussed previously, we distinguish between financial knowledge and financial literacy in this study, focusing on financial knowledge.

Huston and others note that research on financial knowledge inconsistently represents and measures knowledge. Huston (2010) identifies four content areas that have been and should be addressed with financial education: money basics, borrowing, investing, and insurance. Nonetheless, he reports that 35% of studies address only one content area, 40% address two or three areas, but only 25% address all four content areas. The PFP specifically addresses all four content areas leading to a more robust evaluation of financial knowledge. Similarly, researchers (Association for Financial Counseling and Planning Education, 2006; Bosshardt & Walstad, 2014; Huston, 2010; Knoll & Houts, 2012) lament the fact that studies measuring financial knowledge often use widely different questions to measure it. Huston (2010) finds that researchers use three to 45 questions, with most studies using three to five, largely

centered on money basics and investing, to measure knowledge. Knoll and Houts (2012) address this issue and developed a knowledge test of 20 questions from past research that is psychometrically validated using Item Response Theory and covers each content area identified in Huston (2010).<sup>4</sup> We use those same questions for our knowledge test.

#### **4. Section 3: Survey construction**

In addition to the knowledge questions from Knoll and Houts (2012), the pre-seminar survey instrument captures demographic information. For the student, we capture gender, race, age, college major, whether the student is a student-athlete, as well as the sources/weights of how they pay for college: grants, loans, parent, or self. In addition to the student demographic data, we collect data about parents. For example, the students provide information about household income, parent educational attainment, and parent profession. The demographic information is not repeated on the post-seminar instrument.

One of the unique benefits of our study design is that the survey poses questions that address a variety of psychological characteristics that may impact whether students choose to participate in the program and that may influence the student's propensity to develop their financial knowledge. Equally important, we ask a series of questions targeted at ascertaining the students' confidence in their post-college financial future, confidence in each of the topics to be covered in the PFP, whether or not the student has experienced any health or financial stress during the period before the seminar, and what the student's overall perception of how satisfied they are with their lives. The questions related to the psychological characteristics and confidence are repeated in the postsurvey instrument.

Our interest in student confidence is intentional. While some prior work indicates that individuals have misplaced confidence in their financial knowledge (e.g., Toker Asad, 2015), our focus is on whether students are confident about their ability to manage their financial future, not confidence in their responses to knowledge questions. We examine whether the PFP has an impact on this type of student confidence.<sup>5</sup> To the extent that the statement "knowledge is power" is true, then the PFP may lead to an improvement in students' perception that they can manage their financial future. Our research design allows us a unique way to assess whether confidence is justified or overblown. If there is an increase in financial confidence without an improvement in financial knowledge, we would be reluctant to classify the program as a success. However, if we see an increase in confidence with a corresponding improvement in financial knowledge, we will be more emboldened to consider this stage of the research successful, warranting further analysis of behaviors.

#### **5. Section 4: Hypothesis development, empirical model, and summary statistics**

##### *5.1. Section 4.1: Hypotheses*

The primary purpose of the PFP program is to improve college student financial literacy as measured through an evaluative survey and ultimately behaviors. Thus, the foundational

hypothesis is that the program will improve financial knowledge for our participants (treatment) and that no similar increase would be found for the control group (future research will address changes in behaviors after the program.) Specifically:

*Hypothesis 1:* After participating in the PFP, participants (treatment group) will score higher on the financial knowledge portion of the post-survey than they did on the pre-survey AND non-participants (control group) will show no improvement from the pre- to post-test.

Prior research demonstrates that women have lower financial knowledge levels than men (e.g., Lusardi & Mitchell, 2007; Lusardi & Tufano, 2009; Lusardi et al., 2010). A program that effectively improves financial literacy should do so for all. As such, Hypothesis 2 states:

*Hypothesis 2:* Female PFP participants will score no differently than male participants on the financial knowledge portion of the post-survey following completion of the PFP, that is, assuming women will score lower on the pre-survey (as has been found in previous research), with exposure to the seminar, female participants will close this knowledge gap with their male PFP peers.

As with gender, prior research shows that minorities exhibit lower levels of knowledge than their peers (e.g., Lusardi & Mitchell, 2007, 2011). A successful program should help close or eliminate this gap if effective. As such, Hypothesis 3 states:

*Hypothesis 3:* Minority PFP participants will score no differently than White peers on the financial knowledge portion of the post-survey following completion of the PFP program, that is, assuming minority participants will score lower on the pre-survey (as has been found in previous research), with exposure to the seminar, minority participants will close the knowledge gap with their White peers.

PFP is available only to senior undergraduate students. The transition from college into the next phase of life, traditionally either graduate school or into a job environment, requires a significant change in one's level of independent financial decision-making. Those students who perceive themselves to be less prepared for such a transition are likely to face increased anxiety and lower confidence regarding their financial future, which could increase the likelihood of students failing to act on important financial decisions. If PFP effectively improves financial knowledge, then we would predict that confidence in the ability to manage one's financial future may also increase. Note that this confidence metric does not gauge a student's confidence in how they answered the financial knowledge questions, but the student's confidence in their ability to manage their financial future after college. The survey question used to gauge their confidence is "I consider myself to be \_\_\_\_\_ about managing my personal finances after college," with five responses ranging from "Not at all confident" to "Extremely confident." Based on responses to this question from the pre and post PFP surveys, Hypothesis 4 states:

*Hypothesis 4:* PFP participants (treatment) will express higher levels of confidence regarding their future financial outlooks in the post-survey relative to the pre-survey, and non-participants (control) will see no such change.

### 5.2. Section 4.2: Empirical model (see Table 2 for a summary of variable definitions)

A significant strength of this research relative to prior work is the pretest, post-test design with a control group comparison. Thus, the authors utilize a multivariate difference-in-difference regression to analyze the program's effectiveness. The model is as follows:

$$\begin{aligned} FinLitVar = & \alpha + \beta_1 PostPFP Dummy + \beta_2 Treatment + \beta_3 (Treatment * Pst) \\ & + \beta_4 Gender + \beta_5 (Gender * Post) + \beta_6 Minority \\ & + \beta_7 (Minority * Post) + \sum \beta_j Characteristics_j + \varepsilon_i \end{aligned} \quad (1)$$

*FinLitVar* represents the dependent variable of interest, which is either *KnowScore*, the number of correct financial knowledge questions answered on the student survey, or *Confidence*, a student's confidence level regarding their future financial outlook. *Post* is a dummy variable that equals 1, reflecting survey results submitted after PFP completion and 0 otherwise. Both the treatment group and the control group submit the survey results shortly after the completion of the PFP. *Treatment* is a dummy variable equal to 1 if the survey results are submitted by a student who *did* participate in the PFP program and 0 otherwise. *Gender* represents a student's self-reported gender. Though students were provided options of "transgender," "other," and "prefer not to answer," all participants selected either male or female; thus, *Gender* is a dummy variable equal to 1 if female and 0 otherwise. *Minority* is a dummy variable equal to 1 if the student self-identified as belonging to a minority race and 0 otherwise.

*Characteristics* represents a series of control variables with the following description. *GPA* is a student's grade point average based on a traditional 4.0 scale at the end of the students' junior year. These are official GPA's provided by the university, not self-reported. When *KnowScore* is the dependent variable, we expect *GPA* to be positive. If higher grades promote self-confidence generally, then *GPA* may be positively correlated with a student's confidence in their ability to manage their financial future. Alternatively, stronger academic students may have a greater appreciation for the significance of these issues that manifests itself in lower confidence. *Loanperc* is the student's self-reported level of student loan debt to total college cost, and *Selfperc* is the amount of education costs being covered by the student, but not in the form of student loans or paid by a parent, both stated as a percentage of total college costs. Each of these measures accounts for financial factors that might be correlated with knowledge and confidence. We argue that students who finance more of their education with debt will have lower knowledge scores and lower levels of confidence in their financial future. We expect the opposite (a positive relationship) with the dependent variables for *Selfperc*.

