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FINANCIAL LITERACY AND NUMERACY:
IMPLICATIONS ON PERSONAL WEALTH POTENTIAL IMPROVEMENT METHODS

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ABSTRACT

Financial education is currently lacking in the United States and globally, resulting in poor worldwide financial literacy. In efforts to improve literacy and numeracy, the CFA Society Pittsburgh launched a high school financial literacy campaign, which resulted in statistically significant improvement. Students who participated in the survey experienced a statistically significant improvement in the four main areas tested: financial behavior, subjective financial knowledge, objective financial knowledge, and self-esteem. These findings highlight the potential to improve attributes that impact financial decision-making through education.

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Chapter 1

Introduction

Currently, the state of financial literacy and numeracy in the United States and across the world is in distress. Based upon the results of multiple academic studies conducted both in the United States and worldwide, a significant lack of financial literacy exists across nearly all demographics. While financial literacy statistics are important by themselves, the implications of financial literacy and numeracy are far reaching, due to their impact on financial decisions. As a result, the potential implications of financial literacy and numeracy will be explored in depth. Most importantly, effective methods to improve financial literacy need to be put into place in order to increase financial literacy and numeracy.

According to Redmund (2010, p. 278), "Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions."

As a general description, financial literacy is the understanding of fundamental concepts that influence personal financial behavior. In order to gauge financial literacy, studies use many different knowledge-based questions; however, the overall concepts remain relatively consistent across financial literacy surveys. Three common fundamental financial knowledge concepts exist: interest rates; inflation; and risk diversification.

Numeracy is an important extension of financial literacy that literature often relates to financial behavior. Estrada-Mejia, de Vries, & Zeelenberg (2016, p. 53) define numeracy as "the

ability to understand and use numerical information." Numeracy is closely related to multiple aspects of financial decision making. The global financial literacy survey features a question about numeracy as one of the four essential concepts of personal finance (Klapper, Lusardi & Oudheusen 2015).

This study extends prior research on the effectiveness of financial literacy education by providing direct evidence from a financial literacy campaign launched by the CFA Society of Pittsburgh. The study is based upon data collected from a financial literacy campaign of 53 high schools, across seven states, during the 2017-2018 academic year. The financial literacy education campaign materials were created using the book *The Missing Semester* as the main resource. Before starting the course, students were given a pre-survey to test their baseline in four major areas: subjective financial knowledge, financial behavior, objective financial knowledge, and financial self-esteem. Following the completion of the course, students were tested in a post-survey on the improvement in the four major areas. To anonymously track the progress of students, they were assigned a unique student ID code. The results display significant improvement in all areas of interest, indicating an effective financial literacy improvement effort.

Chapter 2

Literature Review

Previous Surveys

S&P Global Financial Literacy Survey

According to a global financial literacy survey published by Standard and Poor's, only 33% of adults worldwide are financially literate (Klapper, Lusardi & Oudheusen, 2015). Each adult was given a survey of five financial literacy questions. In order to be considered financially literate, the respondent must have answered at least three of the five questions correctly. After applying the percentage results of the survey, it was approximated that nearly 3.5 billion adults worldwide would lack a proficient level of financial literacy. Although the survey included quality data from 144 countries, some of which were less developed, the literacy of many developed nations reported a failing grade as well. Only 57% of American adults were considered financial literacy after taking the survey.

In order to gather accurate data from across the world, Standard and Poor's leveraged the experience and size of Gallup. The data used in the global financial literacy survey was extracted from the 2014 results of the Gallup World Poll. Gallup interviewed individuals in 148 countries for a total of greater than 150,000 interviews conducted in 2014 worldwide. Surveys were conducted either over the phone or face-to-face in the countries where less than 80% of the population had telephone coverage Gallup's country samples are probability based surveying resident populations aged 15 and older. For the majority of countries, Gallup interviewed 1,000

people. The only countries, which were in the survey, but did not have 1,000 people interviewed were the three largest countries (Russia, India, and China) and three smallest countries (Belize, Haiti, and Jamaica). The sampling errors were between the absolute value of 2.7% and 5.2% at a confidence level of 95%. Therefore, the results of the study were considered to be statistically significant.

The survey consisted of five total questions, which covered four essential concepts of personal finance: risk diversification, inflation, numeracy, and compound interest. Risk diversification focused upon how to invest money when presented with multiple options. The inflation question concurrently introduced the indirect relationship between prices and purchasing power, as well as the direct relationship between income growth and purchasing power. Next, numeracy tested the subject's ability to process a simple equation and to decide between a fixed amount or an amount of principal plus interest. Finally, compound interest featured two questions that illustrated the power of investment growth due to compounding returns. Overall, the survey questions simply tested a person's ability to understand and process the foundational pieces necessary to make an informed financial decision.

In addition to the overall statistics of baseline proficiency, the design of the survey allowed for a more in-depth look at what areas of financial literacy the subjects significantly struggle with. For instance, in the United States 60% of adults use credit cards, yet 43% of credit card users answered the interest rate numeracy question incorrectly.

FINRA's Financial Capability in the United States 2016

As a portion of the Financial Industry Regulatory Authority's (FINRA) *Financial Capability in the United States 2016* publication, financial literacy among Americans was examined (Lin, Bumcrot, Ulicny, Lusardi, Mottola, Kieffer, & Walsh 2016). Of all adults

surveyed, only 37% were able to answer at least four out of five financial literacy questions correctly. Since 2009, the percentage of Americans who give themselves a high self-assessment on financial knowledge has increased by nine percent. This finding is intriguing because the percentage of respondents who actually tested as financially literate fell by five percent in the same six-year period.

In order to gather accurate data, the National Financial Capability Study was conducted by Applied Research & Consulting. The survey consisted of a 27,564-adult sample size, which included about 500 respondents per state with the exception of the four largest states (CA, IL, NY and TX), each of which had 1,000 respondents. To ensure the validity of respondents, the study utilized non-probability quota sampling from online panels of recruited respondents that use industry-standard verification techniques. By using both the respondents' demographic information, as well as the Census Bureau's *American Community Survey*, the survey enforced demographic quotas so that the sample data would remain representative of the entire population. The survey originally aimed for a sample of over 25,000 in order to minimize the estimated margin of error to half of a percentage point for the overall data sample.

The Financial Capability in the United States survey focused on five separate concepts of financial knowledge: interest rates, inflation, bond prices, mortgages, and risk. The majority of questions involved the effects of interest rates on multiple areas of finance. The results of each question explain a distinct lack of financial knowledge that has the potential to influence financial decisions, but three questions raise additional concern. First, only 28% of respondents knew that an interest rate rise will cause bond prices to fall. Second, only 33% of respondents could identify the effects of compounding interest on a loan. Lastly, only 46% of respondents understood that a mutual fund provides a safer return than an individual stock.

Financial Literacy and Retirement Planning in the United States

An additional extension of financial literacy is examined within a survey conducted by Lusardi & Mitchell (2011). In the study, the relationship between financial literacy and planning for retirement is explored. As a result of the survey, a clear difference exists in financial literacy between the respondents who plan for retirement and those who do not. The survey featured three questions, relating to compound interest, inflation, and stock risk. Of all respondents, 59.7% of respondents who plan for retirement answered at least two questions correctly, compared to only 40.9% of non-planners.

The data being analyzed within the study derives from the 2009 FINRA *National Financial Capability Survey*. In the 2009 survey, 1,500 American adults were contacted by telephone with the rationale that 1,200 respondents would be representative of the United States population. Similarly, the sample involved weighting based upon certain socio-demographic characteristics, specifically African-Americans, Hispanics, Asian-Americans, and adults with less than a high school education.

