

Empirische Pädagogik

32. Jahrgang 2018

3./4. Heft

Herausgeber

Zentrum für Empirische Pädagogische Forschung (zepf)
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Verlag

Empirische Pädagogik e. V.
Bürgerstraße 23, 76829 Landau/Pfalz
Telefon: +49 6341 280 32180, Telefax: +49 6341 280 32166
E-Mail: info@vep-landau.de
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Druck

DIFO Bamberg

Zitiervorschlag

Förster, M., Happ, R., Walstad, W. B. & Asarta, C. J. (Eds.). (2018). Financial Literacy (Empirische Pädagogik, 32 (3/4), Themenheft). Landau: Verlag Empirische Pädagogik.

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ISSN 0931-5020

ISBN 978-3-944996-55-4

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Editorial

Financial literacy of students and young adults: Determinants and impacts

Manuel Förster, Roland Happ, William B. Walstad and Carlos J. Asarta

As financial markets and products become increasingly accessible to individuals around the world, financial literacy is becoming ever more important as well. However, a growing body of research conducted in various countries has revealed clear and significant differences in the financial literacy of young adults. This development could have serious consequences for individuals and for societies as a whole. On grounds of its growing, worldwide importance, the issues 3 and 4 of *Empirische Pädagogik* ("Empirical Pedagogy") are being devoted to research on students' and young adults' financial literacy.

The twelve contributions were written by 27 authors from four different countries (Germany (4), Austria (2), the Netherlands (1) and the United States of America (5)). They shed light on the cognitive (knowledge and understanding of personal financial decisions, see Förster, Happ & Molerov, 2017; OECD, 2017; Walstad & Rebeck, 2017), affective (thoughts about and attitude towards financial topics, see Atkinson & Messy, 2012), or metacognitive (such as self-regulation in financial decision-making, see Huston, 2010; Remund, 2010) facets related to the development of financial literacy as a competence. The articles offer insights about financial decision-making behavior and its potential determinants and consequences. The twelve contributions cover the three following content areas:

- (1) Test development and measurement in financial literacy
- (2) Determinants of financial literacy
- (3) Teaching and learning about financial literacy

To investigate the financial literacy of young adults, the first logical step lies in the development of tests as well as the subsequent validation of these measuring instruments. Subsumed under the content area "Test development and measurement validation in financial literacy," the first two contributions focus on those development and validation aspects. William B. Walstad and Ken Rebeck analyze the test items of the "Basic Finance Test for Children" (BFT) and the "Test of Financial Knowledge for Youth" (TFK), which are standardized measurement instruments for financial understanding of personal finance. The authors use

classical test theory and item response theory in consideration of financial literacy standards and benchmarks for fourth- and eighth-graders. Using a sample from 15 US elementary schools, the validity and reliability of each test is comprehensively evaluated. Eveline Wuttke and Carmela Aprea describe the development and validation of a new test instrument focusing on a competence-oriented facet of the financial literacy construct. Using a situational judgement approach, this test instrument was successfully evaluated in terms of dimensionality, validity, and reliability using a sample of 206 young adults from Germany. Both contributions point to the challenges of developing and validating test items that capture different facets of financial literacy. They also provide hints to other researchers about a successful instrument construction and measurement process.

Six papers are included in the second content area "Determinants of financial literacy." The first two contributions address gender effects on financial literacy. Both contributions address the gender gap known in research on financial literacy, according to which female students tend to exhibit lower scores in cognitive financial literacy tests than male students. The contribution by Manuel Förster, Roland Happ, and Andreas Maur focuses on the question of whether interest in financial and economic topics, as well as media usage, mediate the relationship between gender and knowledge, and understanding of personal finance. Using the German adaptation of the "Test of Financial Literacy", the authors analyze differences in the financial literacy of 1 108 young adults at the beginning of their university studies according to the separate content areas of banking, insurance, and everyday money management. Rebecca G. Chambers and Carlos J. Asarta take a closer look at country-specific gender differences concerning financial knowledge by using data from the Programme of International Student Assessment (PISA) Financial Literacy Assessment, which has been conducted in 18 different countries. This study investigates the influence of macroeconomic indicators on financial knowledge and a gender gap using multilevel modeling procedures.

The subsequent two contributions shed light on family background with a particular emphasis on the parents' educational background and young adults' migration background. Roland Happ, Manuel Förster, Marion Grein, and Ann-Kathrin Bültmann study the underachievement in finance and economics topics of beginning higher education students in Germany with migration background. By means of a reading comprehension test, the authors analyze to what extent a lack of financial knowledge might stem from deficits in the understanding of the non-native language. Elizabeth Breitbach and Jamie Wagner focus on the financial background (e.g., the highest degree of the parents, the parents' financial knowledge, the process of talking with family about finances, etc.) and its relation to the level of financial literacy. They not only confirm demographic results from

other studies (e. g., that females and students with low levels of math ability tend to have lower levels of financial knowledge), but also emphasize the significant role that parents have in fostering the financial literacy of their children. Both studies highlight the impact of socialization and mediated value systems on students' financial literacy.

The next two contributions within the second content area highlight non-cognitive determinants of financial literacy. The study by Stefan Grohs-Müller and Bettina Greimel-Fuhrmann analyzes the relationship between students' attitudes towards money and their financial behavior in terms of consumption and saving. The relationship is investigated through confirmatory factor analysis and structural equation modeling using a sample of 1 343 students from Austria. Aisa Amagir, Arie Wilschut, and Wim Groot extend this approach to cover four different aspects of financial literacy: financial knowledge, attitudes towards money, self-efficacy, and financial behavior. Using a Dutch adapted version of the "Test of Financial Knowledge", and a sample from high school students from the Netherlands, they examine the impact of the abovementioned aspects as well as the relationships between them. Overall, research on the determinants of financial literacy shows that the construct is neither one-dimensional nor determined by one specific cause. Hence, a broad variety of influencing factors should be considered to tailor teaching and instruction more effectively to the individual preconditions of the students.

The last four contributions are dedicated to the content area of "Teaching and learning about financial literacy". Diego Méndez-Carbajo and Scott A. Wolla study how performance differences in financial literacy are associated with students' use of online learning resources. Using a two-group quasi-experimental design, the authors investigate the different rates of increase in students' scores while chunking the contents of an online course offered in the United States. Andrew T. Hill and Carlos J. Asarta focus on the identification of the optimal age for high school students to take a personal finance course. The authors use data from the "Keys to Financial Success" program to compare the learning outcomes of younger and older groups of U.S. high school students. Bärbel Fürstenau and Mandy Hommel analyze the extent to which online information provided by banks can support the development of financial competence about mortgages. The authors investigate the influence of content-related webpages and online calculators on the financial competence of 101 German students by using self-assessment questions, post-tests, and think-aloud data. In a seldom researched topic, Nora Cechovsky, analyzes the fiscal literacy of students from Austria, that includes their understanding of tax knowledge, the fiscal system and its elements, and their interdependencies by means of problem-centered interviews. The last four contributions thus introduce

and investigate alternative and extracurricular strategies to foster and teach financial literacy.

The editors appreciate the cooperation of all authors in compiling this present issue. We would particularly like to thank the 23 individuals who participated in the review process for their highly valuable and constructive feedback and advice. Altogether, the contributions in this issue provide an overview of a research field that is receiving more and more attention due to its relevance for young adults in their everyday lives. At this point, we would like to refer to another thematic series which is in progress and focuses on the assessment of financial literacy as a basis for designing and evaluating interventions in vocational and adult education and training. In that series, Carmela Aprea, Eveline Wuttke, and Bärbel Fürstenau focus on different approaches for assessing financial literacy. The series will be published by "Empirical Research in Vocational Education and Training (ERVET)", and will make several connections to the present issue. Together, the two issues give a colorful bouquet of perspectives on research in financial literacy.

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Articles

The measurement properties of the Basic Finance Test for children and the Test of Financial Knowledge for youth

William B. Walstad and Ken Rebeck

The Basic Finance Test (BFT) and Test of Financial Knowledge (TFK) offer standardized measures of the understanding of personal finance concepts that experts think should be understood prior to attending a U.S. high school. The National Standards for Financial Literacy describes standards and benchmarks at the fourth-grade and also the eighth-grade levels that serve as the financial literacy content for each test. This study reports on the development of the test items, the relationships of the test items to the financial literacy standards, and how the items worked with a sample of 475 students from 15 U.S. elementary or middle schools. The test scores and item data are first analyzed from a classical test theory (CTT) perspective to provide evidence about the reliability and validity of each test. Further analysis is conducted with each test using item response theory (IRT). The test score results from the samples from each test suggest that the BFT and TFK offer teachers and researchers with valid, reliable, and useful instruments to measure understanding of personal finance before high school.

Keywords: financial literacy – item response theory – personal finance – testing – validity

1 Introduction

Interest in personal finance education of students increased substantially throughout the world in recent years. In 2015 the Organization for Economic Co-operation and Development (OECD) conducted its second administration of a financial literacy assessment to about 48,000 fifteen-year-olds in 15 OECD countries' and partners' economies as part of its Program for International Student Assessment (PISA) (OECD, 2017). The importance of financial literacy in the schools also is well understood in the United States. The Council for Economic Education (CEE) reported that from 1998 to 2018 the number of states that include content standards for personal finance education in the school curriculum rose from 21 to 45 (CEE, 2018). During that same period, the number of states requiring the implementation of those content standards increased from 14 to 37 and the number of states requiring that a personal finance course be taken before graduation from high school changed from 1 to 17.

The challenge for teachers and education researchers is how to measure financial literacy, especially among children and youth. This measurement problem is important to consider in the assessment of effects of instruction, curricula, and other determinants of financial literacy of students. Most of the test items used by PISA are not suitable as a standalone test that can be used by teachers of younger students (less than 15 years old) or by researchers interested in evaluating the effects of different curricula or teaching methods. Most of the PISA test items are not available because of confidentiality reasons for their use in future assessments. Although a U.S. high school survey on financial literacy from the Jump\$tart organization was widely used in past studies, it has been criticized as to its reliability and validity (Lucey, 2005) and it is now dated. More recently, a U.S. high school Test of Financial Literacy (TFL) for classroom use was developed that contains detailed information on the test content and psychometric properties (Walstad & Rebeck, 2017). This test also has been adapted and validated for use in Germany (Förster, Happ & Molerov, 2017). Despite the TFL advantages, its target audience is students in the eleventh or twelfth grades, so it is not appropriate for testing with students below the high school grades¹.