*Income* is a categorical variable ranging from one to six, representing ranges of family income, with a minimum category of less than \$25,000 and a maximum category of more than \$150,000. While prior studies (Lusardi & Tufano, 2009) show respondents with lower incomes have lower levels of financial knowledge, our inclusion of *Income* is a proxy measure since it is not the student's income being measured. However, if lower household incomes mean financial knowledge is not transferred, then the students from these



households may also exhibit lower scores. We expect students from higher earning families to have more confidence in their financial future. *ECNBUSACC* is a dummy variable equal to 1 if the student is majoring in either economics, business administration, or accounting (the university does not offer the full range of business degrees) and 0 otherwise. We expect students from these majors to have higher levels of knowledge and confidence, in part due to their exposure to the seminar contents within their disciplines.

The next control variable is unique. Students were asked “How much do you think you will need to retire?” Upon initial data examination, a nontrivial number of students chose not to answer the question.<sup>6</sup> After significant thought, the authors hypothesized that the students that did not answer the question may be particularly at risk in terms of their financial knowledge and confidence. *NoRetAns* is a dummy variable equal to 1 if a student did not answer the survey question about the amount needed for retirement and 0 otherwise. We expect an inverse relationship between *NoRetAns* and both dependent variables, *KnowScore* and *Confidence*.

*FinServ* is a dummy variable equal to 1 if a student responded that either (or both) parent (s) work in the financial services industry. These parents may be more likely to pass on knowledge and develop confidence in their students relative to parents in other professions, so we expect a positive relationship to the dependent variables. Finally, *NeedCog* stands for the psychological construct “Need for Cognition,” which captures individual differences in how much people engage in and enjoy thinking, measured by an 18-item scale (see Cacioppo & Petty, 1982). Example items include, “I find satisfaction in deliberating hard and for long hours,” and “I only think as hard as I have to – reverse-scored.” Each question uses a 5-point Likert scale for answers. So, *NeedCog* can range from 0 to 90. Unlike Lusardi et al. (2010) that control for cognitive *abilities*, our measure captures a student’s propensity to be open to learning and deep thinking, factors pertinent to participating in an educational program. We expect students with a higher need for cognition to actively seek knowledge generally and that includes financial knowledge. As such, we expect a positive relationship between *NeedCog* and *KnowScore*. The predicted relationship to *Confidence* is less clear. If a student’s need for cognition leads them to seek out information about financial issues, that could lead to more confidence. Conversely, students with a higher need for cognition may recognize the weighty nature of financial topics in a way that leaves them less confident.

In addition to the variables just discussed, the following variables are used when *Confidence* is the dependent variable. *Health* is the sum of the responses (on a Likert 5-point scale) to two questions regarding student health, one that asks if the student has experienced significant emotional or mental health issues in the past month and the other that asks whether the student has experienced significant financial distress in the past month. Students that have experienced high levels of stress may also report less confidence in their ability to manage their financial future. *LifeSat* is the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) that measures subjective global well-being and is a composite measure of five questions, each of which has responses on a 7-point Likert scale. Students with low satisfaction levels are expected to have lower levels of confidence in their financial future.

For our primary analysis, we estimate Eq. (1) using ordinary least squares with a difference-in-difference model to help mitigate the inherent endogeneity based on a student’s choice to participate in the PFP. Roberts and Whited (2013) recommend this approach when

the sample has both a treatment and control group, but also when there is a pretreatment and post-treatment measurement of the treatment effect (participation in the PFP), which exactly describes our research design. That is, both treatment and control participants have pre-PFP knowledge scores (confidence scores) and post-PFP knowledge (confidence scores), thereby doubling the number of observations from 161 (158) to 322 (316). With this approach that is able to control for baseline measures of knowledge and confidence, any findings associated with the treatment effect can be unbiasedly attributed to the treatment.

While we use the least squares methodology as our primary statistical technique, we also estimate Eq. (1) for the dependent variable *Confidence* using the ordered probit technique. Because *Confidence* is measured as a value from 1 to 5, the assumption of linear change between values implied by the least squares technique may not hold. To account for the possibility of this nonlinear movement between values, the ordered probit technique is employed as a robustness check. As noted below, the results demonstrate that the variables of interest have the same statistical and directional effects using both techniques; however, we choose to discuss our results in the context of the least squares technique due to its more straight-forward interpretation.

### 5.3. Section 4.3: Preliminary data analysis

#### 5.3.1. Section 4.3.1. data analysis sample construction

The first delivery of the PFP occurred in fall 2017 and was delivered successively in the spring 2018, fall 2018, spring 2019, and fall 2019 semesters. While over 500 students (program participants and control respondents) initiated a pre-seminar survey over the course of the five semesters, only 161 (158) completed both surveys with all of the required data needed to estimate Eq. (1) above for *KnowScore (Confidence)*. In total, for the semesters identified above, there are 10, 2, 17 (15), 12, and 50 (49) control respondents respectively for *KnowScore (Confidence)* and 18, 11, 15, 5, and 21 PFP participants, respectively, from the same semesters. As is evident from the usable responses in each semester, statistical analysis required the aggregation of respondents across semesters. However, we do control for any semester differences that might be present by including a dummy variable representing each semester except fall 2017. In no case are the semester dummies statistically significant. We use these samples in the analysis discussed in Tables 2-6. The exception to this is the results in Table 1, which analyzes the characteristics that predict PFP participation, a subject to which we now turn.

#### 5.3.2. Section 4.3.2.: Predicting PFP participation

While our primary interest is in the impact of the PFP on financial knowledge and confidence, a unique characteristic of this program is that students self-select into the program, and it is completely voluntary. As such, we first examine a logit model to determine if there are student characteristics that predict participation. The dependent variable has a value of 1 if the student participates in the PFP and 0 otherwise. The variables used are discussed above. For this analysis, we use all observations (428 total, 222 control respondents, and 206 seminar participants) that have the necessary data to estimate the logit model from pre-seminar survey data. We believe the results may be specific to the population of students served; therefore, we draw no generalized conclusions from the analysis. However, the results are of

Table 1 Logit model predicting PFP participation

Variables	(1) Treatment
<i>KnowScore</i>	−0.0649 (0.0550)
<i>GPA</i>	−0.157 (0.288)
<i>Confidence</i>	−0.697*** (0.139)
<i>Gender</i>	0.620** (0.304)
<i>ECNBUSACC</i>	0.687 (0.369)
<i>Loanperc</i>	−0.287 (0.823)
<i>Selfperc</i>	1.017 (2.141)
<i>Minority</i>	−0.803 (0.447)
<i>Income</i>	−0.141 (0.0965)
<i>NeedCog</i>	0.0143 (0.0115)
<i>FinServ</i>	0.351 (0.319)
<i>NoRetAns</i>	−1.059*** (0.396)
<i>Recent Emotional/Mental Distress</i>	−0.244** (0.1000)
<i>Recent Financial Distress</i>	−0.0988 (0.124)
<i>LifeSat</i>	0.0603** (0.0236)
Observations	428

This table presents results from estimating a logit regression to predict student participation in personal finance program (PFP). The model takes the form:

$$\text{Logit}(P(Y = 1|x_1, \dots, x_k)) = [\exp(\beta_0 + \beta_1x_1 + \dots + \beta_nx_n)]/[1 + \exp(\beta_0 + \beta_1x_1 + \dots + \beta_nx_n)]$$