As far as the actual survey questions, the survey consisted of three questions that cover the same three fundamental concepts listed in the "What is Financial Literacy and Numeracy" section: interest rates (numeracy), inflation, and risk diversification. The questions asked in this survey mirror the interest rate, inflation, and risk diversification questions asked in the 2016 FINRA survey (Lin, et al. 2016). More than half of the full sample answered each individual question correctly, resulting in 46.2% of the entire sample answering at least two of the three questions correctly.

After preliminary observations, the relationship between planning for retirement and financial literacy appears obvious, but without controlling for multiple other variables the results cannot be considered statistically significant. Therefore, Lusardi & Mitchell (2011) use a multivariate model to isolate the relationship between planning for retirement and financial literacy. Three measures of financial literacy are used to run an ordinary least square (OLS) regression. The three measures include: an indicator of "1" for three possible correct responses; an indicator for the amount of correct answers; and a dummy variable. After running the OLS regression, a strong relationship between financial literacy and retirement planning is revealed. While this is a more accurate measure, the data was still subject to potential contamination from previous economic education of respondents. In order to extract the contamination, Lusardi and Mitchell (2011) control for instrumental variables by accounting for respondents who were subject to economic education mandates in school. After applying both steps of statistical improvements, a statistically significant relationship between financial literacy and retirement planning still existed. Thus, the results show that financial literacy does actually drive retirement planning.

Implications of Financial Literacy and Numeracy

Impacts on Debt and Personal Wealth

The lack of financial literacy in the United States is astonishing, but its effects reverberate much further than a simple lack of knowledge. Financial literacy and numeracy have been found to have resounding impacts on financial behavior in multiple areas. In terms of debt, people with lower financial literacy are more at risk to make poor borrowing decisions that result

in higher fees, charges, and overwhelming quantities of debt (Lusardi & Tufano, 2015). Furthermore, a lack of financial understanding is associated with biases that lead to elevated borrowing and decreased saving (Stango & Zinman, 2009).

Lusardi & Tufano (2015) research the relationship between debt literacy, debt preferences and self-perceived knowledge. The results were based upon data collected in a survey from TNS Global. The survey was conducted in 2007 and included a sample of 1,000 U.S. residents who were interviewed via phone interview. Based upon the sample, more than 40% of families struggled with debt even before the financial crisis of 2007-2008. Furthermore, Lusardi & Tufano (2016) discover that financial ignorance actually has a cost, specifically in terms of debt literacy. Data shows that nearly one third of all fees and charges related to borrowing are due to lack of financial knowledge. As a result, lack of financial literacy, specifically debt literacy, leads to poor borrowing decisions and potentially overwhelming debt consequences.

In addition, Stango & Zinman (2009, p. 2807) find a strong relationship between knowledge and financial behavior, in terms of exponential growth bias. Exponential growth bias is defined as the "tendency to linearize exponential functions when assessing them intuitively." Exponential growth is a fundamental driver of both borrowing and saving, as interest and investment returns compound. By linearizing an exponential growth, the real impacts of saving and spending are muted. As a result of their work, Stango & Zinman (2009) find that people who fall prey to the exponential growth bias tend to borrow more and save less. Exponential growth bias questions in the form of compounding interest are featured in the Global Financial Literacy Survey, in which 61% of Americans were able to answer correctly (Klapper, Lusardi &

Oudheusen, 2015). Therefore, exponential growth bias is considered to be an extension of financial literacy, which impacts borrowing and saving behavior.

The impact of borrowing and saving has a compounding effect on a person's wealth over a long period of time. Wealth is defined as "the total capital accumulated over a lifetime, and it is usually estimated as the net worth of people's savings, investments and loans" (Estrada-Mejia, de Vries & Zeelenberg, 2016, p. 53). Based upon the previous studies about debt literacy, a clear relationship exists between literacy and personal wealth. Another important extension of financial literacy is related to numeracy. Although numeracy is tested as a portion of the financial literacy questions in the initial three surveys, numeracy by itself has a statistically proven and profound influence on personal wealth.

Numeracy's Impact on Personal Wealth and Financial Decisions

According to a study conducted in the *Journal of Economic Psychology* by Estrada-Mejia, de Vries, & Zeelenberg (2016), numeracy and personal wealth have a pronounced relationship with one another. Survey participants were given a test to determine their numeracy on a scale ranging from 0-11. Since wealth can be attributed to many socio-demographic factors, the survey included demographics as an independent variable, which was composed of gender, age, education, and work status. In total, the survey utilized eight independent variables: demographics, numeracy, risk preferences, need for cognition, financial knowledge, financial advisor, beliefs about future income, and income. The dependent variable was wealth. Based upon the results of the survey, an increase of one point in numeracy is associated with an approximately 5.2% increase in wealth (Estrada-Mejia, de Vries & Zeelenberg, 2016). As a

result of the survey, the relationship between numeracy and personal wealth is proven to be statistically significant.

According to the study, the strong link between numeracy and wealth derives from three main sources of influence. First, numeracy has been proven as an accurate predictor of the mistakes that people may fall prey to in regards to financial decisions. High numeracy is related to a lower sensitivity to common financial biases and fallacies, such as framing and ratio bias. Therefore, people with a lower numeracy have an increased chance of falling subject to behavioral biases. Behavioral finance proves that succumbing to common fallacies and biases often leads to suboptimal decision making, which ultimately results in less wealth accumulation. Second, people with higher numeracy are often more willing to take more strategic risks. The effects of strategic risk taking are further proven in another study showing that understanding terms associated with financial risk actually increase willingness to take risks (Shavit, Lahav & Rosenboim, 2016). Third, higher numeracy appears to improve a person's ability to process information and effectively decide upon its relevance. After analyzing the relationship between numeracy and wealth, the results of the study suggest a strong causal relationship between level of numeracy and wealth accumulation. As stated previously, a one-point increase in numeracy was statistically significantly associated with a 5.2% increase in personal wealth. Thus, the impact of numeracy on personal wealth provides a potential solution to improving the current state of wealth retention.

In the previously mentioned risk-taking survey conducted by Shavit, Lahav, & Rosenboim (2016), the effects of knowledge and numeracy in regards to financial decisions are illustrated. The overall results of their experiment show that understanding certain financial concepts reduces a person's perceived risk of investment, thus increasing their willingness to

invest in risky assets. Although the overall risk aversion of the subjects did not necessarily change, they became more aware of the risk-reward relationship, which in turn lowered the perceived investment risk of the risky asset in each scenario.

Shavit, Lahav, & Rosenboim (2016) study the impact of learning about investment-related risks in relation to investment allocation decisions. Participants were asked to allocate 100 coins between a risky and risk-free asset, given three different investment return scenarios. The participants were split into two categories, "before" and "after." The members of the "before" group had never taken a course in investments, while the "after" group had taken part in an investment course. The subjects of the investments course focused upon risk free assets, risky assets, modern portfolio theory and financial risk terms. As a result, the "after" group allocated a higher percentage to the risky asset than the "before" group in every scenario. With the mean age of all participants being just under twenty-five years, successful investment decisions for the participants rely on their willingness to take risks. The sample is young, which is relevant to the thesis as it involves educating people starting at the high school level. The results of the study clearly show the ability to influence a person's financial decisions based upon allocation education. It is commonly said that "people fear what they cannot understand." Based upon the surveys discussed earlier, it is very evident that many people do not understand personal finance. Consequently, by increasing a person's awareness and understanding, they are able to make an informed decision that will benefit their personal wealth.

