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Improving financial literacy in college of business students: modernizing delivery tools

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Abstract

Purpose – The purpose of this paper is to develop and test through an experiment, an innovative online video teaching module that significantly improves financial literacy in college of business students. Specific business major financial literacy levels are also tested.

Design/methodology/approach – A total of 244 college of business students were given a financial literacy test. Half of the students were exposed to the "treatment" (watched a video module), while other half were not. The videos comprised 67 min of micro-lectures that students could download, free of charge, at their own convenience. The researchers analyzed the impact of a previous personal finance course on students' financial literacy levels and tested across four business majors.

Findings – The video intervention was the most successful at increasing financial literacy, surprisingly more so than having taken a past personal finance course. Interaction effects were not significant. Four college majors were tested with a shorter, improved financial literacy measure – finding, to our surprise that non-quantitative business majors (particularly marketing students) are not less financially literate than other majors. Supporting past research, the authors found that female and African-American college students performed significantly lower on the test.

Originality/value – The research adds value to the literature by developing and testing a modern, novel teaching innovation to improve financial literacy in young adults. Using an experimental setting, the authors showed that the innovation was more effective than the commonly proscribed personal finance course. This is one of the few studies to measure financial literacy levels for specific college of business majors.

Keywords Experiment, Video, College of business students, Financial literacy improvement

Paper type Research paper

Introduction: financial literacy – a significant individual and societal problem

Since the late 1990s, the study of "Financial Literacy" has been a hot-button issue in the popular press as well as in education, economics, management, finance and marketing journals. Politicians, pundits, educators, economists and the media fervently express trepidation that Americans, particularly younger ones, appear unable to save money, invest appropriately, handle credit, solve basic math and financial problems as well as comprehend both personal and national financial matters (Hamilton, 2013; Henager and Cude, 2016; Huhmann, 2017; Mandell, 2008; Marcolin and Abraham, 2006). Researchers have identified alarmingly lower levels of financial literacy in certain at-risk demographic groups potentially leading to negative financial behaviors (Bucher-Koenen *et al.*, 2017; Nejad and O'Connor, 2016). Recent studies have also shown that consumers may be over-confident in their perceived financial literacy (subjective vs objective financial literacy – see Hadar *et al.*, 2013) and as a result may take part in riskier financial behaviors (Nejad and Javid, 2018; Porto and Xiao, 2016).

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Millennials are particularly challenged by financial illiteracy due to the unprecedented burden of credit cards and student loans (de Bassa Scheresberg and Lusardi, 2014; Xiao *et al.*, 2011), making US college students a surprisingly vulnerable population. This extends to recent college graduates. Several studies find mean college financial literacy scores not much higher than K-12, even among business majors (Hamilton, 2013), with post-secondary US students having "inadequate knowledge" of personal finance (Hanna *et al.*, 2010; Mandell, 2008; Xiao *et al.*, 2014). As a result, even educated and affluent younger Americans may find themselves unable to navigate the financial world, prone to make uninformed decisions and misled about financial matters (Marcolin and Abraham, 2006). Williams and Oumlil (2005) have called for an "intervention strategy" to improve young college adults' ability to make informed financial decisions. From a macro-economic perspective, if the highest educated and financially secure cohort (college graduates) in a nation are crippled by poor financial skills and knowledge, we risk an "uncompetitive and unattractive workforce that by necessity will lean more on social programs," according to Ted Beck, CEO of the National Endowment for Financial Education (Malcolm, 2012).

Although a generalized lack of objective financial knowledge among younger Americans has been documented for decades at both the high school and college level (Chen and Volpe, 1998; Danes and Hira, 1987; Lusardi *et al.*, 2010), there appears to be little research focused on the financial literacy of specific college majors. As marketing and finance professors, several of the researchers on this project were interested in whether the poor financial literacy scores found in college of business studies extend equally across all majors. There is a concern that poor financial literacy may be amplified in marketing, where there is a long documented history of students experiencing difficulty with math, statistics and numeracy (Aggarwal *et al.*, 2007; Budden, 1985; Ganesh *et al.*, 2010).