Research studies have been conducted to assess the effectiveness of a particular educational program and other determinants on the financial literacy of children and youth using different test instruments. A prime example for elementary and middle school students is the Financial Fitness for Life (FFL) program developed by the CEE². Multiple choice tests on the FFL content were prepared for classroom testing with younger students, with one test focused on children in the upper elementary grades (Walstad & Rebeck, 2005a) and another test designed for youth in the middle school grades (Walstad & Rebeck, 2005b). A third instrument was prepared for testing high school students (Walstad & Rebeck, 2005c). These FFL tests also have been administered in research studies of the effectiveness of the FFL program or related teacher training (e. g., Batty, Collins & Odders-White, 2015; Harter & Harter, 2009). This testing and research on a curriculum can provide valuable insights about student understanding of personal finance, but the content validity of the tests is dependent on the content of the specific curriculum and may not adequately assess student understanding of national standards for personal finance.

¹ The test items given to the general public also would not be useful for testing children and youth. Research on the financial literacy among adults in national and international assessments has primarily relied on only five items (Hastings, Madrian & Skimmyhorn, 2013; Lusardi & Mitchell, 2014). These five items, however, do not measure what is likely to be taught to middle school or elementary school students and would not be acceptable for classroom testing.

² For other examples of testing and research on financial literacy curricula for children and youth, see Walstad et al., 2017, pp. 95-98.

This study seeks to address these test limitations by describing the measurement features and psychometric results for the Basic Finance Test (BFT) designed for students in upper elementary or lower middle school (grades 5 and 6) and the Test of Financial Knowledge (TFK), designed for students in upper middle school or lower high school (grades 7-9). Each test should be a useful instrument for assessing what students know about the basics of personal finance at the respective school or grade levels for which the tests are targeted. The content assessed by each measure covers a wide range of financial concepts and situations. The assessment results from each test should serve as a complement to later testing with the TFL in high school.

2 Development

A necessary step before the tests could be constructed was a detailed description of the concepts experts in financial literacy think should be understood at various pre-college grade levels. This step was completed in 2013 when the National Standards for Financial Literacy (FL Standards) were published (CEE, 2013). This document is composed of six standards and a total of 144 associated benchmarks distributed across three representative grade levels: fourth, eighth, and twelfth. The content validity of the BFT was determined by the 32 benchmarks the FL Standards state should be met by the end of fourth grade. The content validity of the TFK was established by the 49 benchmarks the FL Standards specify for completion by the end of eighth grade³.

Work then began on the development of these financial literacy tests in the summer of 2014. It culminated in mid-2016 with the publications of the BFT and TFK and their associated examiner's manuals (Walstad & Rebeck, 2016a; Walstad & Rebeck, 2016b). The test process was conducted simultaneously with the preparation of the high school TFL and its related examiner's manual (Walstad & Rebeck, 2016c)⁴. The approach taken to prepare the three tests was similar to the successful one used to create three tests in economics targeted at similar respective grade levels as the BFT, TFK, and TEL: Basic Economics Test (BET) (Walstad, Rebeck & Butters, 2010a); Test of Economic Knowledge (TEK) (Walstad, Rebeck & Butters, 2010b); and Test of Financial

³ Many definitions of financial literacy have been used for research or other purposes (e. g., Atkinson & Messy, 2012; Lusardi & Mitchell, 2014), but sometimes definitions can be quite general or broad with respect to cognitive processes they covers and the multiple constructs that are included (e. g., Huston, 2010; Remund, 2010). The main advantage of using the FL Standards for the development of these tests is that it provide a specific and detailed description of the content students should learn and be assessed at different grades.

⁴ All three tests (TFL, TFK, and BFT) and the examiner's manuals are available online from the CEE. Retrieved from: www.councilforeconed.org/resources/online-assessment-center/ [18.09.2018].

Literacy (TEL) (Walstad, Rebeck & Butters, 2013). The content of these three standardized instruments in economics also were determined by national standards as found in the Voluntary National Content Standards in Economics (CEE, 2010).

As with the BET and TEK, the purpose of the BFT and TFK is to provide an assessment instrument that can be used by teachers or researchers in a classroom setting in a reasonable amount of time. To adequately sample the large number of concepts included in the benchmarks, a multiple choice format was adopted for the BFT and TFK, as was successfully used to cover the test content for the BET and TEK. Concise multiple choice items were created with a focus on knowledge, understanding, or application of the concepts presented in the FL Standards without requiring time-consuming reading or calculations so that test administrators could reasonably expect students to complete the exams in 45 minutes or less.

A national writing committee of five members was formed during the summer of 2014 to assist the two project directors in developing and editing test items. This committee comprised national experts in personal finance and economics that also were experienced in assessment. The committee and the directors created a pool of over 300 items that contained newly-written items for specific benchmarks and also items found in various sources that provided ideas for new items. Over the course of several months, consisting of two formal committee meetings and continuous correspondence, writers worked alone, in pairs, and as a group to rate and critique items. This review process ensured that the items captured the primary concept of the intended benchmarks and were carefully edited. New items were written for the benchmarks not yet covered, and all these new items were similarly scrutinized for their content and effectiveness.

By the beginning of 2015, the project directors prepared the first drafts of each test using the items developed by that stage. Not all benchmarks were covered, but this omission was expected. Some benchmarks, even though important, were difficult to assess. Nevertheless, a careful examination of the first drafts of the BFT and TFK identified a few benchmarks that the committee believed should be covered. New items were written and added to the tests to fill these gaps. Refinements were also made to the items at this stage, including altering stem and option lengths, distributing male and female names across items using contemporary names, and ensuring age-appropriate language. These first drafts were sent to committee members for review. Their comments and suggestions were incorporated to create the near-final drafts of the tests.

These drafts were then used to gather data on both the functioning of the items and to create the initial norm references for the examiner's manuals. This testing occurred in elementary and middle schools beginning in the spring of 2015 and

ending late in the winter of 2016. Teachers volunteered to register their classes to take either the BFT or TFK at the CEE’s Online Assessment Center. Overall, 475 students from 15 schools in 9 states took one of the two tests (294 BFT; 181 TFK). Each participating class took the appropriate exam for its grade level.

The testing provided data for assessing the reliability of the scores and also the measurement quality of each test item. This information was used to identify a few items that did not perform as well as expected, or did not provide statistical evidence that the item adequately assessed the concept for which it was created. This final work on the project produced a 35-item BFT and a 40-item TFK. At the same time, work was completed on a 45-item TFL.

3 Content validity

The FL Standards explain in detail what experts in personal finance and economics consider to be core content in personal finance that should be taught by fourth and eighth grades. Accordingly, the content validity of the BFT and TFK is derived from that publication. Each examiner’s manual includes a lengthy table with a complete description of each standard, a complete description of each benchmark, and a listing that shows how test items are associated with a particular standard and benchmark (Walstad & Rebeck, 2016a, pp. 5-6; Walstad & Rebeck, 2016c, pp. 5-6). For brevity, tables 1 and 2 summarize this information from each manual by showing the distribution of items across standards by benchmarks within standards.

Table 1: Item Distribution by Standard and Cognitive Level BFT

Standard	No. of Benchmarks Covered	Number of Items	
		Knowledge and Comprehension	Application
1. Earning Income	9 of 9	4	5
2. Buying Goods and Services	7 of 7	0	7
3. Saving	6 of 6	1	5
4. Using Credit	4 of 4	2	3
5. Financial Investing	2 of 2	3	0
6. Protecting and Insuring	4 of 4	4	1

Note: The BFT examiner’s manual with the test items and item rationales is retrieved from: www.councilforeconed.org/resources/online-assessment-center/ [18.09.2018].

Table 2: Item Distribution by Standard and Cognitive Level TFK

Standard	No. of Benchmarks Covered	Number of Items	
		Knowledge and Comprehension	Application
1. Earning Income	8 of 11	2	6
2. Buying Goods and Services	6 of 6	4	2
3. Saving	8 of 9	4	4
4. Using Credit	6 of 8	2	4
5. Financial Investing	6 of 7	2	4
6. Protecting and Insuring	6 of 8	1	5

Note: The TFK examiner’s manual with the test items and item rationales is retrieved from: www.councilforeconed.org/resources/online-assessment-center/ [18.09.2018].

Tables 1 and 2 show that the BFT and TFK test overall understanding of personal finance as specified by the six standards. Each test also covers all or most of the benchmarks that are associated with each standard. The 35 items on the BFT test content in all 32 of the fourth-grade benchmarks (100 %). The 40 items on the TFK assess content in 40 of the 49 eighth-grade benchmarks (82 %). The number of benchmarks within a standard varies across the standards and grade levels, consequently the number of test items per standard also varies.

Although the BFT and the TFK use benchmarks to test the six standards, the BFT and TFK are tests of standards and not tests of specific benchmarks. The number of benchmarks are too extensive (32 for BFT and 49 for TFK) for each one to be tested in a reliable and valid way. Such a benchmark assessment would require an extensive number of test items to be written and administered. It also would require an unreasonable amount of testing time for students.

Test items also were written to measure several different cognitive levels⁵. Tables 1 and 2 contain information on the distribution of items across two major cognitive categories, one at a lower level (knowledge or comprehension) and one at a higher level (application). For the BFT, this distribution resulted in 14 knowledge or comprehension items (40 %) and 21 application items (60 %). For the TFK, this resulted in 15 knowledge or comprehension items (38 %) and 25 application items (63 %).

⁵ Each test, and the items within it, should be considered as a whole and not as separate subtests by cognitive level so an empirical analysis of cognitive levels was not conducted. The classification of test items as “knowledge or comprehension” or “application” is based on an assessment by the project directors and was reviewed by the national writing committee. The purpose was to reinforce the point that each test did not simply assess knowledge and comprehension of concepts, but also involved, and was weighted more to, the application of conceptual understanding in different contexts.

This distribution shows that the BFT and TFK are primarily tests of application of knowledge and understanding in personal finance.

4 Examples of test items

Each item on the BFT and TFK focuses on a central concept of a grade-appropriate benchmark contained within a standard from the FL Standards. An example of a BFT and TFK item for three of the six standards should provide sufficient insight into the construction of these items, and how learning specific personal finance concepts can be assessed at lower and higher grade levels.

Standard 2 (Buying Goods and Services) contains a fourth-grade benchmark (#7) and an eighth-grade benchmark (#6) focusing on budgets. Item 16 on the BFT assesses this concept at the fourth-grade level:

BFT 16. To live within her means, Bella creates a budget. What are the two main things she keeps track of in her budget?

- A. wants and assets
- B. costs and benefits
- C. loans and payments
- D. income and expenses*

Although all of the options are personal finance or economics concepts, budgets help people manage income and expenses. BFT 16 requires that students recognize that income and expenses are the components of the budget Bella creates. Understanding of budgets is assessed for the eighth-grade benchmark (#8) with item 14 on the TFK:

TFK 14. Which of the following events would be the most likely to cause Alexa to reduce the spending in her monthly budget?