Impacts on Retirement Planning and Retirement Assets

One of the most important impacts on personal wealth relates to the ability to retire from work and enjoy a "comfortable" retirement. Lusardi and Mitchell (2011) identify a statistically significant relationship exists between financial literacy and planning for retirement. Even after controlling for possible causalities, respondents who planned for their retirement scored higher than non-planners on financial literacy questions. While the initial three surveys asked different financial literacy questions, all of them focused upon the same three concepts: interest (numeracy); inflation; and risk diversification. Each of these three topics are essential to financial behaviors, specifically saving and borrowing habits. Both saving and borrowing behaviors impact personal wealth and retirement planning. The results of the studies vary slightly, yet all show a concerning number of Americans are financially illiterate. Standard and Poor's Global Financial Literacy Survey found only 37% of Americans could answer three of four topics correctly (Klapper, Lusardi & Oudheusen 2015). Lusardi & Mitchell (2011) find that only 50.9% of adults age 25-65 could answer two of three questions correctly. FINRA's Financial Capability in the United States survey found that only 37% of Americans could answer four of five financial literacy questions correctly (Lin, et al. 2016). Assuming that a respondent is found to be financially illiterate if unable to reach the thresholds mentioned, a shocking percentage of Americans would be considered financially illiterate. Assuming the results of Lusardi & Mitchell still apply today, the high percentage of financially literacy could pose extremely negative implications on the state of retirement planning.

Not surprisingly, the findings of the National Institute on Retirement Security illustrate a grim picture of retirement savings in the United States. As of 2013, only 54.3% of working-age households in the United States own assets in a retirement account. In the United States, 45.3%

or 39.6 million households do not own a single dollar of assets in a retirement account. In order to identify if a person has accumulated sufficient savings, Fidelity identifies a savings target as a multiple of current income. Based upon the Fidelity savings target, Rhee & Boive (2015) find that 66.2% of households in the United States have an insufficient retirement wealth. The findings of this survey are consistent with the theory that people with lower financial literacy are more at risk to decrease spending habits and engage in poor borrowing decisions that result in higher fees, charges and overwhelming quantities of debt (Stango & Zinman, 2009; Lusardi & Tufano, 2015). The percentage of people with insufficient or no retirement assets is proportional to the percentage of Americans found to be financially illiterate by the three different surveys conducted. Thus, the current state of retirement saving in the United States supports the conclusions that a lack of financial literacy is related to decreased saving, increased borrowing and a lack of retirement planning (Stango & Zinman, 2009; Lusardi & Mitchell 2011; Lusardi & Tufano, 2015).

Improving Financial Literacy and Financial Behavior

Formal Education

Since the effects of financial literacy are evident and the high percentage of financial illiteracy has been proven, steps must be taken to improve financial literacy. Green and Riddell (2012) proved that formal education has a substantial and statistically significant effect on cognitive skills, including: literacy; numeracy; and problem-solving.

Green & Riddell (2012) analyze data gathered from the Canadian component of the *International Adult Literacy and Life Skills Survey* (IALSS), which sought to measure the skills

of adults in Canada. The survey provided demographic, earnings and employment information in order to allow for a clear representation of the sample. The survey asked skill-based questions that focused upon four cognitive skills: prose literacy; document literacy; numeracy; and problem-solving. Each of the questions focused upon the respondent's ability to apply cognitive skills in a real-world scenario. The original sample included 23,038 individuals above the age of 16. Green & Riddell (2012) applied controls to individuals listed as "students," self-employed individuals, individuals with more than 16 years of schooling and individuals with weekly earnings above $20,000 or below $500.

In order to determine the true relationship between cognitive skills and schooling, Green & Riddell (2012) use an OLS regression with the dependent variable as the log of the average skill score. The independent variables of the OLS regression included dummy variables for age, age squared, years of education, gender, and residence. The results of the first regression showed a statistically significant relationship between cognitive skills and schooling. The relationship results in an increase of 3.4% in literacy and numeracy scores for an additional year of schooling. In order to eliminate the remaining bias, schooling laws and providence of residence were both used to control for education components. The overall results of the instrumental variable estimates imply an even stronger relationship between schooling and cognitive skills. According to Green & Riddell (2012), completing an extra four years of schooling could be related to a 24% increase in literacy.

Although the data from the survey relates to Canadian adults, the findings are replicable since Americans also participated in the same international survey effort during the same year as the Canadian survey. As a result, the conclusions of Green & Riddell (2012) can be tested on American adults using the same methodology as the original survey. More research needs to be

done in order to examine the data from the American survey. The findings of the survey present optimistic results between education and cognitive skills, namely literacy and numeracy. Based upon the results of Green & Riddell (2012), an additional four years of education have enough impact to increase a person's literacy from the median level to the 80th percentile. Therefore, the statistically significant and substantial relationship between education and cognitive skills provides an optimistic opportunity to improve financial literacy and numeracy.

Self-Esteem and Knowledge

Although understanding financial concepts is vital to financial behavior, possessing high financial self-esteem and confidence is an essential key to successful financial decisions. Self-esteem is defined as an individual's general attitude towards oneself (Rosenberg, Schooler, Schoenbach & Rosenberg, 1995) and is characterized as a central component of one's overall self-perception, and it is related with a wide range of individual behavior and outcomes (Tang & Baker 2016). In the past, all emphasis has been placed upon objective knowledge, yet simply understanding data driven finance concepts may not be enough to positively shape financial behavior. Results proved that self-esteem exhibited a statistically significant impact on the financial behaviors studied, except for retirement savings.

Tang & Baker (2016) utilize data collected from the U.S. Bureau of Labor Statistics in the 1979 National Longitudinal Survey of Youth (NLSY79). In 1979, a sample of 12,686 Americans youth were chosen to be the subject of annual surveys. The same sample of 12,686 is asked questions annually in order to update the survey constantly. Since the survey features the same sample, it provides insight into how the same people's answers may change over time as

they age. Therefore, the NLSY survey provides a very rich and powerful data set. Important information about each respondent was collected over the course of approximately 30 years. In 2012, the original respondents were asked about their financial behavior and financial knowledge, which is the information being analyzed in the study.

In order to analyze the data, Tang & Baker (2016) create four main variables: financial behavior, self-esteem, objective, and subjective financial knowledge and covariates. Financial behavior focused upon saving, investing in risky assets, retirement savings, and credit card debt. Self-esteem was measured using a 10-point scale that was developed by Rosenberg in 1965. The self-esteem data was obtained in the 2006 version of the NLSY survey. Objective and subjective financial knowledge reflected the number of correct answers for each respondent based upon five fundamental finance questions. Finally, the covariates introduced control variables of race, gender, marital status, educational attainment, age and net worth. Eight path models were regressed using the KHB method, which tested the "strength of the total, direct and indirect effects of self-esteem on financial behavior" (Tang & Baker, 2016, p. 170).

The regression results revealed both a direct and indirect relationship of self-esteem on multiple financial behaviors. As a result, the effect of self-esteem is proven to be statistically significant, thus self-esteem must be considered as a factor of financial behavior. Furthermore, the relationship between self-esteem and subjective financial behavior is found to be statistically significant in all eight path models. Therefore, subjective knowledge can be statistically linked as a driver of self-esteem in financial behavior scenarios. The implications prove that in order to truly improve financial behavior, subjective knowledge must be at least a portion of a financial education curriculum, due to the fact that objective knowledge by itself does not have a complete positive impact on financial behavior.