As marketing researchers and scale developers, we also hoped to find more research exploring financial literacy scale development, refinement and validation (as called for by Hastings *et al.*, 2013; Hung *et al.*, 2009). Researchers disagree upon construct definitions for financial literacy, ways to measure it and direct links to behavior (Huhmann and McQuitty, 2009). There are additional ongoing disagreements about related constructs such as financial capability, objective financial knowledge and financial self-efficacy (Hung *et al.*, 2009; Taylor, 2011; Shim *et al.*, 2013; Xiao and O'Neill, 2016).

Finally, it appears that the major thrust, in terms of efforts to improve financial literacy in millennials, is often relegated to a mandated personal finance course "unevenly applied" in K-12 grade (Harrington and Smith, 2016). We would like to see the rich tapestry of modern marketing educational tools such as mixed media, online video workshops and seminars, and exploratory teaching methods available to marketing educators expand to include the improvement of financial literacy across the college curriculum.

Study purpose

The purpose of this study is to extend the conceptual and theoretical literature related to financial literacy improvement in young people, particularly in college of business students. We analyzed the effectiveness of short videos vs taking a more traditional finance course and evaluated the impact on the participants' performance on a financial literacy test. Working with online media sources already in place, the researchers utilized video self-tutorials, and an experiment was conducted with 244 college of business students to explore if these online tutorials would significantly improve financial literacy in business majors. Specific business school major, GPA, demographics and exposure to a personal finance course were each analyzed, as well as more appropriate measures of college student literacy proposed. The study more deeply explores marketing and management majors, potentially at risk for poor financial literacy demographic groups, and calls for marketing researchers to assist in scale development and improvement. This study also extends

research in utilizing greater diversity in teaching perspectives (Xiao and O'Neill, 2016), and simplifying and modernizing information/content learning and delivery (Huhmann and McQuitty, 2009) using online web tools and systems (Alwehaibi, 2015; Wankel, 2010).

Financial literacy and students

The GAO (2012) defined financial literacy as: "the ability to make informed judgments and to take effective actions regarding the current and future use and management of money. It includes the ability to understand financial choices, plan for the future, spend wisely, and manage the challenges associated with life events such as a job loss, saving for retirement, or paying for a child's education" (p. 3). The origins of academic research and measurement of financial literacy began with US high school seniors and the development of a lengthy measurement instrument in the late 1990s with the "Jump$tart, Baseline Survey 1997–1998 of 12th Graders" (Mandell, 2008). Scores on the measure were problematic at best, with high schoolers in the "failing ranges" of 48–57 percent (Jump$tart, 2014). American university students performed poorly displaying a "dismal knowledge" of personal finance (Chen and Volpe, 1998; Volpe *et al.*, 1996) with a mean score of 53 percent on the instrument in the early years of survey (Hanna *et al.*, 2010). Although the performance of a sub-segment including both college-bound and college students improved in the late 2000s, the annual nationwide high school and college student averages were by most measures still "not passing" (OECD, 2005). Jump$tart survey results support a litany of research indicating American consumers, particularly younger ones, are financially illiterate and this is causing serious issues at home as well as in business and society (Fernandes, 2014; Malcolm, 2012; Mandell, 2008; Marcolin and Abraham, 2006).

Lack of financial literacy in college students continues to resonate in the popular business press as this cohort struggles with repaying soaring student debt (Lachance, 2012; Xiao *et al.*, 2014). The average college student now accrues over $35,000 in student debt (Ellis, 2013), and poor financial literacy skills in college graduates magnify the problem. "It comes back to a financial literacy issue and making sure students understand what they're getting into, how much they're borrowing and an understanding that there are different options for them at the end," says Megan McClean, Director of Policy and Federal Relations at the National Association of Student Financial Aid Administrators (Bidwell, 2013).