The dependent variable (Y) is *Treatment* equal to 1 if the student participates in PFP and 0 otherwise. *KnowScore* is a student’s score on the 20 question knowledge test before the seminar. *GPA* is the student’s GPA at the end of the junior year, on a 4-point scale. *Confidence* is how the student perceives their confidence in their financial future after college and ranges from 1 (*not at all*) to 5 (*extremely*). *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (*low*) to 6 (*high*) capturing the student’s household income. *NeedCog* is a composite measure ranging from 0-90 that captures a student’s propensity to engage cognitive activities. *FinServ* is a dummy equal to 1 if one or both of a student’s parents work in the financial services industry and 0 otherwise. *NoRetAns* is a dummy equal to 1 if the student did not answer the question “How much do you think you will need to retire?” and 0 otherwise. *Recent Emotional/Mental Distress* identifies whether the student has experienced significant emotional or mental distress in the previous 30 days and an estimate of the severity, ranging from 1 (*low*) to 5 (*high*). *Recent Financial Distress* identifies whether the student has experienced significant financial distress in the previous 30 days and an estimate of the severity, ranging from 1 (*low*) to 5 (*high*). *LifeSat* is a composite measure ranging from 5-25 that expresses a student’s satisfaction with their life at the time of the pre-survey.

Note: Standard errors in parentheses.

\*\*\**p* < 0.01, \*\**p* < 0.05.

Table 2 Summary descriptive statistics

Variables	(1) Matched sample	(2) Treatment only	(3) Control only
<i>Pre KnowledgeScore</i>	14.23 (2.473)	14.19 (2.342)	14.26 (2.581)
<i>Post KnowledgeScore</i>	14.832 <sup>***</sup> (2.916)	15.343 <sup>***</sup> (2.513)	14.44 (3.149)
<i>Pre Confidence in Future</i>	2.684 (1.004)	2.357 (0.885)	2,943 (1.021)
<i>Post Confidence in Future</i>	3.184 <sup>***</sup> (0.843)	3.357 <sup>***</sup> (0.638)	3.045 (0.958)
<i>GPA</i>	3.439 (0.427)	3.462 (0.435)	3.422 (0.423)
<i>Gender</i>	0.696 (0.462)	0.757 (0.432)	0.648 (0.480)
<i>Loanperc</i>	0.073 (0.149)	0.053 (0.117)	0.088 (0.168)
<i>Selfperc</i>	0.022 (0.076))	0.02 (0.072)	0.024 (0.080)
<i>Minority</i>	0.0683 (0.253)	0.0714 (0.259)	0.0659 (0.250)
<i>Income</i>	4.783 (1.298)	4.786 (1.250)	4.780 (1.340)
<i>ECNBUSACC</i>	0.236 (0.426)	0.243 (0.432)	0.231 (0.424)
<i>NoRetAns</i>	0.0683 (0.253)	0.0714 (0.259)	0.0659 (0.250)
<i>FinServ</i>	0.168 (0.375)	0.157 (0.367)	0.176 (0.383)
<i>NeedCog</i>	62.35 (11.02)	61.76 (11.26)	62.81 (10.88)
<i>Proportion of Sample Control</i>	0.565 (0.497)		
Observations	161	70	91

This table presents summary descriptive statistics for variables in the *KnowScore* and *Confidence* analysis. *KnowScore* is a student's score on the 20 question knowledge test. *Confidence* is the reported measure of a student's confidence in their ability to manage their financial future ranging from 1-5. *Pre* and *Post* identify either the pre-seminar or post-seminar measurement. All of the control variables listed below are captured in the pre-survey and are means for all PFP participants and control respondents that completed both surveys (column 1), the Treatment group separately that completed both surveys (column 2), and the Control group separately that completed both surveys (column 3). *GPA* is the student's GPA at the end of the junior year, on a 4-point scale. *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (*low*) to 6 (*high*) capturing the student's household income. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *NoRetAns* is a dummy equal to 1 if the student did not answer the question "How much do you think you will need to retire?" and 0 otherwise. *FinServ* is a dummy equal to 1 if one or both of a student's parents work in the financial services industry and 0 otherwise. *NeedCog* is a composite measure ranging from 0-90 that captures a student's propensity to engage cognitive activities. *Proportion of Sample Control* is the percentage of non-participants in the matched sample.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

interest because they may help in recruiting efforts for underrepresented or vulnerable groups in the future. The results are presented in Table 1.

Neither a student's pre-seminar financial knowledge score or GPA are correlated with students participating in the PFP. Thus, students who have more financial knowledge, or who generally perform well academically, are no more inclined to participate in the program than those with less knowledge or academic proclivity. However, students who are more confident in their ability to manage their financial future are significantly less likely to participate in the PFP. The coefficient for *Confidence* is negative and statistically significant at better than 1%. One interpretation is students with low levels of confidence in making future financial decisions make a wise choice to attend the PFP. Alternatively, those that choose not to participate in the seminar may have a false sense of confidence (e.g., Toker Asad, 2015). Our measure does not allow us to distinguish between these two alternatives. Of course, attending the PFP and benefitting from it are not the same, but at least those students who

Table 3 Financial KnowledgeScore and PFP participation

Variables	(1)	(2)	(3)	(4)
<i>Post PFP Dummy</i>	0.572** (0.250)	1.175*** (0.346)	−0.0401 (0.456)	0.700*** (0.252)
<i>GPA</i>	1.093*** (0.360)	1.092*** (0.358)	1.093*** (0.359)	1.097*** (0.356)
<i>Gender</i>	−0.967*** (0.287)	−0.968*** (0.288)	−1.407*** (0.364)	−0.964*** (0.287)
<i>Loanperc</i>	−0.222 (0.871)	−0.223 (0.873)	−0.222 (0.866)	−0.217 (0.857)
<i>Selfperc</i>	−0.0371 (2.012)	−0.0543 (1.951)	−0.0381 (1.999)	0.0280 (2.012)
<i>Minority</i>	−2.519*** (0.786)	−2.521*** (0.766)	−2.519*** (0.783)	−1.512** (0.684)
<i>Income</i>	0.172 (0.105)	0.172 (0.105)	0.172 (0.105)	0.172 (0.105)
<i>ECNBUSACC</i>	2.083*** (0.279)	2.084*** (0.277)	2.083*** (0.279)	2.083*** (0.278)
<i>NoRetAns</i>	−0.990 (0.717)	−0.956 (0.707)	−0.988 (0.710)	−1.12 (0.665)
<i>FinServ</i>	0.127 (0.346)	0.126 (0.344)	0.127 (0.342)	0.131 (0.349)
<i>NeedCog</i>	0.0456*** (0.0116)	0.0456*** (0.0115)	0.0456*** (0.0114)	0.0456*** (0.0116)
<i>Treatment</i>	0.554 (0.284)	0.0233 (0.337)	0.554 (0.285)	0.55 (0.282)
<i>Treat*Post</i>		1.062** (0.494)		
<i>Gender*Post</i>			0.880 (0.543)	
<i>Minority*Post</i>				−1.995 (1.279)
Observations	322	322	322	322
R <sup>2</sup>	0.361	0.370	0.367	0.369

This table presents results from estimating the following equation

$$FinLitVar = \alpha + \beta_1 Post\ PFP\ Dummy + \beta_2 Treatment + \beta_3 (Treatment * Post) + \beta_4 Gender + \beta_5 (Gender * Post) + \beta_6 Minority + \beta_7 (Minority * Post) + \sum \beta_j Characteristics_j + \varepsilon_i.$$

where *KnowScore* is the dependent variable. *KnowScore* is a student’s score on the 20 question knowledge test. For each respondent in our sample there are two observations, one representing the pre-seminar survey responses and the other the post-seminar responses. *Post PFP Dummy* equals 1 if the observation represents the post personal finance program (PFP) knowledge score observation for a student and 0 otherwise. *GPA* is the student’s GPA at the end of the junior year, on a 4-point scale. *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (*low*) to 6 (*high*) capturing the student’s household income. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *NoRetAns* is a dummy equal to 1 if the student did not answer the question “How much do you think you will need to retire?” and 0 otherwise. *FinServ* is a dummy equal to 1 if one or both of a student’s parents work in the financial services industry and 0 otherwise. *NeedCog* is a composite measure ranging from 0-90 that captures a student’s propensity to engage cognitive activities. *Treatment* is equal to 1 if the student participates in PFP and 0 otherwise. *Treat\*Post*, *Gender\*Post*, and *Minority\*Post* are interaction terms between *Treatment*, *Gender*, *Minority*, and *Post PFP Dummy*.