Overconfidence

An important facet of self-esteem that must be examined is the extent which a person's confidence becomes greater than their actual knowledge. As shown by Tang & Baker (2016), self-esteem has a statistically significant impact on financial behavior, creating the opportunity for overconfidence to drive poor financial decisions. Overconfident individuals have the tendency to overestimate their own knowledge, leading to a higher risk of engaging in costly and risky financial behaviors (Asaad, 2015). Asaad (2015) discover confidence is an important fragment of financial literacy, but also found that perceived knowledge without actual knowledge increases the risk of suboptimal financial decisions.

Asaad's hypotheses are proven further in an experiment conducted by McCannon, Asaad & Wilson (2015). The experiment consisted of a total sample size of 95 college students, with five sessions involving between 13 and 25 members of the overall sample. Each experiment session involved subjects playing an experimental Trust Game (Berg, Dickhaut & McCabe, 1995). After completing the Trust Game, subjects completed a risk assessment, background questionnaire and financial literacy quiz. Results of the risk assessment and financial literacy quiz were decomposed in order to generate overconfidence as a variable. Ultimately, the results of the Trust Game established a statistically significant relationship between overconfidence and trusting investments (McCannon, Asaad & Wilson, 2015).

Self-perceived knowledge vs actual knowledge in the United States is illustrated well by Lin, et al. (2016). Although the actual financial literacy of Americans has declined over the past five years, the percentage of Americans who have a high-self assessment of themselves has actually increase. From 2009 to 2015 self-perceived financial knowledge has increased by 9% while actual financial literacy has declined by 5%. As a result of the negative impact of

overconfidence and its growth among Americans, efforts to improve financial behavior must address the going-concern of overconfidence.

Based upon the research conducted by Tang & Baker (2016), subjective knowledge and self-esteem have a profound relationship. In addition, after analyzing the direct and indirect effects of self-esteem, Tang & Baker (2016) find that higher self-esteem led to improved financial behavior. In contrast, the previous two studies show that an escalated level of self-esteem can lead to overconfidence, which is actually detrimental to financial decisions. The common difference between the studies involves the presence of subjective and objective knowledge. Therefore, according to Tang & Baker (2016), the introduction of subjective knowledge has the potential to increase self-esteem at an acceptable level that improves the quality of financial behavior.

Need for Economic Education

Financial Literacy Curriculum in High Schools

According to the 2015 National Report Card, financial literacy education in high school is insufficient. Twenty-six states were given grades of C, D or F (Pelletier, 2015). In order to grade each state, the report reviews the previous 14 years of legislation summaries from the National Conference of State Legislatures. In addition, the report utilizes publications from the Council for Economic Education. The grading system rates all states from A to F based upon their efforts towards implementing financial literacy education. An “A” grade (5 states) requires the schools to offer a one semester personal finance course as a graduation requirement. A “B” grade (20 states) requires the schools to include personal finance education within a required

course, whether as a stand-alone course or part of another course. A “C” grade (11 states) requires schools to offer personal finance topics in schools, but does not mandate students take the course. A “D” grade (3 states) means that the state has a “modest levels” of personal finance in its academic standards. Finally, an “F” grade (12 states) is given to states with nearly no financial educational requirements, meaning that a student can graduate high school without ever being introduced to any financial literacy concepts. Since formal education has a statistically significant relationship with literacy and numeracy (Green & Riddell, 2016), the lack of high school financial education is a potential factor of low financial literacy scores.

Financial Literacy Initiatives

Although the effects of financial literacy education are highly debated, research conducted by Filbeck & Zhao (2016) illustrate that financial literacy initiatives have a positive impact on both financial knowledge and behavior.

The entire sample of the research includes 362 pre-surveys and 113 post-surveys obtained from students at twelve schools. In order to generate accurate assumptions, the test sample was limited to only the 113 students who participated in both pre- and post-surveys. An identical survey of 15 questions were asked in both the pre- and post-surveys. Of the 15 total questions, 11 related to financial knowledge and 4 related to financial behavior. Pre-surveys were taken by students before participating in the financial literacy initiative. Post-surveys were administered to students after their completion of the financial literacy curriculum. The financial literacy curriculum relied upon information presented in a book titled *The Missing Semester*. The book is co-authored by Matt Kabala and Gene Natali, Jr. of the CFA Society of Pittsburgh. *The Missing*

Semester introduces important financial concepts, including: managing debt, investing, and planning for the future.

In order to assess the effectiveness of the financial literacy initiative, Filbeck & Zhao (2016) utilize a t-test of the pre- and post-survey results. After running a t-test, both financial knowledge and financial behavior were analyzed. The average financial knowledge of all students increased from 37.027 to 43.398 with a statistically significant t-stat at a 99% confidence interval. In addition, the average financial behavior score increased from 14.779 to 15.558 with a statistically significant t-stat at the 0.01 level. Therefore, teaching financial concepts to high school students had a profound and statistically significant effect on both financial knowledge and financial behavior for the students involved in the survey.

The results of the study conducted by Filbeck & Zhao (2016) offer optimistic implications about the ability of education to improve financial literacy. It will be important to analyze if the same results are found using a larger sample size. Furthermore, the survey may be further enriched by gauging actual financial knowledge alongside perceived financial knowledge. Based upon previous research conducted, perceived knowledge may differ from actual knowledge (Asaad, 2015; McCannon, Asaad & Wilson, 2015; Lin, et al., 2016). In addition, Tang & Baker (2016) show that self-esteem and subjective knowledge have a statistically significant effect on financial behavior. As a result, further research can be conducted that incorporates subjective education as a piece of the financial initiative, as well as financial knowledge questions that analyze both perceived and actual financial knowledge.

In short, previous research presents the opportunity to increase financial literacy and numeracy through education. Numeracy has a profound impact on personal wealth, as a one-point incremental increase in numeracy is related to a 5.2% increase in personal wealth (Estrada-

Mejia, de Vries & Zeelenberg, 2016). Thankfully, numeracy and literacy can both be increased through education (Green & Riddell, 2012). Utilizing financially focused education has the potential to increase a person's overall financial literacy. Furthermore, well conducted education can enhance cognitive skills and self-esteem via objective and subjective teaching, which has the potential to increase overall financial understanding. Assuming the conclusions drawn by previous research about financial knowledge remain true, increased financial understanding leads to improved financial behavior, which in turn increases a person's likelihood of financial success (Stango & Zinman, 2009; Lusardi & Mitchell 2011; Lusardi & Tufano, 2015). Thus, by utilizing objective and subjective financial education, there is a potential to improve a person's chance of obtaining financial success.

Chapter 3

Hypothesis and Methodology

Data Sample

A total of 53 high schools, spread amongst seven states and 70 teachers, agreed to participate in both a pre- and post-survey to examine the effectiveness of financial literacy education. In likeness to the survey conducted by Filbeck & Zhao (2016), links for a pre- and post-survey were provided to the participating teachers. Within the introductory email, instructors were given directions to assign each student with a unique ID number, allowing pre- and post-surveys to be matched for analysis.

The survey distributed was designed as an extension of the word conducted by Filbeck & Zhao (2016) with the addition of five objective financial knowledge questions. The full survey and material modifications of the extension can be found in Appendices A, B, and C, respectively. Of the original population, pre-surveys were completed by 438 students from fourteen schools and two states. A total of 103 post-surveys were completed by students from five schools.