More recent research has focused on parsing out and measuring important objective and subjective or "perceived" knowledge elements of the financial literacy construct (Hadar *et al.*, 2013; Nejad and Javid, 2018). It is presumed that overly confident college students and graduates who lack true objective financial literacy will make uninformed personal decisions in their everyday financial lives (Perry, 2008; Porto and Xiao, 2016) and may even negatively impact significant financial decisions at work after graduation. Fernandes (2014) worried that financial illiteracy runs rampant in corporate America and that business executives and managers without basic financial skills make key strategic decisions daily. Numerous studies and measures indicate that American college students score poorly when it comes to financial literacy and performance is deteriorating for most groups. Of particular concern are minority student populations (Harnisch, 2010) and women (Bucher-Koenen *et al.*, 2017) who continue to test at lower financial literacy levels. Experts further warn that a lack of financial literacy and basic financial skills in graduated business majors is costing our economy through entrepreneurial failure (Hannaher, 2011), consumer debt (Collins *et al.*, 2011; Ellis, 2013; Lusardi and Tufano, 2009), risky decision making (Mouna and Jarboui, 2015; Blankson *et al.*, 2012) and poor corporate decision making (Fernandes, 2014; Gruca, 2000).

Relatedly, there has been great concern over marketing students' apparent weaknesses in math, statistics and quantitative skills. First diagnosed nearly 30 years ago by Budden (1985), researchers since have called for educators to enhance financial and analytical skills in the classroom (Brennan and Vos, 2013; Ganesh *et al.*, 2010; Gruca, 2000) and have warned

that math and quantitative skills have become even more important for marketers post-graduation (Davis *et al.*, 2002). Undergraduate marketing majors have been found to lack mathematical and quantitative skills in general (Aggarwal *et al.*, 2007), and may even gravitate to the major because of perceived lower quantitative skills requirements when compared with other business majors (Ganesh *et al.*, 2010). According to Tarasi *et al.* (2012), marketing students are less likely to have an affinity for the crucial quantitative aspects of the discipline and statistical anxiety is especially strong for marketing majors relative to other business majors. This has become a significant concern for marketers with the contemporary emphasis on "Big Data" analysis and marketing metrics in the workforce (Schlee and Harich, 2010). This is extremely important for marketing faculty, since weaknesses in marketing math and elementary financial understandings weaken employability of marketing graduates (Brennan and Vos, 2013). "Poor mathematical fluency" appears to continue even after four years of marketing curricula (Saber and Foster, 2011). Degreed marketing managers exhibit poor financial planning skills (Abernethy and Gray, 2000) and their lack of financial literacy, numeracy and problem-solving skills can significantly handicap a marketer's business career as well as hurt his or her ability to advance in an organization (Ganesh *et al.*, 2010). Aggarwal *et al.* (2007) warned that particularly quantitatively challenged marketing undergraduates may find difficulty both on the job front and in their hopes of gaining an MBA with poor and declining GMAT scores. After graduation, marketing majors are increasingly called upon to be accountable for their financial decisions within the firm (Brennan and Vos, 2013; Ganesh *et al.*, 2010; Saber and Foster, 2011).

The marketing major has a significantly higher percentage of female graduates compared to higher paying numerical majors such as engineering and computer science (50 percent vs below 20 percent – Perry, 2016), supporting the argument that women marketing majors comprise a vulnerable group in terms of financial well-being. Mahdavi and Horton (2014) found college-educated women particularly at risk for lower levels of financial knowledge and call for action to enhance financial literacy in this population as well as vulnerable ethnic groups (Bucher-Koenen *et al.*, 2017; Nejad and O'Connor, 2016).