Note: Robust standard errors in parentheses.

\*\*\**p* < 0.01, \*\**p* < 0.05.

are less confident take actions to address their concerns. Women are significantly (at the 5% level) more likely to participate in the program. This finding is encouraging given that women have historically shown lower levels of financial knowledge than men, a result we confirm with pre-PFP data.

Table 4 Financial *KnowScore* and PFP participation

Variables	(1)	(2)	(3)
<i>Post PFP Dummy</i>	0.113 (0.352)	0.510** (0.257)	0.117 (0.351)
<i>GPA</i>	1.091*** (0.359)	1.133*** (0.358)	1.126*** (0.357)
<i>Gender</i>	−1.088*** (0.337)	−0.973*** (0.286)	−1.118*** (0.335)
<i>Loanperc</i>	−0.166 (0.865)	−0.153 (0.870)	−0.0933 (0.862)
<i>Selfperc</i>	−0.184 (1.962)	−0.107 (2.045)	−0.271 (1.998)
<i>Minority</i>	−2.509*** (0.771)	−3.008*** (0.902)	−2.939*** (0.897)
<i>Income</i>	0.169 (0.105)	0.172 (0.104)	0.168 (0.104)
<i>ECNBUSACC</i>	2.078*** (0.277)	2.095*** (0.279)	2.088*** (0.277)
<i>NoRetAns</i>	−0.935 (0.705)	−0.926 (0.743)	−0.879 (0.731)
<i>FinServ</i>	0.135 (0.342)	0.0928 (0.347)	0.107 (0.342)
<i>NeedCog</i>	0.0461*** (0.0115)	0.0445*** (0.0116)	0.0453*** (0.0115)
<i>Treatment</i>	0.0370 (0.339)	0.479 (0.278)	0.0406 (0.342)
<i>Fem*Treat*Post</i>	1.196** (0.530)		1.090** (0.532)
<i>Male*Treat*Post</i>	0.648 (0.629)		0.427 (0.630)
<i>Minority*Treat*Post</i>		2.137** (1.007)	1.889 (0.997)
Observations	322	322	322
$R^2$	0.372	0.368	0.377

This table presents results from estimating Eq. (1) where *KnowScore* is the dependent variable. *KnowScore* is a student's score on the 20 question knowledge test. For each respondent in our sample there are two observations, one representing the pre-seminar survey responses and the other the post-seminar responses. *Post PFP Dummy* equals 1 if the observation represents the post personal finance program (PFP) knowledge score observation for a student and 0 otherwise. *GPA* is the student's GPA at the end of the junior year, on a 4-point scale. *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (low) to 6 (high) capturing the student's household income. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *NoRetAns* is a dummy equal to 1 if the student did not answer the question "How much do you think you will need to retire?" and 0 otherwise. *FinServ* is a dummy equal to 1 if one or both of a student's parents work in the financial services industry and 0 otherwise. *NeedCog* is a composite measure ranging from 0-90 that captures a student's propensity to engage cognitive activities. *Treatment* is equal to 1 if the student participates in PFP and 0 otherwise. *Fem\*Treat\*Post*, *Male\*Treat\*Post*, and *Minority\*Treat\*Post* are equal to 1 if the observation represents a female (male, minority), is from the treatment group, and represents the post-seminar survey.

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

Student major has no impact on the choice to participate in the PFP. Neither the proportion of debt or self-funding by the student predicts participation. There is no evidence that minorities are more or less likely to take the PFP. Household income (*Income*), need for cognition (*NeedCog*), and having one or both parents that work in the financial services industry (*FinServ*) are not correlated with student attendance.

Students who did not answer the question about how much they thought they would need to retire (*NoRetAns*) are significantly (at the 1% level) less likely to participate in the program. If, as the authors suspect, the students who meet these criteria are less knowledgeable, yet are more confident in their ability to manage their financial future, then it presents a challenge to identify these students and encourage participation. While experiencing a recent

Table 5 Financial confidence and PFP participation

Variables	(1)	(2)	(3)	(4)
<i>Post PFP Dummy</i>	0.582*** (0.132)	1.267*** (0.184)	0.289 (0.235)	0.535*** (0.133)
<i>GPA</i>	-0.417*** (0.160)	-0.415*** (0.160)	-0.412*** (0.160)	-0.427*** (0.161)
<i>Gender</i>	-0.569*** (0.171)	-0.608*** (0.173)	-0.785*** (0.223)	-0.568*** (0.171)
<i>Loanperc</i>	-0.723 (0.369)	-0.749** (0.377)	-0.724** (0.368)	-0.723** (0.369)
<i>Selfperc</i>	0.997 (0.833)	1.009 (0.794)	0.994 (0.801)	0.972 (0.842)
<i>Minority</i>	0.653 (0.372)	0.634 (0.376)	0.641 (0.375)	0.327 (0.516)
<i>KnowScore</i>	0.0933*** (0.0275)	0.0819*** (0.0283)	0.0894*** (0.0280)	0.0980*** (0.0283)
<i>Income</i>	0.0385 (0.0495)	0.0426 (0.0497)	0.0385 (0.0492)	0.0366 (0.0497)
<i>ECNBUSACC</i>	0.474*** (0.163)	0.526*** (0.167)	0.485*** (0.164)	0.465*** (0.164)
<i>NoRetAns</i>	-0.257 (0.432)	-0.244 (0.448)	-0.264 (0.437)	-0.203 (0.451)
<i>FinServ</i>	0.218 (0.183)	0.228 (0.184)	0.220 (0.183)	0.216 (0.182)
<i>NeedCog</i>	0.0200*** (0.00621)	0.0215*** (0.00620)	0.0204*** (0.00619)	0.0199*** (0.00621)
<i>Health</i>	-0.0645 (0.0430)	-0.0627 (0.0434)	-0.0682 (0.0426)	-0.0687 (0.0429)
<i>LifeSat</i>	0.0148 (0.0155)	0.0166 (0.0154)	0.0140 (0.0155)	0.0152 (0.0154)
<i>Treatment</i>	-0.241 (0.138)	-0.821*** (0.197)	-0.239 (0.139)	-0.244 (0.137)
<i>Treat*Post</i>		1.168*** (0.251)		
<i>Gender*Post</i>			0.427 (0.274)	
<i>Minority*Post</i>				0.685 (0.634)
Observations	316	316	316	316