Table 1 reports the descriptive statistics for the full sample and the test sample. The full sample is constructed of 438 students completing the pre-survey, while the test sample including only 48 students who submitted both a pre- and post-survey. Of the full sample, 417 (95 percent) students are in their junior or senior year; in the test sample, 48 students are in their junior or senior year. Female students account for approximately 48 percent in both the full sample and

the test sample. Regarding favorite subject, students within the full sample favored math (33 percent) and science (29 percent), a trend which continued to the test sample with math and science as the favorite subjects at 38 percent and 31 percent, respectively.

Survey Methodology

Survey questions are categorized into two major types: financial knowledge and financial behavior. Financial knowledge questions are further categorized as objective or subjective financial knowledge. The survey consists of 19 overall questions: three financial behavior, five objective financial knowledge, and 11 subjective financial knowledge. Financial behavior and subjective financial knowledge questions are rated on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). The three financial behavior questions are "I like to save money more than I like to spend it," "I have a checking and/or a savings account," and "I have conversations with my parents regarding personal finance." Subjective financial knowledge questions involve perceived understanding of financial concepts and include questions such as: "I understand how to establish a financial plan," "I think financial literacy is important for my future," and "I understand the process by which my parents/guardians make financial decisions."

Objective financial knowledge questions are asked in a manner that contains a right or wrong answer. Each objective financial knowledge question contains at least one wrong answer and a choice of "I Don't Know." The questions are based upon five major categories of financial literacy: risk diversification, compound interest, credit, numeracy (interest), and inflation. The questions are analyzed using two methods: correctness and willingness to answer. The first

method of correctness assigns a 1 for each correct answer and 0 for any other answer. The second method to measure willingness assigns a 1 for an answer of "I Don't Know" and 0 for any other answer.

The organization of the survey is constructed in a way that assesses the four major keys to financial success: financial self-esteem, perceived financial knowledge, financial behavior, and objective financial knowledge with numeracy. The financial behavior and subjective financial knowledge test financial self-esteem and perceived financial knowledge by gauging the student's self-reported understanding. The final five objective knowledge questions test financial self-esteem and objective financial knowledge by assessing correctness of answers and willingness to select an answer other than "I Don't Know."

Hypothesis

A three-step hypothesis will first analyze whether there is a significant relationship between financial literacy education and objective financial knowledge. The second hypothesis will test if financial literacy education positively impacts financial self-esteem. Finally, the third hypothesis statement tests ability of financial knowledge to affect financial behavior. If the alternative hypotheses statements hold true, education will increase financial knowledge and self-esteem, which ultimately improves the likelihood of financial success – a result of improved financial behavior and decision-making.

Chapter 4

Test Results

Pre-Survey Analysis

For the t-test of the pre-survey responses, two student characteristics are present: gender and GPA. Each characteristic divides the full sample into two groups. The grade level divides the sample into upperclassmen and underclassmen. Gender is broken into a sub-group for females and males. Finally, the median GPA of the whole sample divides the students as a higher GPA or lower GPA group.

The response differences between groups are shown in Table 2. The average responses are compared to the individual subgroups of gender and GPA to determine if the characteristics exhibit a statistically significant effect. The gender characteristic identifies the effect of a student being a female versus a male (gender), as well as the effect of a student having a high GPA versus low GPA. The data shows no statistically significant effect of gender or GPA on subjective financial knowledge. For financial behavior, students with a high GPA tend to be better financially behaved (statistically significant at the 1 percent level), while gender has no statistically significant effect. In objective financial knowledge, females tend to score lower in correctness, while students with high GPAs tend to score higher in correctness (both significant at the 1 percent level).

Table 3 further reports the response differences on “percent correct” and “I don’t know” between groups for objective questions. The results are consistent with the results in Table 2. For example, 46.32 percent (51.42 percent) male students (students with high GPA) answered correctly in at least three objective questions, while the corresponding figure for female students

(students with low GPA) is 38.28 percent (34.21 percent). In addition, about 9.57 percent (9.91 percent) male students (students with high GPA) responded with "I don't know" in at least three objective questions, while the corresponding figure for female students (students with low GPA) is 15.15 percent (14.91 percent).

We use logistic regression models to analyze the relationship between characteristics and financial literacy measures. To identify the impact, we assign the dependent variable as High_BEHAV (High_KNOW, High_OBJ), which separates the sample into two groups based on their survey response scores. Three models are used to test the effect of financial behavior scores (High_BEHAV), subjective financial knowledge scores (High_KNOW), and objective financial knowledge scores (High_OBJ). In all three models we include gender, grade level, favorite subject, GPA and favorite learning method as independent variables. Each regression factor is a dummy variable, set to equal 1 if the variable criteria is met and 0 if it is not. The regression variables are defined below:

- **High_BEHAV**: Higher response scores than the median score – 1, otherwise 0
- **High_KNOW**: Higher response scores than the median score – 1, otherwise 0
- **High_OBJ**: Higher response scores than the median score – 1, otherwise 0
- **Female:** Student is a female – 1, otherwise 0
- **Sophomore:** Student is a Sophomore – 1, otherwise 0
- **Junior:** Student is a Junior– 1, otherwise 0
- **Senior:** Student is a Senior– 1, otherwise 0
- **English:** Student's favorite subject is English – 1, otherwise 0
- **Math:** Student's favorite subject is Math – 1, otherwise 0
- **Science:** Student's favorite subject is Science – 1, otherwise 0
- **LBD:** Student's favorite learning style is Learning by doing – 1, otherwise 0
- **Listening:** Student's favorite learning style is Listening – 1, otherwise 0
- **Discussing:** Student's favorite learning style is Discussion– 1, otherwise 0
- **Visual:** Student's favorite learning style is Visualization – 1, otherwise 0
- **High_GPA:** Student has a higher GPA than median full sample GPA – 1, otherwise 0

Table 4 illustrates the results from these three logistic regression models.

Model (1) uses High_BEHAV as the dependent variable. The results show students with high subjective and financial knowledge, as well as a high GPA, have a higher probability to be better behaved financially. In addition, the first regression tested null hypothesis C to determine if higher financial knowledge leads to better financial behavior. The subjective financial knowledge coefficient is statistically significant at the 1 percent level and objective financial knowledge at the 10 percent level, implying that a student who possesses more financial knowledge will likely behave better financially.

Model (2) uses High_KNOW as the dependent variable. The results show students with high GPAs that prefer visual learning are more likely to have lower subjective financial knowledge. The coefficient of High_BEHAV (statistically significant at the 1 percent level) shows that a student who is better financially behaved is also more likely to be subjectively knowledgeable in finance. The statistically insignificant coefficient of High_OBJ shows the disconnect between subjective and objective financial knowledge, similar to the results of Tang & Baker (2016) when comparing actual and perceived financial knowledge.

Model (3) uses High_OBJ as the dependent variable. The results show male students with GPAs are more likely to have better objective financial knowledge. Students whose favorite subject is English are more likely to exhibit lower objective financial knowledge. The coefficient of High_BEHAV (statistically significant at the 5 percent level) shows that a student who is better financially behaved is also more likely to be objectively knowledgeable in finance. The insignificant coefficient of High_KNOW reiterates the difference between actual and perceived financial knowledge.

Post-Survey Analysis

We compare the results of the pre- and post-survey using our test sample of 48 matched students. We define improvement in several ways. For subjective financial knowledge and financial behavior, we define gains as the post-survey scores minus the pre-survey response scores. For objective financial knowledge questions, we define gains in financial knowledge as the difference between the post-survey scores minus the pre-survey response. To gauge financial self-esteem, we define confidence gains as a decrease in the responses of "I Don't Know" in the post-survey minus the pre-survey. We run univariate tests on the gains in our test samples and sub-samples.