- A. She gets a promotion at work that requires more company travel.
- B. She decides to enroll in a training course paid for by her employer.
- C. She cuts back on her hours at work to take care of her elderly parents.*
- D. She gets assigned a new position at work that reduces her commuting time.

TFK 14 explicitly states that spending (or expenses) are a component of a budget, but requires that students apply this understanding to a decision Alexa might make that influences her expenses, specifically cutting back on hours working. Although costs or benefits might be associated with all of the situations found in the distractors, and the first two affect her employer's budget, only the correct answer applies to Alexa's budget.

Standard 3 (Saving) contains a fourth-grade benchmark (#4) and an eighth-grade benchmark (#7) focusing on setting goals to save and the incentives to save, and

compound interest, respectively. Item 20 on the BFT assesses this concept at the fourth-grade level:

BFT 20. Ariana set a goal to save \$10 each month from her allowance to buy a new bike. The new bike is

- A. a financial investment.
- B. a deposit into her savings.
- C. an incentive for her to save.*
- D. an alternative to her spending.

Students must understand that people set goals when they save, and these goals - the new bike as applied to Ariana's situation - provide the incentives to save. The eighth-grade benchmark (#8) extends the incentive to save to a more difficult concept, compound interest. Knowledge of this is assessed with item 21 of the TFK:

TFK 21. Mike and Katlyn both deposited \$500,000 into their savings over their lifetimes for retirement. Mike began saving 10 years before Katlyn, and retired with more savings than Katlyn. Which of the following is the best explanation for why Mike re-tired with more savings?

- A. People who start saving earlier allow compound interest to work longer on their savings.*
- B. People who start saving earlier likely earn higher salaries than the people who wait to save.
- C. People who start saving earlier are paid higher interest rates than those who wait to start saving.
- D. People who start saving earlier are less likely to lose any of their saving than those who wait to save.

Where the fourth-grade item (BFT 20) expects an understanding that goals provide incentives to save, TFK 21 extends this to compound interest and how the potential of compound interest to increase the rate of return on saving provides an incentive to save early.

Standard 4 (Using Credit) contains a fourth-grade benchmark (#1) and an eighth-grade benchmark (#4) focusing on interest and interest rates. Item 24 on the BFT assesses this concept at the fourth-grade level:

BFT 24. Austin borrows \$1,000 from a bank. He wants to pay the bank back in full next month. Which of the following is he likely to pay?

- A. the amount of the loan
- B. the interest on the loan
- C. \$1,000 plus the interest on the loan*
- D. \$1,000 minus the interest on the loan

Fourth graders are expected to recognize that both the principle (the amount of the loan) and the price of the loan (interest) must be paid back by Austin when he borrows the \$1,000 from a bank. Actions by borrowers influence the interest paid, and this is captured at the eighth-grade level with item 25 on the TFK:

TFK 25. Who is likely to pay the greatest dollar amount in finance charges, if each has charged the same amount on credit cards that have the same interest rate?

- A. someone who pays the minimum payment each month*
- B. someone who pays half the balance on his card each month
- C. someone who pays off the credit card bill in full each month
- D. someone who pays the minimum amount one month, and then the full balance the next

Eighth graders are expected to understand that interest must be paid when borrowing money with a credit card, and actions under the control of the borrower when paying back the loan affect how much interest is paid. Here, the student must recognize that paying only the minimum balance will lead to the largest amount of unpaid balance generating interest owed to the credit card company.

5 Test scores

An important characteristic of a standardized test is whether the items on the test work together to assess understanding of content. One widely-used estimate of this internal consistency is the coefficient alpha (Cronbach, 1951). The reliability was .90 for the BFT based on test data from 294 student sample. The reliability was .83 for the TFK using test data from 181 students. These results indicate that there is good internal consistency among test items for both the BFT and TFK, and thus the tests are likely reliable measures for assessing knowledge of personal finance at the two grade levels.

The mean score on the BFT is 17.82 (51 %) with a standard deviation of 8.1. The mean score on the TFK is 17.39 (43 %) with a standard deviation of 6.97. The relatively low scores should be interpreted in the context of the purpose for these tests. The tests were designed as achievement measures that cover a broad range of personal finance topics. Many students in pre-high-school classes are not likely to be taught all of the concepts included on the BFT and TFK. Further, the items were designed to assess students of diverse abilities, including high-achieving students. For these reasons, one should not assume that a score less than 50 % or 60 % necessarily signals a failing achievement level.

Unfortunately, the student sample for each test is small and the information about the personal finance instruction they had or had not received was incomplete. It was not possible, therefore, to compare score means for the two groups of students,

some of whom had received extensive instruction and some of whom had not. That analysis would have indicated how well each test worked to assess expected differences in financial literacy and would have provided more information about the construct validity of each test. The test samples also were voluntary and not a representative national sample of students. Given these conditions, the test scores are only suggestive of what might be found when administering the test to a larger and broader sample.

Table 3 presents the breakdown of scores achieved by FL Standard. The data show a similar pattern of understanding of personal finance between elementary and middle school students. The standard appearing to show the highest level of understanding on the TFK and the second-highest understanding level on the BFT is Standard 1 on Earning Income (57.75 % and 53.33 %, respectively). Both elementary and middle school students showed the least amount of understanding of concepts included in Standard 5 on Financial Investing (44.33 % and 32.83 %, respectively). Although it is possible that the items in Standard 1 were innately easier and the items in Standard 5 were innately harder than items in the other standards, it seems probable that pre-high-school coverage of personal finance is more likely to include topics involving sources of income and employment skills and potentially less likely to include topics involving rates of return and diversification. Elementary students did, however, perform well regarding Standard 6 on Protecting and Insuring, relative to middle school students. A likely reason for this is that the level of difficulty between the two fourth-grade benchmarks and seven eighth-grade benchmarks for Standard 6 is significant for this benchmark relative to the others.

Table 3: Scores by Standard - BTF and TFK

Standard	BFT		TFK	
	Number of Items	Average Percent Correct	Number of Items	Average Percent Correct
1. Earning Income	9	53.33	8	57.75
2. Buying Goods and Services	7	50.29	6	43.00
3. Saving	6	52.33	8	42.50
4. Using Credit	5	46.80	6	40.17
5. Financial Investing	3	44.33	6	32.83
6. Protecting and Insuring	5	53.80	6	40.33

6 Item difficulty and discrimination

Table 4 reports data on the difficulty of items. For the BFT, they range from a low of 25 % correct (item 3) to a high of 74 % correct (item 1). The majority of items (29) are concentrated in the 40 % to 60 % range (8 in 40s; 14 in 50s; and 8 in 60s). Similarly for the TFK, item difficulty ranges from a low 20 % correct (item 26) to a high of 73 % correct (item 5). These test items are more difficult for the sample of students tested because the majority of them are found in the 30 % to 40 % range (12 in 30s; 13 in 40s). These scores show that although the BFT and TFK items are challenging, they are not easy or too impossible for students to answer⁶.

⁶ Data on the percentage of responses to the correct answers and three other distractors for each item can be found in table 5 of the examiner’s manual for each test.

Table 4: Percentage of Correct Responses and Item Discrimination for TFL Items - BFT and TFK

Item	BFT (N = 294)		TFK (N = 181)	
	Percent Correct	Corrected Item-Total Correlation	Percent Correct	Corrected Item-Total Correlation
1	74	.42	60	.35
2	57	.44	59	.25
3	25	.45	67	.44
4	44	.52	66	.44
5	49	.24	73	.39
6	54	.52	69	.27
7	55	.50	29	.22
8	60	.42	39	.25
9	62	.37	34	.32
10	64	.41	34	.24
11	50	.30	65	.47
12	56	.61	46	.44
13	40	.27	43	.41
14	57	.22	36	.21
15	56	.49	45	.33
16	29	.39	48	.37
17	62	.43	49	.25
18	42	.36	40	.36
19	64	.37	24	.29
20	37	.32	38	.48
21	64	.44	48	.35
22	45	.33	48	.50

Item	BFT (N = 294)	TFK (N = 181)	32	.42
	Percent Correct	Corrected Item-Total Correlation	Percent Correct	Corrected Item-Total Correlation
25	53	.46	38	.13
26	56	.50	20	.25
27	42	.43	62	.34
28	38	.46	43	.33
29	42	.52	37	.07
30	53	.45	27	.08
31	54	.58	40	.30
32	50	.41	37	.17
33	45	.51	33	.08
34	55	.60	23	.11
35	65	.36	46	.32
36			34	.19
37			65	.39
38			21	.14
39			30	.33
40			46	.50

The item difficulty scores also provide insights about understanding of specific concepts⁷. On the BFT, eight items were answered correctly by more than 60 % of the student sample: item 1 (relating skills with jobs), item 8 (identifying a gift as income), item 9 (recognizing income taxes), item 10 (understanding that purchasing can satisfy a want), item 17 (recognizing saving), item 19 (identifying banks as a place to save), item 21 (associating time with return on saving), and item 35 (applying the expression "saving for a rainy day"). The results for other items suggest that there is substantially less understanding. Three items on the BFT were answered correctly by

⁷ Further insights about each item can be obtained from an analysis of the percentage of responses to both the correct answer and three other distractors. For the sake of parsimony, those data are not reported in this study, but they are available in table 5 of each examiner's manual.

around 30 % or less: item 3 (recognizing a commission), item 16 (defining the components of a budget), and item 23 (understanding interest is the payment for borrowing).

On the TFK, nine items were answered correctly by more than about 60 % of the student sample: item 1 (identifying work), item 2 (defining human capital), item 3 (understanding the relationship between education and income), item 4 (identifying training as a way to increase income potential), item 5 (understanding long-term investing in human capital), item 6 (identifying risk entrepreneurs face), item 11 (defining a bounced check), item 27 (defining a mortgage), and item 37 (relating risk and insurance). By contrast, seven items were answered correctly by around 30 % or less: item 7 (recognizing a capital gain), item 19 (distinguishing a principle from other investment concepts), item 26 (ordering financial lenders by interest rates likely charged), item 30 (calculating interest rates), item 34 (contrasting financial investments by risks and returns), item 38 (understanding deductibles), and item 39 (recognizing the relationship between deductibles and premiums).

Table 4 also provides corrected item-total correlations which is the correlation of an item score (correct or incorrect) with an overall test score (minus that item). These correlations can be used to evaluate how well items discriminate among students who show greater or lesser understanding of personal finance. These point-biserial correlations for all items on each test are positive. For the BFT all 35 values are above .20. For the TFK, 32 of 40 values are above .20. The 8 weaker discriminators on the TFK, however, are still positive. The low values for these items are probably because this content is not widely taught and are therefore more difficult for students. In fact, these 8 items are, on average, less likely to be answered correctly (31 %) than the other 32 items (47 %).