On the positive side, poor quantitative, statistics and numeracy skills (and apparent interest) among marketing majors (Tarasi *et al.*, 2012) have resulted in a myriad of cross-departmental creative teaching innovations for undergraduates and MBA students (Brennan and Vos, 2013; Gruca, 2000; Saber and Foster, 2011). Innovative pedagogical tools and methods to improve the "less quantitative minded" business student' have resulted in whiteboards in the classroom (Greene and Kirpalani, 2013), stand-alone self-study tutorials (Chen *et al.*, 2012) and innovative class modules to improve numeracy (Ganesh *et al.*, 2010). The financial literacy literature appears to have a gap in cutting edge pedagogical tools (see Lusardi *et al.*, 2017 for an exception), and researchers have called for more creative methods in the classroom (Goetz *et al.*, 2011; Huhmann and McQuitty, 2009).

Researchers have also suggested greater financial skills development and exposure to basic finance concepts be integrated into the marketing curriculum (Brennan and Vos, 2013; Gruca, 2000). A personal finance course and financial literacy itself is often ignored after high school, and neither is a part of the majority of university business programs. Bianco and Bosco (2011) examined the curricula of 100 AACSB accredited schools and found that only 54 percent offered a personal finance course, and that these were mostly (44 percent) only offered (not required) to business majors. Only 10 percent of these offerings were available to non-business majors (Lafond and Leaubie, 2014). These numbers indicate that many marketing majors and graduating marketing professionals from the social sciences and more practice-based backgrounds miss out on personal finance and financial literacy education after high school. The majority of advertising-, sales-, web-development- and branding-focused students are not exposed to the basic concepts of financial literacy.

Since financial literacy is "the ability to make informed judgments and to make effective decisions regarding the use and management of money" (Marcolin and Abraham, 2006), it should be a concern to marketing faculty that financial literacy is not more adequately addressed in or adjacent to the marketing curriculum.

Study rationale and measure development

In order to ascertain basic financial literacy levels in business majors and explore whether there might be problems and/or differences among majors, several researchers at different universities collaborated in an experiment. The idea began with a finance professor who had taught personal finance in the past, and was interested in analyzing financial literacy in different majors. This professor had been developing a shorter version of the lengthy Jump $tart Instrument (2009) that would be more concise (length of time to complete: 15 vs 45 min) and had more age appropriate measures. Researchers have often used abbreviated instruments to measure financial literacy (Hanna *et al.*, 2010; Mitchell and Lusardi, 2015). Through collaborating with several marketing professors, a 16-item financial literacy instrument was developed and pre-tested across three universities and scores of students. The shorter instrument maintained similar "means" to the larger, ungainly Jump$tart measure that had been used over decades primarily to study high school students. This research tested several new questions specifically developed to measure financially informed and effective judgments, vs more commonly measured financial knowledge (Jump $tart questionnaire). We also sought to update the context of the questions to better suit the age bracket of our subjects (college students). These two sample questions (among others) delve deeper into behavioral intentions:

(1) You just received the following offers from credit card companies. It came in a good time because you needed $1,000 for a new laptop to replace the old one that just broke down. You expect to be able to pay it back in full in two years. Which of the following would be the best offer?:

- $0 signup fee and 10 percent annual percentage rate (APR) interest for two years.
- $200 signup fee, 0 percent APR interest for the first year and 12 percent APR interest for the second year.
- $0 signup fee, 0 percent APR interest for the first year and 18 percent APR interest for the second year.

(2) Which of the following scenarios would you choose for books for next semester? The on-campus bookstore price of these books is $400. If you buy from the bookstore at full price, they will give you $100 back if you sell back all the books at end of the semester (one quarter of your purchase). Assume you cannot sell back books from online, or if purchased at a discount from the bookstore. Choose the best priced option:

- You buy the books full price from the bookstore, you only sell back 80 percent of the books.
- Bookstore has a sale at 25 percent off.
- Online store rents them for 50 percent full price; you must pay shipping and handling (receiving and returning) of approximately $45 each way.

Although these are two of the longest, most complex (and time consuming) questions, they clearly resonate with a younger subject pool and represent complex decision making with real financial outcomes.