This table presents results from estimating Eq. (1) where *Confidence* is the dependent variable. *Confidence* is how the student perceives their confidence in their financial future after college and ranges from 1 (*not at all*) to 5 (*extremely*). For each respondent in our sample there are two observations, one representing the pre-seminar survey response and the other the post-seminar response. *GPA* is the student’s GPA at the end of the junior year, on a 4-point scale. *Post PFP Dummy* equals 1 if the observation represents the post personal finance program (PFP) confidence observation for a student and 0 otherwise. *Treatment* is equal to 1 if the student participates in PFP and 0 otherwise. *KnowScore* is a student’s score on the 20 question knowledge test (pre or post). *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (*low*) to 6 (*high*) capturing the student’s household income. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *NeedCog* is a composite measure ranging from 0-90 that captures a student’s propensity to engage cognitive activities. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *FinServ* is a dummy equal to 1 if one or both of a student’s parents work in the financial services industry and 0 otherwise. *Health* is the sum of the values to the questions of whether the student has experienced significant emotional or mental distress in the previous 30 days and an estimate of the severity and whether the student has experienced significant financial distress in the previous 30 days and an estimate of the severity, with the value ranging from 2 (*low*) to 10 (*high*). *LifeSat* is a composite measure ranging from 5-25 that expresses a student’s satisfaction with their life at the time of the pre-survey. *NoRetAns* is a dummy equal to 1 if the student did not answer the question “How much do you think you will need to retire?” and 0 otherwise. *Treat\*Post*, *Gender\*Post*, and *Minority\*Post* are interaction terms between *Treatment*, *Gender*, *Minority*, and *Post PFP Dummy*.

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

financially distressing event is not predictive of participation, students that have experienced a more significant emotional or mental challenge are less likely to participate in the course (at the 5% level). Finally, students who are more satisfied with their lives at the time of the seminar are more likely to take the PFP (at the 5% level). These findings support the idea

Table 6 Financial confidence and PFP participation

Variables	(1)	(2)	(3)
<i>Post PFP Dummy</i>	0.0989 (0.179)	0.549*** (0.131)	0.101 (0.180)
<i>GPA</i>	−0.416*** (0.160)	−0.388** (0.161)	−0.394** (0.160)
<i>Gender</i>	−0.590*** (0.204)	−0.585*** (0.171)	−0.613*** (0.203)
<i>Loanperc</i>	−0.759** (0.378)	−0.679 (0.369)	−0.717 (0.376)
<i>Selfperc</i>	1.030 (0.800)	0.955 (0.848)	0.983 (0.810)
<i>Minority</i>	0.633 (0.376)	0.332 (0.412)	0.396 (0.428)
<i>KnowScore</i>	0.0822*** (0.0283)	0.0859*** (0.0280)	0.0771*** (0.0287)
<i>Income</i>	0.0431 (0.0498)	0.0391 (0.0496)	0.0430 (0.0497)
<i>ECNBUSACC</i>	0.526*** (0.167)	0.503*** (0.166)	0.545*** (0.169)
<i>NoRetAns</i>	−0.248 (0.447)	−0.219 (0.445)	−0.218 (0.457)
<i>FinServ</i>	0.227 (0.184)	0.197 (0.182)	0.212 (0.183)
<i>NeedCog</i>	0.0214*** (0.00622)	0.0200*** (0.00626)	0.0213*** (0.00625)
<i>Health</i>	−0.0625 (0.0435)	−0.0733 (0.0433)	−0.0693 (0.0437)
<i>LifeSat</i>	0.0165 (0.0154)	0.0145 (0.0154)	0.0163 (0.0154)
<i>Treatment</i>	−0.823*** (0.197)	−0.291** (0.139)	−0.826*** (0.197)
<i>Fem*Treat*Post</i>	1.148*** (0.263)		1.097*** (0.266)
<i>Male*Treat*Post</i>	1.231*** (0.344)		1.121*** (0.326)
<i>Minority*Treat*Post</i>		1.464** (0.610)	1.101 (0.618)
Observations	316	316	316

This table presents results from estimating Eq. (1) where *Confidence* is the dependent variable. *Confidence* is how the student perceives their confidence in their financial future after college and ranges from 1 (*not at all*) to 5 (*extremely*). For each respondent in our sample there are two observations, one representing the pre-seminar survey response and the other the post-seminar response. *GPA* is the student's GPA at the end of the junior year, on a 4-point scale. *Post PFP Dummy* equals 1 if the observation represents the post personal finance program (PFP) confidence observation for a student and 0 otherwise. *Treatment* is equal to 1 if the student participates in PFP and 0 otherwise. *KnowScore* is a student's score on the 20 question knowledge test (pre or post). *Gender* is a dummy variable equal to 1 if the student is a female and 0 otherwise. *Minority* is a dummy equal to 1 if the student identified as a minority and 0 otherwise. *Income* is a variable ranging from 1 (*low*) to 6 (*high*) capturing the student's household income. *ECNBUSACC* is a dummy equal to 1 if the student is an economics, business, or accounting major and 0 otherwise. *NeedCog* is a composite measure ranging from 0-90 that captures a student's propensity to engage cognitive activities. *Loanperc* and *Selfperc* are the percentage of student college cost paid for with debt or by the student. *FinServ* is a dummy equal to 1 if one or both of a student's parents work in the financial services industry and 0 otherwise. *Health* is the sum of the values to the questions of whether the student has experienced significant emotional or mental distress in the previous 30 days and an estimate of the severity and whether the student has experienced significant financial distress in the previous 30 days and an estimate of the severity, with the value ranging from 2 (*low*) to 10 (*high*). *LifeSat* is a composite measure ranging from 5-25 that expresses a student's satisfaction with their life at the time of the pre-survey. *NoRetAns* is a dummy equal to 1 if the student did not answer the question "How much do you think you will need to retire?" and 0 otherwise. *Fem\*Treat\*Post*, *Male\*Treat\*Post*, and *Minority\*Treat\*Post* are equal to 1 if the observation represents a female (male, minority), is from the treatment group, and represents the post-seminar survey.

Note: Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

that one's state of mind, including perceived stress and overall well-being predict self-efficacy, or the belief that one can set a goal and enact the necessary behavior to achieve that goal (Bandura, 1977). Enrolling in and completing the PFP required students to respond to the recruiting email, attend sessions, and complete a pre- and post-seminar survey; these



steps require a level of persistence and engagement encouraged by feeling positive about one's life and not feeling overwhelmed by stressful life events.

To summarize, students who participate in the PFP are less confident in their financial future, experience less stress and have a higher level of life satisfaction. Most importantly, the participants and the control group did not differ in pretest knowledge level, or academic ability as measured by GPA, as well as their interest in thinking (Need for Cognition), or whether their parents work in the finance industry.

### 5.3.3. Section 4.3.3.: Summary descriptive statistics

Table 2 presents summary descriptive statistics of financial knowledge and control variables for the sample. The sample is broken down into three groups. Column (1) reflects participants and control respondents who fully completed both the pre and post surveys. Columns (2) and (3) split the survey sample into those participating (treatment) in the PFP and those not participating (control) in the PFP, respectively, and that completed both surveys. A substantial number of students (over 400) over the course of the three years of the study completed only the presurvey as was described above.

## 5.4. Participant demographics (only assessed in the pretest)

Results in Table 2 show that seminar participants are (1) reasonably high academic achievers, having an average GPA of 3.4, (2) mostly women, and have (3) minimal student loans and minimal self-funding. Relatively few minorities participated in the study, although the authors suspect that is due, in part, to university demographics. The average study participant is from a relatively wealthy household; *Income* averages approximately 4.7, which is a categorical ranking corresponding with an average family income between \$100,000 and \$150,000. Just under 25% of study participants were majoring in economics, business, or accounting. Approximately 7% of presurvey responders failed to answer the retirement question and approximately 16% of study participants have a family member in the financial services industry. Regarding need for cognition, on a 90-point scale with 90 suggesting a substantially high need for cognition, study participants show a slightly higher than average need for cognition at around 62.