7 Application of item response theory

An alternative method to classical test theory for analyzing test data is item response theory (IRT) (de Ayala, 2009; Hambleton & Swaminathan, 1985). IRT was developed to overcome the sample-dependent and item-dependent limitations with classical test theory. For example, the percentage correct for items will be higher when the sample tested is of higher-ability students than when it is of lower-ability students. The scores also will depend on the sample of items that are used for the testing. These limitations can be moderated by administering a test to a broad sample of students and by using a wide selection of test items, but questions remain about psychometric properties of each test so it is worthwhile to analyze them from an IRT perspective.

Caution should be exercised, however, when reviewing the IRT results that follow because the accuracy of the parameter estimates can be affected by sample sizes and the number of test items (Sahin & Anil, 2017). The IRT analysis of the BFT is based on a sample of 294 students with 35 test items while the TFK is based on a sample of 181 students and 45 test items. The IRT results should be considered as exploratory because it is not known how the relatively limited sample size in combination with the number of test items may have affected the IRT outcomes when using the selected IRT model.

A major assumption for using an IRT model is that a test is unidimensional, which means that only one type of achievement or latent trait is being measured by the test items (de Ayala, 2009). One initial method that is used to for assessing whether the test's unidimensionality is to conduct a factor analysis of the correct and incorrect responses to test items (Hambleton & Swaminathan, 1985). Accordingly, principal components analysis was conducted for each test. The analysis of the BFT data produced an eigenvalue of 8.164 for the first component that accounted for 23.32 % of the variance in the test data. The same analysis with the TFK data produced an eigenvalue of 5.906 for the first factor that accounted for 14.76 % of the variance in the test data. For both tests, the first eigenvalue was substantially greater than the second (by 4.92 for the BFT and 4.35 for the TFK). These results indicate that a dominant factor or ability (financial literacy) is being measured by each test.

An IRT model shows the relationship between the latent ability of the test-taker and the probability of supplying a correct answer to a test item. The monotonically increasing function for each item shows how the probability of a correct response increases as ability increases. Estimation for IRT models can be conducted with one to four parameters (1P to 4P), with the number of parameters varying based on the focus of the test instrument and the assumptions made about its use (de Ayala, 2009; Hambleton & Swaminathan, 1985).

A four-parameter model was estimated for the IRT analysis of the BFT and TFK data because it appeared to best match the conditions for the testing: (1) the multiple choice items are dichotomously scored (1 = correct; 0 = incorrect); (2) items are subject to guessing; and, (3) very high-ability students may still give incorrect answers because of carelessness or inattention. Following Magis (2013), the general form for a four-parameter IRT model for a particular item j from a set of J items would be stated as:

$$P_j(\theta) = \Pr(X_j = 1 \mid \theta, a_j, b_j, c_j, d_j) = c_j + (d_j - c_j) \frac{\exp[a_j(\theta - b_j)]}{1 + \exp[a_j(\theta - b_j)]}$$

$P_j(\theta)$ is the probability that a student with ability (θ) answers an item j correctly. X_j is the binary response of the student. The terms a_j , b_j , c_j and d_j are the respective vectors for the four item parameters: discrimination (a_j), difficulty (b_j), pseudo-guessing (c_j), and inattention (d_j).

Tables 5 and 6 report the exploratory results from estimating a four-parameter IRT model with the BFT and TFK data using the jMetrik program (Meyer, 2014, 2016). The item fit statistics ($S-X^2$) are chi-square statistics (Ames & Penfield, 2015; Orlando & Thissen, 2003). They are insignificant for 32 of the 35 BFT items and 36 of 40 TFK items. These results show that the four-parameter model appears to be a good fit for almost all items on the test and they provide supporting evidence on the validity of the BFT and TFK items for measuring financial literacy.⁸

⁸ Further investigation of the three items on the BFT and four items on the TFK did not show any problems with the financial literacy content of the items. From an observed score perspective, the three BFT items showed good difficulty (0.50 to 0.64) and discrimination (0.37 to 0.41). The TFK results may have been affected by the smaller sample ($n = 181$) that had fewer students with instruction in financial literacy. Three of the four TFK items were difficult (0.32 to 0.37) and two of those had low discrimination (0.07 and 0.08). Overall, IRT estimates for item difficulty are highly correlated with estimates of item difficulty based on observed scores for the BFT (-0.84) and TFK (-0.75).

Table 5: Four-parameter IRT Estimates for BFT Items Parameters and Standard Errors

Item	Parameters and Standard Errors								S-X ²	P-value
	a	a(se)	b	b(se)	c	c(se)	d	d(se)		
1	1.62	.32	-0.96	0.22	.20	.09	.96	.02	24.23	.51
2	1.88	.44	0.20	0.20	.29	.06	.96	.03	26.51	.38
3	1.91	.36	0.83	0.18	.14	.03	.70		25.30	.45
4	1.84	.33	0.28	0.15	.12	.04	.94	.03	33.30	.12
5	0.92	.53	1.31	1.01	.41	.04	.70		19.44	.78
6	2.05	.36	-0.06	0.15	.18	.05	.95	.03	28.26	.30
7	1.86	.36	-0.10	0.17	.17	.06	.95	.03	24.22	.51
8	1.59	.37	-0.17	0.22	.24	.07	.95	.03	29.44	.25
9	1.21	.30	-0.33	0.33	.23	.09	.94	.04	28.68	.28
10	1.48	.31	-0.55	0.23	.19	.08	.94	.03	38.27	.04
11	1.04	.32	0.08	0.44	.34	.06	.70		36.16	.07
12	2.42	.29	-0.21	0.10	.12	.04	.97	.02	20.88	.70
13	1.38	.41	1.09	0.38	.34	.04	.70		20.90	.70
14	0.69	.32	-0.16	1.00	.37	.08	.70		18.42	.82

Item	Parameters and Standard Errors									p-value
	a	a(se)	b	b(se)	c	c(se)	d	d(se)	S-X ²	
15	1.75	.34	-0.29	0.17	.14	.06	.94	.03	21.38	.67
16	1.50	.32	0.88	0.24	.18	.04	.70		20.15	.74
17	1.93	.41	-0.06	0.19	.29	.06	.97	.02	13.64	.97
18	1.28	.33	0.58	0.34	.29	.05	.70		26.36	.39
19	1.48	.39	-0.63	0.25	.20	.08	.91	.04	55.18	.00
20	1.83	.41	0.84	0.23	.28	.04	.70		30.87	.19
21	1.80	.39	-0.21	0.21	.28	.07	.97	.02	13.15	.97
22	1.08	.33	0.64	0.50	.31	.05	.70		36.69	.06
23	1.90	.37	0.76	0.19	.20	.04	.70		26.86	.36
24	1.76	.45	0.60	0.22	.31	.05	.95	.03	30.42	.21
25	1.84	.38	0.19	0.18	.23	.05	.95	.03	24.82	.47
26	1.98	.36	0.01	0.16	.21	.06	.96	.02	26.94	.36
27	1.80	.40	0.33	0.24	.23	.05	.70		24.57	.49
28	2.06	.40	0.39	0.19	.20	.04	.70		20.51	.72
29	2.07	.36	0.48	0.14	.15	.04	.95	.03	16.36	.90
30	2.05	.42	0.35	0.17	.27	.05	.96	.03	16.94	.88
31	2.37	.31	-0.06	0.11	.16	.04	.97	.02	21.98	.64
32	1.76	.40	0.49	0.20	.26	.05	.95	.03	45.31	.01
33	1.79	.35	0.34	0.17	.15	.05	.94	.04	22.40	.61
34	2.35	.30	-0.25	0.11	.11	.04	.96	.02	33.05	.13
35	1.44	.42	-0.52	0.28	.25	.09	.93	.04	28.16	.30

Table 6: Four-parameter IRT Estimates for TFK Items

Item	Parameters and Standard Errors								S-X ²	p-value
	a	a(se)	b	b(se)	c	c(se)	d	d(se)		
1	1.16	.36	-0.19	0.40	.24	.10	.93	.04	17.94	.65
2	0.85	.28	-0.17	0.52	.23	.10	.92	.05	17.15	.75
3	1.98	.40	-0.69	0.19	.17	.07	.94	.03	28.30	.13
4	1.94	.46	-0.47	0.21	.23	.08	.95	.03	40.96	.01
5	1.60	.39	-0.81	0.28	.24	.09	.96	.03	19.97	.52
6	0.95	.34	-1.08	0.46	.21	.10	.91	.05	15.41	.80
7	1.13	.47	2.01	0.51	.19	.05	.91	.05	24.76	.26
8	0.85	.37	0.47	0.58	.19	.08	.70		16.57	.74
9	0.93	.35	0.76	0.48	.12	.06	.70		18.71	.60
10	0.87	.37	0.83	0.51	.15	.07	.70		25.39	.23
11	2.01	.42	-0.53	0.19	.18	.07	.94	.03	25.28	.24
12	1.75	.47	0.08	0.22	.13	.05	.89	.05	21.29	.44
13	1.03	.37	-0.07	0.45	.23	.07	.70		30.30	.09
14	1.57	.66	-0.24	0.52	.15	.06	.60	.11	23.59	.31
15	0.85	.36	0.00	0.60	.20	.09	.70		20.20	.51
16	1.34	.47	0.63	0.34	.24	.08	.93	.04	23.04	.34
17	0.82	.30	0.57	0.54	.22	.09	.91	.05	22.76	.36
18	1.04	.33	0.29	0.42	.24	.06	.70		19.06	.64
19	1.62	.55	1.87	0.32	.15	.04	.92	.05	18.42	.62
20	1.24	.31	0.22	0.31	.17	.06	0.70		20.33	.50