The next step was to use the instrument to test and compare and contrast financial literacy levels of college of business majors. The marketing professors were interested in whether marketing majors would score poorly – particularly in comparison to more "quantitative" business majors such as accounting and finance.

After canvassing the financial literacy literature, two marketing professors suggested adding an experimental teaching component to the testing of business majors. The marketing professors had developed innovative pedagogical tools to improve numeracy and statistical knowledge in marketing students using online training videos in the past. Armed with the understanding that these kinds of tools were not being commonly used to improve financial literacy with college students, the co-authors set out to find or produce a more personalized, online video that could be easily accessed by students on their own time. The video would be short in time (shorter than a single class period), cost effective (utilizing extant videos on YouTube – or easily produced videos by a professor) and effective in terms of increasing financial literacy measures. The goal of this study then expanded beyond simply measuring financial literacy in college of business majors, to include a teaching innovation to improve students' financial literacy knowledge. Collaborating researchers across different disciplines added to the richness of the scale development and teaching innovation.

Students at the private southeast school in three different business courses participated in the experiment. Students in introductory business (4 sections for a total of 116 students), introductory finance (2 sections for a total of 36 students) and introductory marketing (3 sections of 92 students) course took part so that the researchers could maximize students from multiple majors.

Video treatment development

In order to quickly roll out a video tool easily accessible to students, previously developed financial literacy videos on YouTube were chosen. It should be recognized, however, that instructors could create and develop their own videos for this or related pedagogical purposes. Researchers hoped the learning module could be integrated later into an introduction to business course – or a principles of marketing course (perhaps during "break-even analysis" or "marketing math") without having to add any significant class time to the curriculum. Dowell and Small (2011) found that college students' incorporating online resources into their self-regulated learning strategies can significantly improve engagement and outcomes. Lusardi and Mitchell (2014) indicated that videos can be particularly compelling at improving financial literacy and Henager and Cude (2016) suggested that young people specifically respond to new and creative self-directed learning options. We hope this research contributes to the growing literature on packaging learning modules for millennials and delivering them online through YouTube and social media (Alwehaibi, 2015; Phillips and Trainor, 2014).

Two private university professors were tasked with finding approximately one hour of video micro-lectures that could be easily aggregated into a module that students could download, free of charge, at their own convenience. This specific time length coupled with a short, financial literacy measurement tool would equate to the time of a single class period in a three or four credit-hour course. College students were expected to have a shortened attention span, one that is echoed by nearly all consumers who "spend very little time processing financial information" (Huhmann, 2017, p. 757).

To test the efficacy of the module, financial literacy levels were assessed across cohorts receiving the treatment (module) vs those not receiving the treatment. Financial literacy scores were also compared across several majors and several other classes (introduction to business), something not done in previous research. Finally, the researchers analyzed the impact of a previous personal finance course on their students' financial literacy.

To minimize demand effects and not "teach to the test," the researchers at the private institution were not given the measurement tool. They were given the GAO (2012) definition, several "popular press" articles on financial literacy and its decline among US students, and two other construct definitions as a guide for selecting the micro lectures to be included in the module (Jump$tart, 2014; Marcolin and Abraham, 2006). The total module length ended up at 67:36 – and the links can be accessed at: https://youtu.be/7cvDExdTKsw. The module was pre-tested with over a dozen undergraduate and MBA students to get feedback in terms of optimal length, concept clarity and the "level of boredom" as it was assumed (correctly, unfortunately, etc.) that undergraduate business students would have a limited attention span for some of these concepts. The pre-testing helped to inform the final length and video choices.