Table 5 illustrates the t-test results by question and overall score for each of the four items measured: subjective financial knowledge, financial behavior, objective financial knowledge, and financial self-esteem. The results show improvements in nearly all categories, per question and total. Each total improvement is statistically significant at the 1 percent level, indicating an overall improvement in each area with 99 percent confidence the improvement was not random.

Within subjective financial knowledge, the biggest gains come from understanding of Roth IRA (gain of 1.813) and retirement (1.333). All subjective financial knowledge questions are at least statistically significant at the 5 percent level. The biggest gain in financial behavior derives from willingness to save money (gain of 0.604). These results closely mirror the research of Filbeck & Zhao (2016), who find the largest growth within the same categories.

Additionally, the biggest gains from objective financial knowledge are compounding interest (gain of 0.333) and credit (gain of 0.333). The biggest improvement in self-esteem also stems from compounding interest (0.370 improvement) and credit (0.326 improvement). The

results show a link between confidence to answer a question (self-esteem) and correctness (objective financial knowledge).

The T-test results analyze the first and the second hypothesis, both of which are related to the objective financial knowledge questions. Students experienced a positive gain in correctness of 1.063 (statistically significant at the 1 percent level), which represents an improvement of 52 percent. Furthermore, the mean total score for the test sample increased to over 3, representing an aggregate score for the test sample that is considered financially literate. With a significance level of 1 percent, the results show that students are more likely to be more financially knowledgeable after completing financial literacy education.

Additionally, students experienced an increase in financial self-esteem, as measured by the amount of questions answered with “I don’t know.” Students experienced an improvement in the amount of “I don’t know” answers of 1.236 (statistically significant at the 1 percent level), representing an improvement in financial self-esteem to answer the question. Therefore, our results indicate that students are less likely to answer “I don’t know” and be more financially confident after completing financial literacy education.

Chapter 5

Conclusions

This research study investigates the effectiveness of a high school financial literacy campaign to significantly improve financial literacy in four areas: subjective financial knowledge, financial behavior, objective financial knowledge and self-esteem. The financial literacy campaigns within the study were launched by the CFA Society of Pittsburgh based upon the book *The Missing Semester*.

Initially, the result of the pre-survey, taken by students before beginning the financial education program, are analyzed using a t-test. The results show students with higher GPAs are more likely to display better financial behavior and objective financial knowledge than students with lower GPAs. Similarly, male students are more likely to exhibit better objective financial knowledge.

Subsequently, logistic regressions test the relationship of subjective financial knowledge, financial behavior, and objective financial knowledge. Students with high GPAs are more likely to exhibit better financial behavior and objective financial knowledge, yet lower subjective financial knowledge. Male students are more likely to show higher objective financial knowledge. Students who favor English are more likely to show lower objective financial knowledge, and visual learners are more likely to show lower subjective financial knowledge. Overall, good financial behavior implies better financial knowledge, both objective and subjective, and vice-versa. Conversely, subjective financial knowledge exhibits no statistically significant effect on objective financial knowledge, indicating perceived financial knowledge

does not equate to actual financial knowledge. Therefore, the analysis shows that all three aspects can be positively increased with an improvement in subjective and objective financial knowledge.

To test the effectiveness of the financial literacy program, we then conducted a T-test between results of the pre- and post-survey, taken after completion of the course. The T-test analyzes the four major topic areas listed above. Students experienced an increase in all for topics at a statistically significant level of at least the 5 percent level. Financial behavior improved at the 5 percent level, while subjective financial knowledge, objective financial knowledge, and financial self-esteem improved at the 1 percent level. The results of the surveys portray similarities to many studies conducted in the past. Through the questions in the survey, topics from debt management to numeracy to exponential growth bias to retirement understanding were tested before and after the financial literacy campaign. Students exhibited a gain in each of these categories after completing the financial literacy education.

Based upon the analysis, statistically significant gains in subjective financial knowledge, financial behavior, objective financial knowledge, and financial self-esteem lead us to the conclusion that the CFA Society Pittsburgh financial literacy program is successful at increasing students' chances of financial success. After similar results were found by Filbeck and Zhao (2016), this study further examines the effectiveness of the same outreach program with the addition of objective financial knowledge and self-esteem analysis. Therefore, the analysis shows the program continues to be successful at attempting to confront the financial literacy crisis.

Table 1. Sample Descriptions

Table 1 shows the number of students across different grade level and different favorite subjects for the whole sample and the test sample.

		Grade				
		9th	10th	11th	12th	Total
Panel A. Whole sample						
Male	English	0	1	4	24	29
	Math	2	4	25	48	79
	Science	2	1	16	43	62
	Social Studies	2	1	28	28	59
Female	English	0	2	13	42	57
	Math	0	2	12	52	66
	Science	0	2	13	51	66
	Social Studies	2	0	1	17	20
	Total	8	13	112	305	438
Panel B. Test sample						
Male	English	0	0	0	1	1
	Math	0	0	4	9	13
	Science	0	0	1	3	4
	Social Studies	0	0	3	4	7
Female	English	0	0	3	2	5
	Math	0	0	2	3	5
	Science	0	0	4	7	11
	Social Studies	0	0	0	2	2
	Total	0	0	17	31	48

Table 2. Differences based on student characteristics: Pre-Survey

Table 2 shows the differences of pre-survey student responses on financial knowledge and financial behavioral questions across different gender and GPA for the whole sample.

	Average Response	Gender	GPA
Panel A. Financial knowledge questions			
2. I understand how to establish a financial plan.	3.055	-0.177*	-0.042
3. I think financial literacy is important for my future.	4.309	0.071	0.203***
6. I understand the process by which my parents/guardians make financial decisions.	3.215	-0.116	-0.222**
7. I know how to determine the appropriate total costs associated with the colleges/universities I am interested in attending.	3.111	-0.039	0.122
8. I understand the process by which loan repayments take place including the impact of interest, delinquency and default.	2.820	-0.250**	-0.136
9. I understand the process by which credit card charges and repayment schedules can impact the level of financial debt levels.	3.470	0.080	-0.002
10. When it comes to purchasing a car, I know how to determine how much of a car I can afford.	3.167	-0.217**	-0.322***
11. I understand how to evaluate the cost-benefit analysis of training for the job I would like to perform after completing school.	3.053	-0.119	-0.074
12. I know what a Roth IRA is and how it works from a taxation standpoint.	2.103	-0.197*	-0.271***
13. I know how to create a savings plan based on the ability to estimate monthly living expenses.	3.185	-0.097	-0.084
14. I know how to plan financially for retirement.	2.622	-0.166	-0.186*
Total score for financial knowledge	33.959	-1.089	-0.986

Panel B. Financial behavior questions			
1. I like to save money more than I like to spend it.	3.452	0.013	0.292***
4. I have a checking and/or a savings account.	3.752	0.216	0.343***
5. I have conversations with my parents regarding personal finance.	3.237	-0.166	0.147
Total score for financial behavior	10.418	0.015	0.768***
Panel C. Objective questions			
1. Is it safer to put your money into one investment or put your money into multiple investments?	0.584	-0.147***	0.065
2. If you invest $100 in a Roth IRA and earn 10% per year for 3 years, how much would it be worth at the end of three years.	0.273	-0.547	0.056
3. If you use a credit card in January for a total of $300, which payment option will result in the lowest amount of overall interest paid.	0.445	-0.374	0.169***
4. Suppose you decide to buy a BMW for $50,000. If you take out an auto loan for 5 years with 5% interest, how much total will you pay per year?	0.418	-0.122***	0.112**
5. In the future, the cost of things you buy doubles AND your income also doubles. How much will you be able to buy in the future in comparison to today?	0.532	-0.011	0.157***
Total score for objective questions	2.252	-0.371***	0.560***

***, **, * indicate statistical significance at 0.01, 0.05 and 0.10 level, respectively.

[a] A positive number indicates that upperclassmen (11^{th} and 12^{th}) agreed more than students of underclassmen (9^{th} and 10^{th}).