Item	Parameters and Standard Errors								S-X ²	p-value
	a	a(se)	b	b(se)	c	c(se)	d	d(se)		
21	0.91	.37	-0.18	0.56	.28	.07	.70		18.66	.61
22	1.26	.31	-0.30	0.29	.14	.06	.70		26.78	.18
23	1.70	.40	0.97	0.22	.13	.04	.93	.05	52.52	.00
24	0.85	.29	-0.09	0.56	.21	.08	.70		18.25	.63
25	0.94	.85	1.54	0.78	.28	.09	.70		23.92	.30
26	1.34	.61	1.22	1.21	.11	.04	.60	.36	20.33	.50
27	1.24	.37	-0.52	0.34	.20	.09	.92	.04	28.75	.12
28	0.85	.30	0.05	0.53	.18	.08	.70		28.17	.14
29	0.65	.79	2.27	1.38	.28	.12	.70		33.37	.04
30	0.56	.54	5.50	2.86	.24	.08	.91	.05	29.19	.11
31	0.85	.31	0.45	0.54	.19	.07	.70		19.59	.55
32	0.77	.43	1.16	0.85	.22	.09	.70		17.49	.68
33	0.66	.51	3.36	1.63	.25	.07	.91	.05	33.26	.04
34	0.99	.57	3.15	1.08	.19	.04	.91	.05	20.20	.51
35	1.04	.31	0.51	0.39	.18	.08	.92	.05	16.59	.74
36	1.31	.55	1.09	0.42	.22	.06	.70		31.23	.07
37	1.40	.37	-0.40	0.32	.24	.09	.95	.03	26.23	.24
38	0.62	.35	4.08	1.88	.15	.06	.91	.05	23.77	.30
39	1.42	.49	1.46	0.31	.17	.05	.92	.05	28.01	.14
40	1.90	.41	0.14	0.18	.12	.05	.92	.04	20.68	.48

A graph of an item characteristic curve has ability (in this case financial literacy) on the horizontal axis and the probability of a correct response on the vertical axis. The curve is generally S-shaped, indicating that students with less financial literacy have a lower probability of a correct response to the item than students with higher financial literacy. The discrimination parameter (a) is proportional to the slope of the curve where it is steepest, with lower values showing less discrimination and higher values indicating more discrimination. The difficulty parameter (b) is the location on the financial literacy scale where the slope of the curve is steepest. The easier the item, the lower the value, and the more difficult the item, the higher the value on the financial literacy scale. The pseudo-guessing parameter (c) is the lower asymptote of the curve, showing the probability of a correct response for students with

the lowest level of financial literacy. The inattention parameter (d) is the upper asymptote of the curve that allows the probability of a correct response will be less than one even for students with the highest financial literacy because they may be inattentive or make mistakes.

Figure 1 shows the results for the first item on the BFT. The difficulty of the item (-0.96) is located at less than the location for financial ability, indicating it is an easier item for students. The pseudo-guessing parameter is 0.20 , which means that students with the lowest level of financial literacy have only a small probability of getting this item correct, which is about what would be expected for a four-option test question. The probability of a correct response then rises slightly to 0.30 as ability increases from -3 to -2 . From -2 to 0.5 , however, the probability of a correct response increases substantially from 0.30 to 0.90 . It is in this ability range that the item appears to work best in assessing ability. The probability of a correct response tops out at 0.96 at the highest level of financial literacy, indicating that even these students can make mistakes or be challenged by the item.

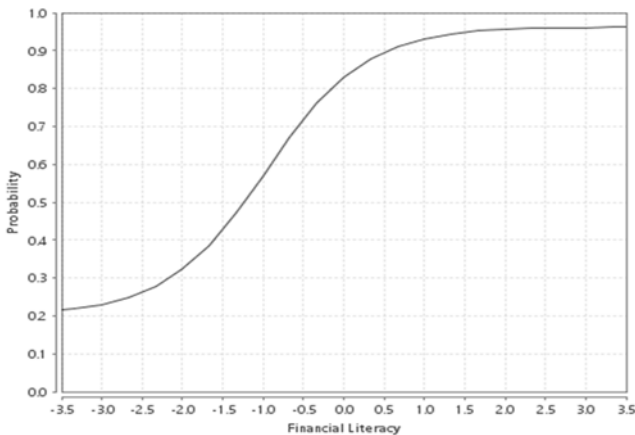


Figure 1: BFT Item 1.

The IRT estimates can be transformed to an expected score or true score for the BFT. This transformation is made by summing the probabilities for a correct response to each item at the financial literacy level for that student. When this procedure is done for all students at all financial literacy levels it can be used to graph a test characteristic curve (figure 2). Students at the lowest level of financial literacy will have an expected TFL score of only 7.5 , which provides an estimate for guessing. Students

at the highest-level of financial literacy score about 30, which indicates that the BFT is a challenging one or that these high-achieving students may be careless with items. Overall, the BFT appears to be effective in assessing students across a broad range of financial literacy. Although not shown, a similar expected score graph can be constructed for the TFK.

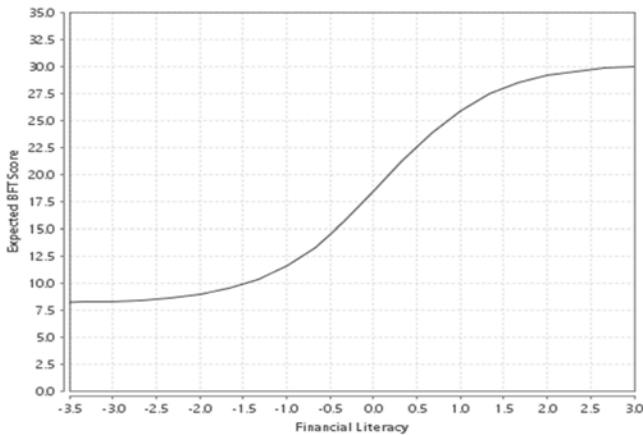


Figure 2: Test Characteristic Curve for BFT.

8 Conclusion

The development of two reliable and valid measures for assessing student understanding of personal finance is a challenging project. The information provided about the BFT and TFK from this study should offer solid evidence to support the claim that each test contains important content that experts in personal finance think should be taught at the respective grade levels for each test. Each test is based on the standards and benchmarks described for the respective grade levels in the FL Standards (CEE, 2013). These standards and benchmarks guided the preparation and content review of the 35 items on the BFT and the 40 items on the TFK. The sample items described in this study also help to explain how the test items are designed to assess students' understanding of different financial concepts.

The test data from administering the BFT and TFK to a limited sample of students supply encouraging data for assessing the construct validity of each measure. The item data show most items are not too easy nor too difficult for students. In addition,

most test items are good discriminators and thus contribute to the valid measurement of financial literacy. In addition, the results for analyzing the BFT and TFK data using a four-parameter item response theory (IRT) model with the small samples showed that each item and the overall test measures understanding across a range of financial literacy. These two tests should be useful for classroom teachers and other educators who want to assess student understanding of financial literacy. They also should be useful tools for education researchers who conduct studies on the determinants and impacts of financial literacy on children and youth.

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A situational judgement approach for measuring young adults' financial literacy

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Considering that valid and reliable assessment is an indispensable prerequisite for adequately designing financial education, we describe the development and validation of a new test instrument for measuring a central facet of financial literacy. Our research activities are based on a competence-oriented view of financial literacy, defined as the potential that enables a person to effectively plan, execute and control financial decisions. Moreover, we adopt a situational judgment approach, which is mostly used in the context of personal psychology. On this basis, we developed a test instrument with 11 situations and 46 items, representing three individual cognitive facets of financial literacy (evaluation of own revenues, planning expenses in agreement with own needs and possibilities/income and drawing up a budget). To validate the instrument, we then conducted an empirical study with 206 young adults. This study yielded good results regarding the test dimensionality and validity of the scales and fairly acceptable findings for item difficulty, item total correlation and reliability. As with other situational judgment tests, this latter result may have been caused by problems of social desirability, among other things. Thus, further studies and the reformulation of items are necessary.

Keywords: Germany – pedagogical diagnostics – situational judgement test – test of financial literacy

1 Introduction

In contemporary economies, the ability to properly manage money and financial matters is becoming increasingly essential, not just for professionals in the investment and banking sector, but also for every person responsible for managing his or her financial affairs in everyday life. This ability is usually subsumed under the term financial literacy. The increasing importance of financial literacy is driven primarily by various socioeconomic factors that are currently challenging most European (and other industrialised) countries, including structural changes in financial services and the labour market, the decline of the welfare state and demographic changes. Consequently, a wide-ranging transfer of risk from governments and employers to employees and consumers has occurred (e. g. reduced state-supported pensions, reduced healthcare benefits), shifting the responsibility for saving for their own financial security in the case of, for example, illness or retirement, to individuals. Furthermore, if individuals use the services of financial intermediaries and advisors, they need to understand what is being offered to them, as even standard procedures like electronic payments – which have replaced face-to-face transactions – require a certain amount of money- and finance-related knowledge and skills (Aprea et al.,

2016). These issues are increasingly important when adolescents and young adults are considered, mainly because the younger generations are likely to bear more financial risks in adulthood than their parents did. In addition, they are consumers of financial services from a young age (e. g. online payments, mobile phones, music downloads or streams; OECD, 2017). Finally, but significantly, financial issues play a vital role in the current conceptions of citizenship education. Especially during economic and financial crises and prevailing problems in the financial sector, young people need to be empowered to play an active democratic role and develop a broader understanding of the financial world (e. g. Davies, 2015).

Given the magnitude and complexity of these trends and the consequent demands on consumers and citizens, it is reasonable to assume that they impose challenges on financial education that cannot be tackled only by family socialisation and everyday experience. Thus, the promotion of financial literacy should become a core concern for every educational system with organised learning and education processes. This necessity, in turn, presupposes the availability of an appropriate assessment approach for measuring existing learners' prerequisites, as well as determining learning needs and developments to provide relevant information for subsequent educational decision making. As we have set out elsewhere (Aprea & Wuttke, 2016), such an approach should be based on a well-defined, coherent and justified specification of the underlying construct. This should refer to an educationally legitimate goal perspective; it should also be free from commercial interests and ideological biases and compatible with contemporary learning theories. Moreover, it needs to move beyond a focus on single and detached knowledge portions to encompass more complex aspects of student achievement, including cognitive, motivational and attitudinal facets. Finally, the approach should ensure psychometric quality and consider recent developments in assessment theory (e. g. Biesta, 2009; Shavelson, 2008; Wilson, 2005). However, the available measurement approaches and instruments often do not fully meet these requirements. Many instruments rely on self-reports, neglecting that people tend to overestimate their competencies. The tests used in research so far, often have limitations: (1) They mainly test knowledge instead of competencies, (2) they are seldom grounded on realistic problems and (3) they neglect non-cognitive facets, such as delay of gratification or moral considerations connected with financial decisions (e. g. Aprea, 2012; Breuer, 2016; Huston, 2010; Remund, 2010; for more detail, see Aprea & Wuttke, 2016, p. 399).

Given the limitations of the current approaches, an alternative method of measuring financial literacy is needed. The study at hand seeks to fill this gap with a newly developed instrument. More specifically, the study is part of a larger research project aiming at the development and validation of a comprehensive test that includes financial literacy with its different facets, and at the same time, allows relevant data

to be collected in a valid, reliable way. This should enable us to gain the knowledge needed for successfully designing and implementing financial education interventions in schools. The target group for our test is young adults in the process of starting their (professional) life and becoming responsible for their own financial affairs (renting apartments, spending money for mobility, weighing preferences because they do not have money for everything they might want, etc.).