Experimental protocol and composition

The use of several introductory courses with multiple sections allowed the researchers to reach a wider variety of majors than otherwise possible. The researchers included a question allowing them to assess if a student had previously taken personal finance. We were agnostic as to how differing majors and previous exposure to personal finance might impact the experimental results, although it was expected that those students that had taken such a course in the past would score higher on measures of financial literacy. Students in the experimental group were given the link to the video and asked to view it within a two-week period before Spring break. Both the control and experimental groups were asked immediately after spring break to fill out a questionnaire in class for extra credit – providing an interval of time between viewing the module and measuring financial literacy. There were no discussions of financial literacy in any of the classes. No details about the study were provided until after all students had completed the survey.

A total of 244 students were involved in the research, all were given a financial literacy test. Of these, 122 were asked to watch the video, while 122 were not. The viewing data provided by the YouTube video indicated that there were 107 unique views of the video. Approximately 50 percent watched the entire video or most of it, while 13 percent watched less than 2 min of the video. The remaining 37 percent were exposed to varying amounts of viewing. We were unable to parse out performance on the test based upon viewing time. Of the 244 students, 12 declined to provide their major, the remaining 183 identified business majors were as follows: marketing 23.4 percent, management 45.4 percent, accounting 22.9 percent and finance 8.3 percent. The majority of respondents had not taken a personal finance course (72 percent), while 28 percent had, ten of the students declined to answer the question. The majority of students were male (63 percent), had a GPA between 2.5 and 3.5 (62 percent) and were mostly juniors (54 percent) and seniors (33 percent). The 49 percent of the students had $1,000 or less of credit card debt, 29 percent had $1,000 to $3,000 and 22 percent had over $3,000. In total, 62 percent of the students anticipated having less than $5,000 in student loans, while 28 percent anticipated loans between $5,000 and $30,000, and 22 percentage anticipated loans over $30,000 with 5 percent of these students estimating loans of more than $50,000. The majority of the students were white (70 percent), with 13 percent African-American, 11 percent Hispanic and 6 percent other (including Asian and Native American).

Experimental findings

The primary research finding was that the relatively short (just over one hour) video treatment had a significant positive effect upon financial literacy scores for the students – across all majors (see Table I). The video treatment had a stronger positive effect than a previously taken personal finance course (since most of these students are juniors, many of them would have recently taken the personal finance course – or even taking it concurrently). The most important finding is that those students exposed to the video

module scored significantly higher than those who did not receive the treatment ($p < 0.001$; F-statistic = 20.03). Having had a personal finance course also had a stronger positive effect ($p < 0.03$, F-statistic = 4.64) but curiously there was not a significant interaction effect ($p = 0.21$).

A two-factor ANOVA model with fixed effects for the two main variables of interest (video treatment and personal finance course) and their interaction was used to analyze results. To explore student/major effects, marketing and management majors were combined reflecting an extensive literature suggesting these two majors are the "non-quantitative" business majors vs the more numeracy-oriented accounting and finance majors (Chinen and Endo, 2012; Gruca, 2000; Saber and Foster, 2011). We combined the majors to verify this assertion, as well as increase sample size and statistical power. The marketing/management combined group scored significantly higher ($p < 0.02$) after the treatment.

Results indicated that all majors might benefit from the video treatment. A personal finance course also significantly improved students' financial literacy scores ($p < 0.03$), but surprisingly, the effect was less than that of the video intervention (Table II).

Perhaps the most unexpected result is the fact that the interaction of the two variables (video and a previous personal finance course) is not statistically significant implying taking a personal finance course earlier and then watching an online tutorial does little to boost scores (as would be expected from the statistically significant impact of each). The video treatment boosts scores significantly and so does a personal finance course albeit to a lesser extent. The online video treatment does not seem to increase the financial literacy scores for those who already had personal finance. It should be recognized that the researchers did not measure the time distance between taking a personal finance course and the testing of financial literacy – so for some respondents there may have been a potential for recency effect.

We theorize that the video is so effective because it is very powerful in increasing understanding of personal finance, especially for those who never had personal finance. This bodes well for non-finance majors; perhaps the liberal arts college could make use of the video concept and this might also point to online tutorials as a way to improve adult learners. So why do these videos appear so effective? As mentioned earlier, there is a growing literature suggesting that online tools resonate more strongly with millennials.