[b] A positive number indicates that female students agreed more than male students.

[c] A positive number indicates that students with higher GPAs agreed more than students with lower GPAs.

Table 3. Differences based on student characteristics: Pre-Survey on Objective Questions

Table 3 shows the differences of pre-survey student responses on objective questions across different grade level, gender and GPA for the whole sample.

		Grade		Gender		GPA	
	Whole	Underclass	Upperclass	Male	Female	Low GPA	High GPA
Panel A. % correct							
OB1	58.41	47.62	58.95	65.37	50.72	55.26	61.79
OB2	38.41	33.33	26.97	29.87	24.40	24.56	30.19
OB3	44.55	47.62	44.39	46.32	42.58	36.40	53.30
OB4	41.82	57.14	41.05	47.62	35.41	36.40	47.64
OB5	53.18	61.90	52.74	53.68	52.63	45.61	61.32
Correct in >=3 objective questions	42.50	52.38	42.00	46.32	38.28	34.21	51.42
Panel B. % IDK (I don't know)							
OB1	30.68	42.86	30.07	23.38	38.76	32.46	28.77
OB2	27.27	19.05	39.38	29.44	48.33	43.42	33.02
OB3	35.00	33.33	35.08	31.60	38.76	39.04	30.66
OB4	30.68	19.05	31.26	23.38	38.76	34.21	26.89
OB5	20.45	14.29	20.76	17.32	23.92	23.68	16.98
IDK in >=3 objective questions	12.50	14.29	12.41	15.15	9.57	14.91	9.91

Table 4. Logistic regressions on student characteristics: Pre-Survey

Table 4 shows the logistics regressions on student characteristics of the whole sample. High_BEHAV (High_KNOW, High_OBJ) is a dummy variable which is equal to 1 if the student has higher response scores in financial behavioral (knowledge, objective) questions, and 0 otherwise. Female is a dummy variable which is equal to 1 if the student is a female student and 0 otherwise. Sophomore (Junior, Senior) is a dummy variable which is equal to 1 if the student is a sophomore (junior, senior), and 0 otherwise. English (Math, Science) is a dummy variable which is equal to 1 if the student's favorite subject is English (math, science), and 0 otherwise. LBD (Listening, Discussing, Visual) is a dummy variable which is equal to 1 if the student chooses learning by doing (listening, discussing with peers, features visual support) as favorite instruction method, and 0 otherwise. High_GPA is a dummy variable which is equal to 1 if the student has a higher than median GPA in the whole sample, and 0 otherwise.

	Model (1)		Model (2)		Model (3)	
	Dependent variable: High_BEHAV		Dependent variable: High_KNOW		Dependent variable: High_OBJ	
	Coefficient	Chi-Square	Coefficient	Chi-Square	Coefficient	Chi-Square
Intercept	0.159	0.03	-0.636	0.57	-0.331	0.14
High_KNOW	1.038	24.47***			0.307	1.99
High_BEHAV			1.034	24.36***	0.42	3.81**
High_OBJ	0.421	3.84*	0.31	2.04		
Female	-0.16	0.54	-0.119	0.3	-0.533	5.64**
Sophomore	-0.657	0.39	1.036	1.14	-0.166	0.03
Junior	-1.357	2.37	0.561	0.51	-0.968	1.43
Senior	-1.007	1.34	0.91	1.41	-0.291	0.13
English	0.082	0.06	-0.41	1.38	-0.766	4.34**
Math	0.123	0.16	-0.376	1.55	-0.086	0.08
Science	0.15	0.23	-0.456	2.14	0.493	2.52
LBD	-0.249	1.14	-0.056	0.06	0.158	0.43
Listening	-0.146	0.45	0.167	0.58	0.057	0.06
Discussing	-0.016	0.01	0.098	0.21	-0.321	2.2
Visual	0.316	2.07	-0.641	8.64***	0.019	0.01
GPA	0.596	7.57***	-0.516	5.60**	0.77	12.15***

***, **, * indicate statistical significance at 0.01, 0.05 and 0.10 level, respectively.

Table 5. T-Test results between Pre- and Post-Survey

Table 5 shows the t-test results of student responses to financial behavior and knowledge questions before and after the financial literacy educational efforts for the test sample.

	Pre	Post	Diff	T-stat
Panel A. Financial knowledge questions				
2. I understand how to establish a financial plan.	2.938	4.000	1.063	6.82***
3. I think financial literacy is important for my future.	4.167	4.47	0.313	2.09**
6. I understand the process by which my parents/guardians make financial decisions.	3.458	3.833	0.375	2.00*
7. I know how to determine the appropriate total costs associated with the colleges/universities I am interested in attending.	3.063	3.708	0.646	3.45***
8. I understand the process by which loan repayments take place including the impact of interest, delinquency and default.	2.958	3.854	0.896	5.38***
9. I understand the process by which credit card charges and repayment schedules can impact the level of financial debt levels.	3.417	4.188	0.771	4.13***
10. When it comes to purchasing a car, I know how to determine how much of a car I can afford.	3.292	4.125	0.833	4.46***
11. I understand how to evaluate the cost-benefit analysis of training for the job I would like to perform after completing school.	3.021	3.729	0.723	4.10***
12. I know what a Roth IRA is and how it works from a taxation standpoint.	2.000	3.813	1.813	10.65***
13. I know how to create a savings plan based on the ability to estimate monthly living expenses.	3.064	4.125	1.064	5.96***
14. I know how to plan financially for retirement.	2.563	3.896	1.333	7.43***
Total score for financial knowledge	33.813	43.750	9.938	7.66***
Panel B. Financial behavior questions				
1. I like to save money more than I like to spend it.	3.333	3.938	0.604	3.72***
4. I have a checking and/or a savings account.	3.750	3.813	0.063	0.38
5. I have conversations with my parents regarding personal finance.	3.458	3.688	0.229	1.42
Total score for financial behavior	10.542	11.438	0.896	2.52**

Panel C. Objective questions				
1. Is it safer to put your money into one investment or put your money into multiple investments?	0.583	0.729	0.146	1.73*
2. If you invest $100 in a Roth IRA and earn 10% per year for 3 years, how much would it be worth at the end of three years?	0.208	0.542	0.333	4.13***
3. If you use a credit card in January for a total of $300, which payment option will result in the lowest amount of overall interest paid?	0.375	0.708	0.333	4.13***
4. Suppose you decide to buy a BMW for $50,000. If you take out an auto loan for 5 years with 5% interest, how much total will you pay per year?	0.354	0.417	0.063	0.650
5. In the future, the cost of things you buy doubles AND your income also doubles. How much will you be able to buy in the future in comparison to today?	0.521	0.708	0.188	2.28**
Total score for objective questions	2.042	3.104	1.063	4.75***
Panel D. Self-Esteem (Number of "I Don't Know" Answered)****				
1. Is it safer to put your money into one investment or put your money into multiple investments?	0.283	0.065	-0.217	3.155***
2. If you invest $100 in a Roth IRA and earn 10% per year for 3 years, how much would it be worth at the end of three years?	0.478	0.109	-0.370	-5.136***
3. If you use a credit card in January for a total of $300, which payment option will result in the lowest amount of overall interest paid?	0.375	0.043	-0.326	-4.264***
4. Suppose you decide to buy a BMW for $50,000. If you take out an auto loan for 5 years with 5% interest, how much total will you pay per year?	0.304	0.065	-0.239	-3.761***
5. In the future, the cost of things you buy doubles AND your income also doubles. How much will you be able to buy in the future in comparison to today?	0.217	0.043	-0.174	-2.697***
Total score for objective questions	1.652	0.326	-1.326	-5.505***