The paper is structured as follows: In section 2, we describe the conceptual and methodological background of the study. We then describe the methods of evaluating the test items (section 3) and present the results of this evaluation (section 4). Finally, these results and limitations of the study are discussed, and conclusions are drawn on further steps (section 5).

2 Conceptual and methodological background

2.1 The competence-oriented approach

We adopt a holistic, competence-oriented view of financial literacy, defined as the potential that enables a person to effectively plan, execute and control financial decisions¹. This potential is based on the availability of individual dispositions – that is, knowledge and skills, motivations and interests, attitudes, values – and contingent on situational characteristics (e. g. Weinert, 2001). To further elaborate our view of financial literacy, a preparatory study was conducted, which included an extensive literature review of the available financial literacy conceptualisations, as well as expert interviews with international stakeholders in the field of finance and youth education². On this basis, we could differentiate two dimensions of a competence structure model³: The first dimension refers to the contextual perspective from

¹ A similar competencies based approach has also driven the design of the Framework for Information Literacy for Higher Education (www.ala.org/acrl/standards/ilframework) by the Association of College and Research Libraries (ACRL).

² The interview study was conducted in the context of the EU Leonardo Da Vinci Lifelong-Learning-Project “Financial Literacy in European Vocational Education and Training (FLinEVET)”. The project brought together a group of partners with different missions and expertise in VET practice and research (e. g. Universities, VET Providers, Teachers and Teacher Trainers, Associations dealing with VET and labour market) from six different countries, namely Austria, England, Germany, Italy, Portugal and Switzerland. The overall aim of the project was to analyse conceptualisations and curricula in the area of financial literacy in different countries. In this context, 40 experts from participating countries and the above mentioned fields were asked to elaborate the facets of financial literacy within our holistic, competence-oriented framework and to judge the importance they attribute to each facet (for details see Leumann, Heumann, Syed & Aprea, 2016).

³ We chose a competence structure model, because financial literacy is not unidimensional, there are various facets that make a person financially literate. We do not have a good enough theoretical basis (yet) to define competence levels for the facets in advance. We are aware that it is possible to define

which financial literacy is considered, and it comprises the “individual versus systemic” categories. The characteristic “individual” focusses on the individual as a consumer making financial decisions in the personal and market environments, whereas the “systemic orientation” characteristic subsumes issues of the larger economic and social context, as well as economic and political framework conditions. The second dimension represents the “personal resources”, and it can be classified as “cognitive” and “non-cognitive”. The “cognitive” category refers mainly to knowledge, skills and abilities, while “non-cognitive” dispositions imply emotional, motivational and volitional aspects, as well as social values and norms, which can also be understood as personal traits and characteristics⁴. The combination of these dimensions led to four competence areas, as follows: the individual cognitive, individual non-cognitive, systemic cognitive and systemic non-cognitive areas. The test construction is aligned with these dimensions. We consider our test holistic overall, although not every item can be holistic.

Based on this rough (literature-based) structure, we conducted expert interviews (see footnote 2), asking the participants to elaborate on the individual/systemic and cognitive/non-cognitive dimensions and describe competencies that, in their opinion and from their professional experience, are part of these. The data from the expert interviews were then used to elaborate the facets of the four areas. The individual cognitive area was represented most prominently and elaborated most sophisticatedly in the statements of the experts. Thus, we decided to start our development and research activities with this area. As depicted in table 1, we could discern eight facets of the individual cognitive area from the interview data. In this paper, we focus on developing and evaluating test items for the individual cognitive facet “planning and managing financial matters of everyday life” with three central subfacets, namely “evaluating own revenues”, “planning expenses in agreement with own needs and possibilities” and “drawing up a budget”.

competence levels empirically, as it was done in the PISA studies or other studies using scaling according to the Rasch model (for a discussion on advantages and disadvantages see for example Leuders & Sodian, 2013). Hartig (2007) developed a promising suggestion within the DESI-study: Three steps are necessary to define competence levels: firstly empirical task difficulties have to be defined (Rasch scaling), secondly every task is assigned characteristics that make a task difficult, and thirdly the empirical task difficulty is calculated with regression analyses on these characteristics. This might be a promising way but is not possible yet because the sample is still too small for Rasch modelling.

⁴ With the term “non-cognitive” we want to contrast conceptions of financial literacy that solely consider cognitive aspects such as knowledge, abilities and skills. Of course we are aware that this distinction is of analytical nature, and that non-cognitive aspects such as motivation and attitudes also contain cognitive elements.

Table 1: Facets of the individual cognitive competence area (with facets that are not in the focus of this paper greyed out)

Facet	Subfacets
1 Earning/obtaining money	
2 Planning and managing everyday financial matters	<div>Evaluating own revenues</div> <div>Planning expenses in agreement with own needs and possibilities</div> <div>Drawing up a budget</div> <div>Spending money</div> <div>Building up short-term reserves of money</div> <div>Using banking and financial services for daily needs</div>
3 Saving money/building assets	
4 Borrowing money/raising credit	
5 Retirement planning	
6 Comparing/contracting insurances	
7 Preventing (over-) indebtedness	
8 Using financial counselling services	

For the individual non-cognitive competence area, the facet most frequently mentioned by the experts was delay of gratification. Thus, this facet is included in some test items (e. g. if test takers must decide whether they want to buy something immediately and go into debt or wait until they have saved the money).

2.2 Situational judgment testing

In many test situations knowledge tests are used to evaluate knowledge and skills of test takers. Quite frequently, the test results are then used to predict behaviour in later real life situations. The problem with this approach is that there usually is a

gap between knowing and doing and that test results represent knowledge, they do not necessarily predict later behaviour. This gap between knowing and doing can be explained with inert knowledge, which is knowledge that is available and can be shown in (knowledge) tests but not transferred to and applied in real-life situations (Mandl & Gerstenmeier, 2000; Renkl, 1996; Whitehead, 1929). According to Shavelson (2012), the assessment of competence as described above requires a measure that can tap complex abilities and skills and make them observable through a common, preferably standardised set of tasks that simulate the performances that are expected to be enacted in the real-world situations and to which inferences of competence are to be drawn. Thus, we have adopted a situational judgment test (SJT) approach.

SJTs represent a type of psychological test that presents test takers with realistic, hypothetical situations or scenarios and asks them to identify the most appropriate response or rank the responses in the order they feel is most suitable (e. g. Kahmann, 2014; McDaniel & Nguyen, 2001; Whetzel & McDaniel, 2009). Later behaviour in real situations can be inferred from these decisions. Currently, the situational judgment approach is used most often in the personal psychology context. Applicants for jobs are presented with realistic work-related situations and given several alternatives for how to react to them (Kahmann, 2014; McDaniel & Nguyen, 2001). They are required to put themselves in the situation and make a decision. Later behaviour or job performance can be inferred from this decision (McDaniel & Nguyen, 2001, p. 103). It is assumed that SJTs measure the participants' procedural context-specific knowledge and situational decision-making ability (Kahmann, 2014, p. 49). This approach seems appropriate not only for evaluating job applicants, but also for measuring financial literacy, since it uses realistic problems and situations of everyday life for measuring competent behaviour in similar circumstances in real life. Therefore, the aim of our research is to develop an SJT that reliably and validly measures young adults' financial decisions at the beginning of their (professional) life and responsibility for their financial affairs. In this study, we focus on the development and evaluation of test items for the subfacets "evaluation of own revenues", "planning expenses" and "drawing up a budget", which are part of the facet "planning and managing everyday financial matters", as outlined above. We are especially interested in analysing the test quality for the four following elements: Item quality, test dimensionality, reliability and convergent validity.

Our research questions are as follows:

- (1) Item quality: To what extent are the item difficulty and item total correlation adequate? How well do the items discriminate between test takers?

- (2) Test dimensionality: How can the test items be grouped into scales, and to what extent do those scales confirm the three facets developed based on the literature reviews and expert interviews?
- (3) Reliability: To what extent do the resulting scales reliably measure the respective facets?
- (4) Convergent validity: Do we find significant correlations between the test results and an external criterion?

3 Method

3.1 Sample

The test was administered in 2016 and 2017. The sample ($N = 206$) was a convenience sample consisting of students in higher secondary education, university students in business and economics as well as in business education and students from vocational schools in Germany⁵. Their mean age was 20.6 years (range: 16–25 years⁶), and 52.2 % were female. Most of the participants (75 %) spoke German as a native language (see table 2). As mentioned above, the target group for our test was young adults in the process of starting their (professional) life and becoming responsible for their financial affairs. This was characteristic of all our participants, even if they had different educational backgrounds and were following different educational tracks (university beginners, vocational education). All the participants had to deal with the types of decisions represented in the test (payments for rent, computers, smartphones, food, saving money, etc.). Thus, the results should be generalisable for young adults starting their professional life.

⁵ Students in the dual system of Vocational Education in Germany attend vocational school 1–2 days a week and work in the company where they are trained 3–4 days per week. Vocational full-time schools lead to state approved school-leaving certificates in middle or higher secondary education.

⁶ Six participants were not members of our target population (aged over 30). We therefore did not consider them in our analyses.

Table 2: Overview of the sample

		N
Type of school or university	Higher secondary school	43
	University, Business/Business Education	34
	University, Educational Science	28
	Full-time vocational schools, dual vocational education (drafting, carpentry, specialty in removal services)	101
Age	16-25 years, mean: 20.6 years	
Gender	52.2 % female	
Native language German	75 %	
		206

3.2 Item and scale development

We developed an instrument with 11 situations and 46 items, representing the individual cognitive facets mentioned above, as follows (for an example, see Fig. 1):

- (1) Evaluation of own revenues (four situations, four items each);
- (2) Planning expenses in agreement with own needs and possibilities/income (three situations; situations 5 and 6 with four items, situation 7 with six items); and
- (3) Drawing up a budget (four situations, four items each).

Delay of gratification was embedded in some of the items, for example, that depicted in Fig. 1 (wanting to buy a new smartphone without having sufficient money).

You are in your first year of vocational education. You still live with your parents. In the following table, your monthly expenses and income sources are listed. You have no savings because you recently bought a fancy motor scooter.

Income		Expenses	
Account balance at the end of the previous month	€20	Gas for the scooter	€34
Your monthly wage	€520	Monthly insurance for the scooter	€6
		Food and drink	€100
		Monthly flat rate for your smartphone	€30
		Parties, cinema, etc.	€100
Sum	€540	Sum	€270

Now you want to buy a new smartphone. You find an offer for one that costs €530.

Please judge the following situations and decide how possible every decision is and how you would react in this situation.