Source of variation	df	Sum of squares	Mean square	F-statistic	p-value
Video treatment	1	125.3831	125.3831	20.0251	0.00
Personal finance course	1	29.0723	29.0723	4.6432	0.03
Interaction	1	0.4396	0.4396	0.0702	0.21
Error	230	1,440.1010	6.2613		
Total	233	1,594.9960			

Table I. Two-factor ANOVA analysis of impact of the video treatment and personal finance course for all students sampled

Source of variation	df	Sum of squares	Mean square	F-statistic	p-value
Video treatment	1	22.5311	22.5311	5.2956	0.02
Personal finance course	1	1.7361	1.7361	0.4081	0.48
Interaction	1	16.7216	16.7216	3.9302	0.05
Error	86	365.9000	4.2547		
Total	89	406.8889			

Table II. Two-factor ANOVA analysis of impact of video treatment and personal finance course for marketing and management students only

According to Craig Kunitani, Co-founder of Security Mentor "The Millennial generation has a unique relationship with technology and digital information. Thanks to a lifetime of video games and always being connected to mobile digital communication/ media, they are used to doing everything at 'twitch speed' and have little patience for lengthy lectures. Burst learning is a great fit for their preferences and data consumption habits – think snackable content" (SCMagazine.com, 2016) (Table III).

Financial literacy-level findings

Unexpectedly, the mean score of marketing students (7.64) on the questionnaire was not significantly lower than that of other majors (finance = 7.69, accounting = 7.50, management = 6.88) contrary to previous research (particularly Chinen and Endo, 2012). In fact, the score differences between majors were not significantly different, although management's lowest score was marginally lower than the others ($p = 0.0593$). Previous research indicating that women perform significantly lower than men was supported (3.96 vs 4.71; $p = 0.0002$ – see Bucher-Koenen *et al.*, 2017; Nejad and O'Connor, 2016). African-Americans (3.59) scored lower than the other demographic groups (range: 4.33–4.56) for a p-value of 0.016, also supported by the literature (Harnisch, 2010). There were no other significant race/ethnicity differences in scores. There were also no significant score differences between varying GPA level, or classmen (juniors vs seniors, etc.). See Table IV for a full summary of findings.

Discussion, implications and limitations

This research uses an experiment and teaching innovation to significantly improve financial literacy scores for college of business majors. Findings indicate that a web-based learning module was an effective teaching tool in improving financial literacy; surprisingly more effective than having taken a personal finance course. This supports Paramonova and Ijevleva's (2015) research on web-based marketing tools, and Lusardi *et al.* (2017) and using

Table III. Two-factor ANOVA of impact of the video treatment and personal finance course for all other students

Source of variation	df	Sum of squares	Mean square	F-statistic	p-value
Video treatment	1	51.5170	51.5170	11.1813	0.00
Personal finance course	1	9.3306	9.3306	2.0251	0.16
Interaction	1	5.0779	5.0779	1.1021	0.30
Error	136	626.6102	4.6074		
Total	139	692.5357			

Table IV. Summary of key findings by groups

Groups	Key findings
GPA	Generally scores rise with GPA but increases are not statistically significant (< 2.0, 2.0–2.5, 2.5–3.0, 3.0–3.5, > 3.5)
Major	Marketing majors scored significantly higher than management majors. There was not a significant difference between the scores of marketing majors, accounting majors and finance majors
Degree aspiration	No significant difference among students with different terminal degree aspirations (bachelor's, master's, professional, doctorate)
Personal finance	Video treatment boosts scores significantly for students who have had a personal finance class
Gender	Males significantly outperform females
Race	African-Americans significantly underperformed. The differences between whites, Asians, Hispanics, Native American and other were not significant

videos and visual tools to improve consumer financial literacy. Video modules appear to be very effective delivering content to students outside of the classroom, particularly to teach additional and related concepts (Wankel, 2010; Kitchenham, 2011).