***, **, * indicate statistical significance at 0.01, 0.05 and 0.10 level, respectively.

**** Improvement is indicated by a negative difference and t-stat (Less people selecting "I Don't Know")

Appendix A

Pre-Survey Questions

State:
School:
Teacher:
Student ID:
Gender:
GPA:
Grade:
Favorite Subject in School:
____ English
____ Math
____ Social Studies
____ Science
Questions:

1. I like to save money more than I like to spend it.
2. I understand how to establish a financial plan.
3. I think financial literacy is important for my future.
4. I have a checking and/or a savings account.
5. I have conversations with my parents regarding personal finance.
6. I understand the process by which my parents/guardians make financial decisions.
7. I know how to determine the appropriate total costs associated with the colleges/universities I am interested in attending.
8. I understand the process by which loan repayments take place including the impact of interest, delinquency and default.
9. I understand the process by which credit card charges and repayment schedules can impact the level of financial debt levels.
10. When it comes to purchasing a car, I know how to determine how much of a car I can afford.
11. I understand how to evaluate the cost-benefit analysis of training for the job I would like to perform after completing school.
12. I know what a Roth IRA is and how it works from a taxation standpoint.
13. I know how to create a savings plan based on the ability to estimate monthly living expenses.
14. I know how to plan financially for retirement.

Learning Preferences:
I am able to master material when instruction includes:

1. Learning by doing/manipulating objects
2. Listening
3. Discussing with peers
4. Features visual support (e.g., powerpoint slides)

Objective Questions:

1. Is it safer to put your money into one investment or put your money into multiple investments?

2. If you invest $100 in a Roth IRA and earn 10% per year for 3 years, how much would it be worth at the end of three years.
3. If you use a credit card in January for a total of $300, which payment option will result in the lowest amount of overall interest paid.
4. Suppose you decide to buy a BMW for $50,000. If you take out an auto loan for 5 years with 5% interest, how much total will you pay per year?
5. In the future, the cost of things you buy doubles AND your income also doubles. How much will you be able to buy in the future in comparison to today?

Appendix B

Post-Survey Questions

State:
School:
Teacher:
Student ID:
Questions:

1. I like to save money more than I like to spend it.
2. I understand how to establish a financial plan.
3. I think financial literacy is important for my future.
4. I have a checking and/or a savings account.
5. I have conversations with my parents regarding personal finance.
6. I understand the process by which my parents/guardians make financial decisions.
7. I know how to determine the appropriate total costs associated with the colleges/universities I am interested in attending.
8. I understand the process by which loan repayments take place including the impact of interest, delinquency and default.
9. I understand the process by which credit card charges and repayment schedules can impact the level of financial debt levels.
10. When it comes to purchasing a car, I know how to determine how much of a car I can afford.
11. I understand how to evaluate the cost-benefit analysis of training for the job I would like to perform after completing school.
12. I know what a Roth IRA is and how it works from a taxation standpoint.
13. I know how to create a savings plan based on the ability to estimate monthly living expenses.
14. I know how to plan financially for retirement.

Learning Preferences:
I am able to master material when instruction includes:

1. Learning by doing/manipulating objects
2. Listening
3. Discussing with peers
4. Features visual support (e.g., powerpoint slides)

Objective Questions:

1. Which is less risky: Investing your money into one investment or multiple investments?
2. If you invest $100 in a Roth IRA and earn 5% per year for 3 years, how much would it be worth at the end of three years.
3. If you use a credit card in January for a total of $500, which payment option will result in the lowest amount of overall interest paid.
4. Suppose you decide to buy a Audi for $50,000. If you take out an auto loan for 5 years with 5% interest, how much total will you pay per year?

5. In the future, the cost of things you buy doubles BUT your income remains the same. How much will you be able to buy in the future in comparison to today?

Appendix C

Material Modifications of Filbeck and Zhao Survey

Removed Questions

- I played money-based games as a child/teen (i.e., allowance game, Life, Monopoly)

Added Questions

Objective Financial Knowledge/Self-Esteem

- Risk Diversification
- Compounding Interest
- Credit
- Basic Interest (Numeracy)
- Inflation

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Academic Vita

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EDUCATION

Level I Candidate in the Chartered Financial Analyst (CFA) Program
Candidate for CFP Certification
The Pennsylvania State University **Erie, PA**
Bachelor of Science in Finance, *Certificate in Financial Planning* Graduation: May 2018
Schreyer Honors College, Black School of Business

FINANCE WORK EXPERIENCE

C.S. McKee, L.P. **Pittsburgh, PA**
Client Services Analyst Intern *August 2017 - Present*

- Analyze portfolio risk-adjusted return metrics using eVestment
- Develop online client education portal to provide current and prospective clients with portfolio information
- Create diagrams for client presentations using Excel and PowerPoint

Hefren-Tillotson, Inc. **Pittsburgh, PA**
Portfolio & Investment Analyst Intern *May 2016 - August 2016; May 2017 - August 2017*

- Analyzed mutual funds and equities for client portfolios using Morningstar and Bloomberg
- Evaluated and created visual representations of macroeconomic data for advisors
- Presented analysis to Investment Advisory team of 5 members, which oversees nearly $10 Billion

Robbins Wealth Management **Erie, PA**
Equity Analyst Intern *November 2016 - April 2017*

- Created 3 automated financial valuation models to establish price targets for equities
- Developed an equity screener using ratios and momentum to narrow equity investment universe
- Evaluated momentum of equities using technical analysis, predominately: MACD, RSI, and moving averages

Centauri Advisory Group, Inc. **Zelienople, PA**
Junior Analyst Intern *June 2015 - September 2015*

- Researched and applied the Modern Portfolio Theory to construct portfolios along the efficient frontier
- Developed aggressive growth, tactical, and low risk model portfolios for clients
- Presented a PowerPoint lecture to firm owners about developed portfolios

FINANCIAL LEADERSHIP

Intrieri Family Student Managed Fund **Erie, PA**
President & Chief Investment Strategist, Lead Analyst *August 2016 - Present*

- Manage portfolio of equities worth over $600,000
- Value publicly traded companies using a valuation model that I created, which uses: discounted dividends, discounted cash flows, industry ratios, and residual income
- Present investment recommendations to the fund for buying and selling positions

CFA Investment Research Challenge Team **Erie, PA**
Team Captain *August 2016 - April 2017*

- Researched and created an investment analysis report about F.N.B. Corporation
- Presented report to CFA judges at local and regional levels
- Led team of 5 students to regional competition held in Seattle, WA

COMMUNITY INVOLVEMENT & VOLUNTEERING

CFA Society of Pittsburgh **Pittsburgh, PA**
Student Member, Financial Literacy Committee *2016 - Present*

SKILLS & HONORS

Software Skills: Excel, Bloomberg, PowerPoint, Word, Morningstar Advisor, YCharts, eVestment
Technical Skills: Fundamental Valuation, Excel Financial Modeling, Portfolio Management, Investment Reporting
Honors Distinctions: Beta Gamma Sigma, Financial Management Association Honors Society