## 5.5. Knowledge and confidence scores

Pre-PFP completion survey results of financial knowledge scores show that all respondents correctly answer 14.23 questions out of 20 (see column 1 in Table 2). However, the control group average is 14.26, while that for the treatment group is 14.19 (columns 2 and 3 in Table 2), which is not statistically different. However, after PFP completion, knowledge scores improve significantly for the PFP participants, a change from 14.19 to 15.34—column (2), compared with no statistical change from 14.26 to 14.44 (column 3) for the control group. Additionally, financial confidence metrics also improve in a statistically significant

way for PFP participants (from 2.357 to 3.357—based on a 5-point scale), while there is no change for the control group, where metrics remain largely unchanged (2.943 to 3.045). Equally important, whereas the control (2.943) group's pre-PFP confidence is statistically higher than the treatment (2.348) group's, the treatment (3.362) group's post-PFP confidence is statistically higher than the control (3.045) group.

In summary, the univariate statistics support Hypotheses 1 and 4 (Hypothesis 2 and 3 are not tested here). PFP participants improve both their financial knowledge and their confidence in their financial future while the control group does not. The improvement in confidence is particularly compelling. Before going through the PFP, participants have a lower level of confidence than the control group. However, after completing the program, not only does the treatment group improve their confidence, but it exceeds that of the control group. Combined, the univariate results for *KnowScore* and *Confidence* are promising, and the improvement in confidence seems to be well placed given the improvement in knowledge scores and the lower level of pretest confidence reported than the control group who chose not to participate in the program.

## 6. Section 5: Multivariate results

### 6.1. Section 5.1.: *KnowScore*

The overall interpretation of the univariate results suggests that PFP participation improves both financial knowledge and confidence in the ability to manage one's financial future; the finding that the control group shows no such improvement strengthens the conclusion that these improvements are a product of the program and not due to time or a practice effect (e.g., taking the knowledge test twice). We now more robustly scrutinize our findings using a multivariate framework using Eq. (1) from above. Column (1) of Table 3 presents the baseline model results for our matched sample. In Table 2, there are 161 students (70 treatment and 91 control) who fully responded to both surveys. The sample size here is 322, representing an observation for the pre- and post-survey responses.

Before addressing the hypotheses directly, we briefly discuss the control variables. Neither funding their education with more debt nor more self-funding influences a student's pre- or post-knowledge score. Additionally, students not answering the question regarding the amount needed for retirement, or having parents who work in the financial services industry has any impact on pre- or post-student knowledge scores. However, students with higher GPA's have higher pre- and post- knowledge scores, as do students who are economics, business, or accounting majors, and students with a higher need for cognition. The results for the control variables clearly demonstrate that the factors influencing a student's financial knowledge are multifaceted and not solely linked to typical demographic information; thus, it is important to control for their influence on our results.

The primary variables of interest initially to test our hypotheses are *Post PFP Dummy*, *Treatment*, *Gender*, and *Minority*. The results show that post-seminar (*Post PFP Dummy*) knowledge scores are statistically higher (at the 5% level) than pre-PFP scores. The

coefficient estimate for *Treatment* is positive but not significant. In combination, these results seem to demonstrate that those participating in the PFP improve knowledge more than the control group do not. However, the results for the *Post PFP Dummy* and *Treatment* variables, while in the direction desired, do not completely provide support for Hypothesis 1 because members of the control group are included in the *Post PFP* sample, and the *Treatment* variable includes both pre- and post-results for the treatment group. Column (1) also shows that women have statistically lower scores than men at better than the 1% level, and minorities have statistically lower scores than their Caucasian peers. While the results for our gender and minority variables are consistent with prior research, as presented, they do not adequately address Hypotheses 2 and 3. Currently, the gender result tells us only that women have lower scores than do men, but does not distinguish between treatment and control, nor between pre- and post-scores. The same is true for the minority result.

Column (2) more directly addresses Hypothesis 1 by introducing the interaction term *Treat\*Post*, which clearly identifies observations from the post seminar treatment group. The coefficient estimate on the interaction term is positive and statistically significant at the 5% level, indicating the treatment group improves its scores relative to the control group. The result provides strong support for Hypothesis 1.

We now turn our attention to addressing Hypotheses 2 and 3 more directly. In columns (1) and (2), *Gender* and *Minority* are negative and significant at the 1% level; however, the models do not allow us to distinguish between the pre and post-PFP scores. In column (3), we add the additional interaction term *Gender\*Post*. The results are similar to those in column (2), but *Gender\*Post* is not statistically different from zero, which would not seem to support Hypothesis 2. In column (4), the interaction term *Minority\*Post* is not different from zero, suggesting a lack of support for Hypothesis 3.

One problem with the gender (minority) interaction is that while it segregates males from females (minorities from Caucasians) and pre- and post-scores, it includes both treatment and control females (minorities). To more directly test Hypothesis 2 and 3, we introduce three terms, *Fem\*Treat\*Post*, *Male\*Treat\*Post*, and *Minority\*Treat\*Post* that are equal to 1 if the observation represents a female (male, minority), in the treatment group, and corresponds to the post-PFP knowledge score and 0 otherwise. The results are in columns (1 and 2) of Table 4.

While all other results remain consistent, we find that females and minorities in the treatment group significantly narrow the knowledge gap, as *Fem\*Treat\*Post* and *Minority\*Treat\*Post* are positive and statistically significant at the 5% level. For women, when combined with the insignificant coefficient estimates on *Treatment* and *Male\*Treat\*Post*, we can conclude that females close the gap with males if they participated in the seminar, a finding providing support for Hypothesis 2. The results in column (2) are similarly encouraging. *Minority\*Treat\*Post* is positive and statistically significant, indicating that minorities close the knowledge gap after participating in the PFP. This result is consistent with Hypothesis 3. The results in column (3) show that the results are robust for women when including all of the terms in the model. In contrast, *Minority\*Treat\*Post* is no longer statistically significant at traditional levels. In the full model presented in column (3), Hypothesis (2) is definitively supported.

## 6.2. Section 5.2: Confidence

We now turn our attention to examining the impact of the PFP on a student's confidence in their ability to manage their financial future. It is important to note again that this is not confidence in whether one answered the financial knowledge questions correctly, but rather one's confidence regarding their future financial outlook. Earlier, we reported that in a univariate framework, PFP participants had significantly lower confidence than their control group peers before the seminar but that this completely reversed in the post-seminar surveys. We now determine the robustness of those results using Eq. (1). We augment Eq. (1) with *KnowScore*, *Health*, and *LifeSat* as additional control variables with an expectation that students with higher knowledge scores who are more satisfied with their lives currently will be more confident, but students who have recently experienced a higher degree of emotional/mental and financial distress will have lower levels of confidence.

The results for estimating Eq. (1) with *Confidence* as the dependent variable are presented in Tables 5 and 6. We follow a similar pattern of presentation used for *KnowScore*. While not of primary interest, a brief discussion of control variables is valuable as the analysis of confidence in a multivariate framework is new to the literature. Regardless of the model, students who are economics, business, or accounting majors are statistically more confident in their financial future, an expected outcome. Additionally, students with higher knowledge scores and a higher need for cognition have statistically higher levels of confidence in their financial future. The result for knowledge score is “comforting” in that it suggests that the confidence may not be misplaced. The result for *NeedCog* suggests that students who seek out cognitive activities feel they can acquire the skills and information necessary to be successful in their personal financial lives. Students with more of their education financed with debt generally have lower levels of confidence in their future. This finding is expected but indicates that in addition to the financial burden that student debt brings, it has a significant impact on how students perceive they can handle their financial future and likely stress levels. Finally, students with higher GPA's have statistically lower levels of confidence, an unexpected finding.