This online tool, easily accessed outside of the classroom, takes only about an hour and can be utilized by all business (including adjunct) faculty. Online and video modules may be used as a reinforcement tool thus providing an extra and "free" resource to assist in student success; particularly reinforcing a personal finance course that college students may have received in high school. An "interventional financial literacy" seminar (Lusardi *et al.*, 2017) might also be used outside of the college of business to shore up financial literacy in any major. There are also non-college applications of the module – perhaps giving this or a similar module to community college students, to new hires for large organizations, or perhaps even to consumers requesting a student loan or a home loan. Future research could determine which micro-lectures of the module are most significant in improving financial literacy. It may be best to develop micro-lectures, or a module from scratch, rather than simply utilizing "off the shelf" products. Differing modules targeted at differing majors, level of education and potential end-use may be useful. A key value component of this method is the ability of the educator to develop and target videos to specific student populations and specific pedagogical content areas.

This project also involved testing financial literacy levels in individual college of business majors – an underdeveloped area of research. The study indicates that marketing majors may not be deficient in terms of financial literacy, mitigating concerns that marketers may be weak in all areas of "numeracy and quantitative skills" as past research has indicated. The levels of financial literacy based upon measures in this study found little variance between business majors (with the exception of marginally significant lower management scores), GPA or class standing. The financial literacy measures in this study did reinforce previous research that at-risk populations, women and African-Americans, scored significantly lower. This research argues that college students themselves, saddled with huge levels of debt upon graduation and low financial literacy levels based upon decades of research, are a vulnerable population needing more study and more pedagogical programs and tools focused on improvement.

As with all research there are some limitations. It would be beneficial to repeat this experiment with larger numbers of students, to show greater significance in individual majors (so we do not have to "combine" majors) and class standing (so we know "when to intervene"). Since a key finding is that these videos appeared more effective than taking a personal finance course, future researchers need to evaluate more clearly the timeline between taking this course and measuring financial literacy. Although video content delivery in education appears to be a growing and effective technique, we must make sure that recency, or other demand effects (such as a higher correlation between video topics and financial literacy measures) have not impacted the results. Further study is warranted to better control for these exigencies.

It would be valuable to extend this experiment and measurement beyond the college of business – liberal arts particularly – and to look at specific areas of concern for minority and female students across universities. A shortened financial literacy test was used (compared to the Jump$tart Instrument) – however, it was longer than most instruments used by financial literacy practitioners on adults (ours having 16 questions). We would also like to see more questions developed that are germane to college students and young adults. We admit that like other researchers, we did not fully develop our scale using rigorous scale development procedures (Bearden and Netemeyer, 1993). Our measures were pre-tested with students to show comparable score percentages and effectiveness, but our shortened instrument may have contributed to the lack of significance when analyzing smaller subgroups.

Moving forward, a more "age appropriate" and shortened instrument should be created specifically for college students and young adults, one developed following individual trait scale development procedures and validity and reliability testing more typically found in the social sciences. We contend the construct of financial literacy itself needs to be appropriately defined, supporting Williams and Oumlil's (2005) call for theory development and Potrich *et al.*'s (2014) request to develop a financial literacy model for university students. This research underscores the need for consumer behaviorists to develop a nomologically and internally/externally valid and reliable trait scale for financial literacy applicable for college students and adults, following rigorous scale development procedures (Bearden and Netemeyer, 1993).

Finally, we must recognize that financial literacy is a nuanced and complex array of cognitive abilities, personal attributes, behaviors and critical thinking that evolves over time. Our environment, our education, our family and friends (and major, and demographics) all potentially impact our financial literacy levels. Although this research found success with a simple and efficient online video module, we should remember that it is just one potential tool now available in our arsenal to battle a significant cultural and educational problem in the USA.

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