(1 = very unlikely, 2 = unlikely, 3 = neither likely nor unlikely, 4 = likely, 5 = very likely)

	1	2	3	4	5
I have enough money and buy the smartphone immediately.					
I have a monthly surplus of €270 and wait for one month to buy the smartphone.					
I notice that I do not have enough money. However, I really want to have the smartphone now. I am sure I will find an opportunity to borrow money. I buy the smartphone.					
I don't buy the smartphone now, but instead, wait until I have enough savings to afford it.					

Figure 1: Facet 1, 'Planning and managing everyday financial matters'; subfacet 1, 'Evaluation of own revenues'; situation 1 with four answer options (items)

We generated the item stems (descriptions of the situations) based on our competence structure model and the results from our expert interviews (see above and Aprea, Wuttke, Leumann & Heumann, 2015; Leumann et al., 2016; for details about the process, see Weekley, Ployhart & Holtz, 2006). The item stems were intended to represent similar real-life situations to the real-life decisions of young adults⁷ (e. g. buying a new smartphone). The appropriateness of the situations was discussed in groups that resembled our target group (university students, students in vocational education). The item generation and scaling were based on the established standard procedures for the development of SJTs, as follows (Muck, 2013):

- ▶ Three to 12 response options for each item stem are common (Weekley et al., 2006). Our situations mainly had four response options⁸.
- ▶ The response options should be verified, which can be done using the four following strategies (Muck, 2013): (1) expert judgment, (2) empirical determination of answer options, (3) theory-based determination of answer options and (4) a hybrid strategy using both empirical and theory-based determination of response options. The first strategy is common (Bergman, Drasgow, Donovan, Henning & Juraska, 2006); thus, we verified our answer options with experts.
- ▶ The response options should represent the construct that is being measured well; they should be close to reality, and distortions due to social desirability are to be avoided (Muck, 2013; for the problem of social desirability, see below).
- ▶ Generally, one must decide whether test takers need to answer what they think they should do (maximal behaviour) or what they would do (typical behaviour) in a situation. Because the “should do” alternative is knowledge-based and we wanted to develop a test that would provide results closely connected to behaviour, we chose the more behaviour-based “would do” alternative (behavioural tendency; McDaniel, Hartmann, Whetzel & Grubb, 2007). Which answer format is superior has not yet been established (for a comparison, see Muck, 2013, p. 196). There is some speculation that knowledge-based SJTs are more valid because they are closer to cognitive abilities than behaviour-based SJTs are

⁷ This is in contrast to existing instruments, for example one item in the PISA 2012 Financial Literacy Framework (www.oecd.org/finance/financial-education/PISA2012FrameworkLiteracy.pdf), where young people are asked to decide about buying 1 kg or 10 kg of tomatoes. The correct answer is 10 kg because a box of tomatoes is better value for money than loose tomatoes. One could argue that buying tomatoes is not a central concern in young people. And one could further argue that this is only correct if you eat a lot of tomatoes in a very short time because otherwise they will rot and then it is not better value for money.

⁸ One could argue that close-ended answer options are not comparable to real-life situations. We nevertheless chose this approach, mainly based on considerations of test economy. Furthermore, just as with multiple choice tests, different levels of complexity can be reached even when close-ended answers are used.

(McDaniel et al., 2007). In contrast, one could argue that behaviour-based SJTs are more valid because they are closer to behaviour (past/intended behaviour predicts future behaviour; Ployhart & Ehrhart, 2003). A meta-analysis by McDaniel et al. (2007) showed that there is no difference concerning the criterion validity. Distortions due to social desirability may be slightly higher in behaviour-based tests (Muck, 2013).

- ▶ Importantly, test designers must decide whether the answer options should be given in multiple-choice or Likert-scale form. Likert scales have the advantage of including more possible answers, and thus, they usually attain better reliability and validity (Ployhart & MacKenzie, 2010; Weekley et al., 2006; Whetzel & McDaniel, 2009). Therefore, we selected Likert scales. A further argument for this is the lower cognitive load for test takers, as every answer can be judged separately instead of having to choose one answer from all the possibilities (Muck, 2013).
- ▶ The total score of every test taker can be computed as the sum of all scores (absolute score) or using the test takers' relative scores compared with an expert rating (Muck, 2013). We followed Mumford, Van Iddekinge, Morgeson and Campion (2008) and computed the sum of all scores for the effective answers plus the sum of all recoded scores for the ineffective answers.

Because we assumed that the ability to delay gratification is closely connected to financial literacy, especially concerning questions of spending, we also administered an established questionnaire for assessing buying behaviour and delay of gratification (Ray & Najman, 1986). As elaborated on in the next section, this questionnaire was used to determine the convergent validity of our test items⁹.

3.3 Item and scale evaluation

3.3.1 Item analysis: Item difficulty and item total correlation

To evaluate the quality of our test, we first conducted an item analysis, including item difficulty and item total correlation as indicators for the discriminatory power of the items. Usually, items that are too easy or too difficult (item difficulty below .20 or above .80) should be excluded from tests. However, we decided to include item difficulties up to .90. This allowed us to differentiate between test takers with extreme characteristics. The item total correlation describes the correlation between the item values x_{vi} of test takers and their test outcome x_v . Item total correlations between .40 and .70 are considered "good"; items with a negative total correlation or close to zero should be discarded. In general, item total correlations should not

⁹ Apart from the SJT and the questionnaire, we collected demographical data (age, gender, educational background, family background).

be below .30 (Moosbrugger & Kelava, 2012). Thus, we decided to exclude items with an item total correlation below this value.

3.3.2 Test dimensionality

To determine the test dimensionality, we calculated an exploratory factor analysis (principal component analysis, varimax rotation; see below for more details). Test dimensionality is used for grouping test items into scales. If this results in interpretable factors that show a certain resemblance to the (assumed) conceptual structure, this may be interpreted as a further sign that the test can be considered a valid indicator of the underlying constructs.

3.3.3 Reliability

To determine the reliability of the resulting scales, we used Cronbachs alpha as a measure of internal consistency. As a rule of thumb, α -values between .70 and .80 are regarded as satisfactory, whereas those below .60 are considered low. However, it should be noted that very high reliabilities are not necessarily desirable, as this indicates that the items may be redundant. Further, Cronbachs alpha is necessarily higher for tests measuring narrower constructs and lower when more generic, broader constructs are measured. Along with several other factors, this phenomenon suggests that objective cut-off values should not be used for internal consistency measures (e. g. Streiner, 2003).

3.3.4 Convergent validity

As mentioned above, we used a questionnaire on buying behaviour and delay of gratification, which was developed by Ray and Najman (1986), to clarify the convergent validity of our test. The results from this questionnaire should correlate significantly and positively with financial literacy as measured by our test. For determining the correlations, we used Pearson's correlation coefficients.

4 Results

4.1 Item quality: Item difficulty and item total correlation

As shown in table 3, none of the items were too difficult, with most falling into a middle range of difficulty. However, 13 items were considered too easy, and thus, they were excluded.

Table 3: Overview of item difficulty (for details see appendix)

Item difficulty	$0 \leq p_i < .2$	$.2 \leq p_i < .5$	$.5 \leq p_i < .8$	$.9 \leq p_i < 1$
Number of items	---	4	29	13

The results regarding item total correlation are depicted in table 4. As can be deduced from this table, 20 items had to be excluded from the test because their item total correlation was below .30. These items include those that were too easy.

Table 4: Overview of item total correlation (for details see appendix)

Item total correlation	$0 \leq r_{it} < .3$	$.3 \leq r_{it} < .7$
Number of items	20	26

No specific facet could be singled out, and the excluded items were distributed over the facets (see appendix). After the item analyses, 26 items remained for further analysis.

4.2 Test dimensionality

A principal component factor analysis was conducted on the 26 remaining items with orthogonal rotation (varimax). The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, $KMO = .800$ (meritorious according to Hutcheson & Sofroniou, 1999). An initial analysis was run to obtain eigenvalues for each factor in the data. Eight factors had eigenvalues over Kaiser's criterion of 1, and in combination, they explained 62.167 % of the variance. The scree plot showed a clear inflexion that would justify retaining three factors. The three-factor solution explained a total variance of 39.031 % (factor 1: 14.076 %, factor 2: 13.201 %, factor 3: 11.755 %). Table 5 shows the factor loadings after the rotation. The items loading on two factors were excluded.

Table 5: Summary of exploratory factor analysis results (loadings > .30)

Item	Content	Rotated Factor Loading		
		Overview/ control of own financial situation	Budgeting	Sensitive handling of money
6_4	Analysis of costs for new apartment vs. income	.713		
6_2	Renting an apartment without analysis of costs and income	.656		
7_2	Deciding to pay for a (necessary) laptop in monthly instalments	.585		
11_2	Buying a smartphone without checking the liquidity	.578		
5_1	Buying a smartphone after having checked the liquidity	.555		
10_1	Finding discrepancies in the budget plan without reacting	.488	.372	
7_3	Borrowing money from parents for necessary laptop	.485		
5_4	Buying goods without controlling financial situation	.474		.329
4_4	Checking available resources	.406		
1_3	Buying a smartphone without having enough money and without checking the liquidity	.378		
1_1	Buying a smartphone after checking the liquidity	.373		
8_1	Having a new job and developing a budget plan		.740	
9_2	Developing a budget plan		.736	
8_3	Deciding not to develop a budget plan		.685	

3_1	Not being able to judge effects of a rise in health insurance costs on budget	.670		
3_3	Being partly able to judge effects of a rise in health insurance costs on budget	.606		
3_4	Being able to judge effects of a rise in health insurance costs on budget	.583	.364	
10_3	Deciding against a budget plan	.536		
10_2	Analysing reasons for discrepancies between budget plan and budget	.354	.342	
1_4	Having enough money and deciding to buy a smartphone		.716	
11_3	Saving money for a smartphone		.694	
4_2	Analysing income		.660	
6_3	Saving money for rent of own apartment		.590	
7_6	Delaying to buy a trendy computer, saving money first		.519	
6_1	Delaying to move into own apartment, saving money first	.375	.479	
2_3	Calculating interest rates		.461	
Eigenvalues		3.80	3.56	3.17
% of variance		14.08	13.20	11.76
α		.754	.573	.691

Annotations: Factor 1 can be interpreted as "overview/control of one's own financial situation", factor 2 as "budgeting", and factor 3 as "sensitive handling of money".

4.3 Reliability

The reliabilities of the resulting scales, as shown in the last line of table 5, were low (factor 2) to satisfying (factors 1 and 3). This will be discussed in section 5.