We now turn to testing Hypothesis 4. In column (1), we present a base model that indicates post-seminar (*Post PFP Dummy*) confidence levels are statistically higher, but that PFP participants (*Treatment*) do not have statistically different levels of confidence when compared with the control group. These findings do not support Hypothesis 4; however, as was the case in column (1) of Table 3, the *Post PFP Dummy* captures both control and treatment respondents, and the *Treatment* variable captures both pre- and post-survey results. To better gauge the effect of the PFP on confidence, we introduce the interaction term *Treat\*Post* in column (2) to more precisely isolate the post-treatment group. The coefficient estimate for *Treat\*Post* is positive and statistically significant at the 1% level, while *Treatment* is negative and significant, confirming that students in the treatment group have significantly lower levels of confidence *before* the seminar. This confirms the univariate results reported earlier and supports Hypothesis 4. So, seminar participants not only overcome their lack of confidence in their financial future relative to the control group, but their participation leads to significantly higher levels of confidence than the control group after seminar participation.

The coefficient estimates for *Gender* in columns (1, 2) indicate that women report significantly lower levels of confidence (pre and post) in their future, while minorities show no statistical difference from Caucasians. Given the starting point with respect to financial knowledge for women, the finding is expected. In columns (3) and (4), we further examine the relationship between gender (minority) and confidence. In column (3), we add the interaction term *Gender\*Post*. The results suggest that women have no difference in post-program confidence levels relative to the preprogram survey. However, the coefficient estimate for *Gender* is still negative and significant, indicating women's confidence is still lower than males. However, as was the case in Table 3, *Gender\*Post* groups all women together. As before, in column (4) we add the interaction term *Minority\*Post*. The results suggest that there is no significant change in confidence levels in the post-program surveys.

Similar to the analysis in Table 4, we introduce *Fem\*Treat\*Post*, *Male\*Treat\*Post*, and *Minority\*Treat\*Post* to isolate the gender, minority, and treatment effects. Results are presented in Table 6. In column (1), we see that both women and men in the treatment (*Male\*Treat\*Post* and *Female\*Treat\*Post*) group have significantly higher levels of confidence after participating in the program, further support for Hypothesis 4. The results in column (1) are important because the coefficient estimate for *Treatment* is negative and significant, consistent with the treatment group being less confident than the control group on the presurvey, but the interaction terms, *Male\*Treat\*Post* and *Female\*Treat\*Post*, indicate that while both males and females in the program improve, they do so at levels that are now higher than the control group. We find complementary results in column (2) of Table 6 for minorities in the treatment group; their confidence is significantly higher than the control group, additional support for Hypothesis 4. The results in column (3) show that the results are generally robust when including all of the interaction terms together, although *Minority\*Treat\*Post* is no longer significant at conventional levels.

### 6.3. Section 5.3: Robustness tests

In total, our multivariate analysis supports all four of our hypotheses. However, one might argue that the measurement of *Confidence* as a discrete variable ranging from 0 to 5 makes using ordinary least squares inappropriate because the least squares technique assumes a linear change from one value of *Confidence* to another, which may not be true. As such, we also estimate Eq. (1) for *Confidence* using an ordered probit model. The results in terms of statistical significance and directional effect of variables on *Confidence* are unchanged from those presented in Tables 5-6. In total, our analysis is robust to a multivariate framework using alternative estimation techniques.

### 6.4. Section 5.4: Reconciling results for knowledge and confidence<sup>7</sup>

The results above demonstrate that PFP students see their knowledge scores and their confidence about their ability to manage their financial future rise significantly after seminar participation. The result for *Confidence* is particularly striking; PFP students go from having significantly lower confidence than the control group to having significantly higher

confidence than the control group after seminar participation. Of course, increasing confidence may not be well placed if it is not calibrated to one's financial knowledge. Prior research shows that people who overestimate their skills or knowledge often make poor decisions and suffer negative consequences (e.g., Kruger & Dunning, 1999). Indeed, if students simply believe that by participating in the seminar that they are now better able to handle their financial future, their "improved" confidence may actually result in poor financial choices. In contrast, if students believe they can better handle their financial future because they have more knowledge to apply, this increased confidence may result in more assertive and effective financial behaviors. Indeed, researchers have identified that in addition to knowledge about finance, people must have a sense of financial self-efficacy to act on that knowledge (e.g., Farrell, Fry, & Risse, 2016; Lapp, 2010) to experience long-term financial success and stability. We speculate that our knowledge and confidence findings may represent a kind of financial self-efficacy (i.e., students gain knowledge and believe in their ability to apply that knowledge to positively affect their financial future).

We now make an effort to gauge the "calibration" between student financial knowledge and confidence in their financial future. To do so, we use a simplified linear model of the form:

$$\text{Confidence} = \alpha + \beta \text{KnowScore} + \varepsilon \quad (2)$$

where we assume that a student's confidence in their financial future is fully explained by their financial knowledge. We recognize that this is a strong assumption, but we believe that this allows us to cleanly evaluate whether participation in the PFP not only increases confidence but does so in a way that tracks increases in knowledge. We should note this calibration could come in multiple forms. For example, we may have students who, before the seminar, have significant confidence in their financial future but do not possess significant financial knowledge, classic overconfidence. In contrast, students that have high levels of financial knowledge may have low levels of confidence, classic under confidence. Ideally, after participating in the PFP, a student's confidence, while having improved, will also be better calibrated to their financial knowledge level, which has also improved.

Thus, the question we examine here is whether seminar participation leads to a better calibration between a student's financial knowledge and confidence. To do so, we examine the residuals from Eq. (2) for the control and treatment groups. If the seminar is useful in better aligning a participant's knowledge and confidence, we expect the residuals for participants to decline from pre to post and the residuals for the control group to remain unchanged.

Before examining residuals from estimating Eq. (2), we use the ratio of *KnowScore* and *Confidence* to gauge whether there is a relative change in values of *KnowScore* and *Confidence* from pre- to post-seminar. The results are presented in panel A of Table 7. For the control group, the ratio of *KnowScore* to *Confidence* before the seminar is 5.657 and remains statistically similar at 5.313 after the seminar. Therefore, any changes in confidence were roughly offset by changes in knowledge scores in a relative sense. In contrast, for the treatment group of seminar participants, the ratio drops from 6.987 to 4.715, statistically significant at better than one percent. From Table 2, we know that both *KnowScore* and

Table 7 Reconciliation of financial knowledge and confidence

Panel A:			
Variables	Pre-seminar ratio	Post-seminar ratio	Difference
Control group	5.657	5.313	−0.344
Treatment group	6.987	4.715	−2.272***

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

Panel B:			
Variables	Pre-seminar residual	Post-seminar residual	Difference
Control group	0.735	0.717	−0.018
Treatment group	0.677	0.528	−0.149***

This table presents results examining the relationship between students’ knowledge scores as predictors of their confidence in their financial future. In panel A, we examine the ratio *KnowScore/Confidence* to provide intuitive motivation for this discussion. In panel B, we assume that *Confidence* can be completely predicted by a student’s *KnowScore*. As such, we estimate the single factor model identified as Eq. (2) in the text:

$$Confidence = \alpha + \beta KnowScore + \varepsilon$$

for both the control and treatment groups both pre- and post-seminar. We then use model parameters to estimate a predicted *Confidence* score, then take the residual between the predicted and actual scores. We then test the differences in residuals for the control and treatment groups between the pre- and post-seminar periods.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ .

*Confidence* increase for the treatment group. The result in panel A of Table 7 indicates that seminar participant confidence changes much more than knowledge in relative terms. While improved confidence is a desired outcome, it is not if it does not coincide with a similar increase in knowledge level. Seeing oneself as able to manage finances in the future would seem to suggest a willingness and confidence to apply one’s financial knowledge.

In panel B of Table 7, we examine the residuals of estimating Eq. (2) for the control and treatment groups pre- and post-seminar. If the seminar simply leads to overconfidence, we would expect the residuals for the treatment group to be higher in the post-seminar survey than in the pre-seminar survey. First, students exhibit overconfidence relative to their financial knowledge. In all four cells of panel B, the residuals are greater than zero. However, in the *Treatment Group* row, residuals are statistically lower for the seminar participants (treatment group) but not the control group. This finding suggests that while PFP participants exhibit overconfidence, even after the seminar, there is better alignment between their financial knowledge and confidence in their financial future after attending the seminar, a finding not reflected in our control sample.

## 7. Section 6: Concluding remarks

This paper summarizes the PFP, a six-week financial literacy improvement program for senior college students at a private liberal arts college, that focuses on major areas of

personal finance. An empirical analysis of the program shows that the PFP improves financial knowledge, and has a particularly positive impact on female participants. The results for minority participants, while encouraging, are not as robust as for women. Both groups have been consistently shown to possess lower financial knowledge scores. Additionally, participant confidence regarding their future financial outlook significantly improves for all participants: male, female, and minority. Finally, we demonstrate that the improvement in confidence is well placed in that seminar participants demonstrate an improvement in their ability to calibrate their improved confidence to their improvement in financial knowledge. This study extends the previous literature in that the PFP is six-weeks long (that is longer than many other interventions), and the change in knowledge and confidence from before and after the program was compared with a control group. Furthermore, the study measures several individual difference factors, allowing the researchers to utilize multiple regression analysis techniques.

The study is not without its limitations. First, we do not measure changes in student behavior. Our speculation about the connection between increases in knowledge and confidence may lead to increased financial self-efficacy can only be tested if we examine how these increases are reflected in behavior. In other words, we can examine if the combination of more knowledge and confidence predicts acting on that knowledge in financially sound ways. The authors are in the process of collecting follow-up behavioral data on the study participants reviewed here.

Second, our research is limited by the sample we use. Due to the nature of the PFP, participants have been limited to only senior level students at a private liberal arts college, that is, the conclusions drawn from this study are limited to a very specific portion of the population. However, the authors are currently expanding the PFP to other universities and are currently summarizing results obtained from a faculty or staff version of the PFP. Finally, given the demographics of the student population represented, we are hesitant to claim all college seniors will respond in similar ways to the program. More research is needed to validate the curriculum in a more diverse setting. Ultimately, this paper expands upon financial literacy research and outlines a robust tool for addressing financial knowledge and confidence.

## Notes

- 1 One could suggest that the use of a financial advisor could mitigate the need for improved financial literacy. However, Handy and Smythe (2020) and Handy, Smythe, and Ricketts (2020) document that retail mutual fund investors face the potential of being misled into sub-optimal funds by well-intentioned advisors.
- 2 The program was first developed approximately 10 years ago but was not the focus of research until 2017. No program was offered in Spring 2020 or Fall 2020 due to the onset of the pandemic. A program was provided in Spring 2021 but with an online delivery, which will allow us to examine if delivery method impacts our findings. The program is also being expanded to a new student population, as one of the authors has changed institutions.



- 3 This is taken from the white paper “Closing the Gap Between Knowledge and Behavior: Turning Education into Action” resulting from the symposium sponsored by the National Endowment for Financial Education.
- 4 See Knoll and Houts (2012) for the list of questions, or they can be provided by the authors upon request. The Knoll and Houts questions include the core three questions introduced by Lusardi (2008) and seven of the nine additional questions used by Lusardi and Mitchell (2007).
- 5 We did include a respondent’s ‘confidence in answers to the knowledge questions’ initially. Unlike prior work, in a multi-variate framework, we found either no effect or a positive effect on knowledge.
- 6 The authors thank Taylor Vahle for her keen observation with respect to this and other points.
- 7 We would like to thank a reviewer for suggesting this analysis.

## **Appendix: Summary of personal finance modules**

### *Budgeting session*

The budgeting module begins with an explanation of what it means to maximize net worth, and defines what assets and liabilities are. In an effort to capture the students’ attention, there is a slide demonstrating approximately how much they might need to live comfortably in retirement. Students are then provided a set of key strategies, that if used, should help maximize wealth (e.g., reduce spending and increase saving). Concepts covered include: the purpose of a budget, steps to creating a budget, the difference between fixed and variable expenses and examples of each, how to estimate expenses, surprises likely to interrupt one’s budget that can be planned for (e.g., annual car maintenance), financial record keeping, reviewing/updating one’s budget, cash management, and the need to establish an emergency fund. Throughout the session, faculty stress the need to regularly review budgets and that budgets reflect one’s stage in life.

### *Credit management session*

This session emphasizes the importance of maximizing wealth by effectively minimizing and managing liabilities. The focus is not that all debt is bad but that it must be used wisely and fit within the budget. Concepts covered include: defining credit, providing examples of consumer credit, discussing credit costs, defining open-end and closed-end credit, providing and discussing an example of amortized loans, a specific look at credit cards and a discussion on how to choose a credit card, a discussion on credit card fraud and protective strategies, credit card uses and misuses, advantages and disadvantages of card use, reasons individuals find themselves carrying high debt levels, and credit-worthiness and credit scores. The discussion of credit scores goes beyond credit usage by explaining how credit scores are being used to set insurance premiums and make employment decisions.

### *Risk and return session*

This module is treated separately for two reasons. First, the authors concluded that the risk/return relationship is one most often “forgotten” and misunderstood by investors, especially those that are not financially inclined (a significant population in these sessions). Second, the principles are essential to getting students to understand the need to invest in capital markets to achieve goals like retirement. This session reminds students of the importance of maximizing wealth and introduces how uncertainty or risk can impact decisions. Concepts covered include: a historical look at risk and return, a formal definition of risk and return, fundamental rules of investing, implications of risk, and diversification (what it is, graphical representation, statistical information, and how to achieve in general).

### *Mutual funds session*

This module is included separately because mutual funds are the primary vehicle that students will likely use to participate in capital markets, and given the growing complexity of fee structures, especially in the advisor-sold channel (see Handy et al., 2020), the authors decided to devote one module to funds. Additionally, the module helps develop and reinforce the principle of diversification. The session emphasizes the importance of asset class diversification. Students learn that mutual funds are one of the most popular asset growth tools. Concepts covered include: defining a mutual fund, discussing the types of mutual funds (load vs. no-load), a significant focus on fund fees, load structure (e.g., A-class, B-class, or C-class), general fund investment types and information on each type including risk profiles, fund families, and how to evaluate mutual fund performance.

### *Retirement planning session*

This session begins by discussing the importance of wealth maximization, especially for this goal. The session covers popular retirement beliefs and myths, the importance of starting to save early, the state of Social Security, defined contribution plans and important terminology, traditional and Roth IRAs, annuities, how to start a retirement account, and 529 college savings plans.

### *Risk management session*

This module is intentionally titled Risk Management instead of Insurance to focus attention on *why* we need insurance—to protect net worth. The session reminds students of the importance of maximizing wealth but introduces them to the need to protect their assets from large loss via risk management. Students learn general insurance terminology (e.g., Coinsurance, deductible, or copay), and are exposed to health insurance, auto insurance, disability insurance, life insurance, and renter’s insurance. Emphasis is placed on how insurance needs vary by life stage and insurance coverage should be revisited periodically.

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