4.4 Convergent validity

The correlations between the buying behaviour and delay of gratification scale (Ray & Najman, 1986) as an external criterion and our test scales showed moderate values and were positive and highly significant ($r = .568^{**}$ for factor 1, $r = .465^{**}$ for factor 2 and $r = .336^{**}$ for factor 3; $* = p \leq .05$, $** = p \leq .01$). Thus, people able to delay gratification and control their spending behaviour can also control their financial situation and act sensibly in the areas of budgeting and handling money. We cautiously interpret this as a support for the convergent validity of our test.

5 Discussion, limitations and further studies

In this paper, we presented a study that represents a first step in a larger research project intending to reliably and validly measure financial literacy as a multifaceted construct. The study, which is based on a holistic, competence-oriented view of financial literacy, as well as on a situational judgment assessment methodology, specifically intends to develop test items for three subfacets of the whole construct and evaluate those items by considering item quality, test dimensionality, reliability and convergent validity.

The results showed a three-factor solution with good interpretability. The explained variance of the factors was satisfying (39.03 %). Moreover, the three-factor solution was closely connected to the three subfacets of the financial literacy concept that we intended to measure. Although the content meaning was slightly different, and items partly loaded on factors other than expected, we cautiously interpret this result as a sign of construct validity. This interpretation is further corroborated by the substantial correlations with the buying behaviour and delay of gratification scale, indicating a fairly good convergent validity. Thus, we can carefully assume that the newly generated test items and scales are valid in terms of measuring the intended construct.

Despite the generally positive findings, the results of our study also revealed certain limitations; thus, further development and research activities are required. In line with many other SJTs, a substantial number of the items were too easy. We suppose that social desirability may be an explanation for this, as items that explicitly described socially desired or discouraged behaviours (e. g. saving money as a desired behaviour or going into debt as a discouraged one) especially fell into this category. To further test this assumption and possibly find better item formulations, we need

more information on how participants conceive and interpret the descriptions, for example, by using think-aloud protocols. In addition, studies that control for participants' general tendency toward a desirable responding behaviour and response latency may be useful to successfully handle this problem (McDaniel et al., 2007).

Also in line with many other SJTs, the reliability of the scales in terms of internal consistency, as measured with Cronbachs alpha, was rather moderate. Catano, Brochu and Lamerson (2012) presented results from a meta-analysis and reported an average internal consistency of .46. They explained such a relatively low outcome with the fact that even people with a similar result in a construct may act differently in concrete situations. Moreover, an SJT represents a behaviour-based simulation of a criterion behaviour that is not a "pure" construct (Muck, 2013). Since many constructs require multiple skills, the search for unidimensional factors can be limiting. To act reasonably in financial decision situations, people need many dispositions, including financial knowledge, mathematical knowledge and the ability to delay gratification. According to Catano and colleagues (2012), applying reliability estimates other than internal consistency (e. g. retest reliability in a longitudinal perspective) may provide additional insights in this regard. Moreover, a multidimensional skills profiling approach (e. g. diagnostic classification models; see Kunina-Habenicht, Rupp & Wilhelm, 2009) may also be a suitable and promising avenue. This, in turn, would require larger samples. Our further studies will adopt this approach.

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Appendix

Table 6: Item characteristics. Items with a "*" had to be removed due to low item quality (see chapter 4.1). The items are numbered for each situation (S). S1_1 means item 1 in situation 1. For contents of the items see table 5.

Item	Mean	SD	p_i	r_{it}
S 1_1	4.21	1.144	.80	.337
S 1_2*	3.25	1.367	.56	.039
S 1_3	4.22	1.184	.80	.348
S 1_4	4.31	1.196	.83	.484
S 2_1*	3.31	1.321	.56	.136
S 2_2*	3.59	1.154	.62	.004
S 2_3	3.77	1.363	.68	.353
S 2_4*	3.55	1.300	.62	.135
S 3_1	3.43	1.323	.55	.428
S 3_2*	3.38	1.206	.58	.071
S 3_3	3.43	1.244	.60	.370
S 3_4	3.43	1.414	.59	.469
S 4_1*	3.58	1.342	.35	.143
S 4_2	4.19	1.342	.78	.328
S 4_3*	3.34	1.325	.41	.018
S 4_4	4.36	1.048	.82	.426
S 5_1	4.47	0.961	.87	.321
S 5_2*	3.59	1.276	.65	-.042
S 5_3*	3.75	1.234	.69	.184
S 5_4	4.49	1.027	.87	.510
S 6_1	4.42	0.954	.85	.467
S 6_2	4.61	0.845	.90	.568
S 6_3	4.11	1.114	.78	.434
S 6_4	4.40	0.920	.85	.431
S 7_1*	4.77	0.658	.94	.440
S 7_2	3.96	1.155	.74	.362

Item	Mean	SD	p_i	r_{it}
S 7_3	4.42	0.919	.85	.322
S 7_4*	3.36	1.366	.59	.196
S 7_5*	3.96	1.169	.74	.281
S 7_6*	3.63	1.272	.65	.140
S 8_1	3.22	1.431	.55	.322
S 8_2*	2.95	1.384	.48	.248
S 8_3	4.14	1.216	.78	.522
S 8_4*	3.50	1.389	.63	.223
S 9_1*	4.29	1.023	.82	.251
S 9_2	2.96	1.406	.48	.418
S 9_3	4.10	1.111	.79	.364
S 9_4*	3.52	1.250	.62	.251
S10_1	4.13	1.029	.78	.426
S10_2	4.05	1.104	.77	.489
S10_3	3.82	1.182	.71	.402
S10_4*	3.49	1.348	.62	.152
S11_1*	3.44	1.393	.60	.026
S11_2	4.47	0.908	.85	.376
S11_3	4.25	1.016	.78	.440
S11_4*	3.67	1.326	.60	.088

The relationship among gender, interest in financial topics and understanding of personal finance

Manuel Förster, Roland Happ and Andreas Maur

In some studies on young adults' knowledge and understanding of personal finance, males have outperformed females. In this paper, we investigate whether interest in financial and economic topics and media usage mediate the relationship between gender and knowledge and understanding of personal finance in three content areas: banking, insurance, everyday money management. We administered the German adaptation of the Test of Financial Literacy (TFL-G), developed by the American Council for Economic Education, to assess young adults' knowledge and understanding of personal finance. Although we found that male participants performed better on the TFL-G, we also identified significant gender-specific differences in young adults' interest in financial and economic topics and media usage. When controlling for interest in financial and economic topics and media usage, the gender-specific gap in performance on the TFL-G decreased. These influencing factors accounted for 13 % to 26 % of the variance in the TFL-G scores in the three content areas under investigation. Hence, when investigating the gender gap in knowledge and understanding of personal finance, greater consideration should be given to contextual variables. Further, differences in test scores should be investigated according to separate content areas.

Keywords: gender gap – interest in financial topics – knowledge and understanding of personal finance – media usage

1 Relevance

In various studies, young adult males have exhibited greater financial knowledge than young adult females (see e. g., Atkinson & Messy, 2012; Chambers & Asarta, in this issue; Messy & Monticone, 2013). For example, in most of the countries investigated in the Programme for International Student Assessment (PISA) study 2012, young male adults demonstrated a higher level of financial literacy than females when reading and mathematics abilities were controlled for (OECD, 2014). However, in some studies, varying or even no significant gender differences in financial knowledge and understanding were found, depending on the test instrument (see Hill & Asarta, 2016; Walstad, Rebeck & MacDonald, 2010) and on the country in which the study was conducted (for Korea, see Jang, Hahn & Park, 2014). This variation implies that further country-specific studies are necessary, which applies particularly to countries such as Germany, where research on knowledge and understanding of personal finance still is in its early stages (e. g. Erner, Goedde-Menke & Oberste, 2016). Moreover, the gender gap in financial literacy has been widely discussed in the literature (Hill & Asarta, 2016), but little explanation for it

has been given. In this paper, we investigate the relationship between young adults' gender and their knowledge and understanding of personal finance while considering various other contextual factors that might moderate or mediate this relationship. In section 2, we develop hypotheses based on the state of research on the relationships between gender and knowledge and understanding of personal finance, and between interest in financial and economic topics and media usage. In section 3, we describe the test and sample, and in section 4 we present the results in relation to the hypotheses by means of various structural equation models. In our study, we analyze knowledge and understanding of personal finance in three content areas: banking, insurance, everyday money management. Finally, in section 5, we discuss the results and their practical implications.

2 State of research and hypotheses

In a multitude of studies conducted in several countries, males outperformed females on tests of financial knowledge (see, e. g., Atkinson & Messy 2012; Chen & Volpe 2002; Erner et al., 2016; Filipiak & Walle 2015; Fonseca, Mullen, Zamorro & Zissimopoulos, 2012; Hanna, Hill & Perdue, 2010; Lusardi & Mitchell, 2014; OECD, 2017). However, Walstad and colleagues (2010), and Hill and Asarta (2016) administered the Financial Fitness for Life High School Test (FFFL-HS) to students in the United States. In the first study, they found that females performed as well as males (Walstad et al., 2010). In the second study, using a pre-posttest design at the beginning and end of a training course on financial literacy, Hill and Asarta (2016, p. 545) found no gender-related performance gap in the results of the pretest and that female participants performed even better than male participants on the post-test. Using a Korean adaptation of the FFFL-HS, Jang and colleagues (2014) found no performance differences. These inconsistent results of current research on gender differences in knowledge and understanding of personal finance suggest that contextual variables might play a role in the development of financial literacy. Another reason for the inconsistencies in findings could be that there are only a few studies (e. g., Hill & Asarta, 2016) in which content-related gender differences were investigated.

In Germany, research on knowledge and understanding of personal finance still is in an early stage compared to, for instance, research in the United States. Although Germany participates in PISA, the part on financial literacy is not included in the German test (neither in PISA 2012, nor in PISA 2015; see Frühauf & Retzmann, 2016, p. 268). Promisingly, the number of studies conducted in Germany addressing young adults' financial literacy is increasing gradually (Aprea & Wuttke, 2016 & in this issue; Barry 2016, Bender 2012; Erner et al., 2016; Frühauf & Retzmann, 2016; Fürstenau & Hommel, in this issue; Schuhen & Schürkmann, 2014). Preliminary

findings of these studies indicate that female participants exhibit lower levels of knowledge and understanding of personal finance than male participants (Erner et al., 2016), leading to our first hypothesis:

H₁: Young male adults will exhibit greater knowledge and understanding of personal finance than young female adults in Germany.

Due to the above-mentioned inconsistencies in research findings, any gender differences we find in this study will be investigated further to determine whether they are connected to specific content areas of knowledge and understanding of personal finance within the context of hypothesis H₁. Administering test items that measure young adults' knowledge and understanding in three particular areas of personal finance allows us to identify various contextual factors that may influence gender-related patterns in test results.¹

Apart from knowledge and understanding of personal finance, we also investigate young adults' interest in financial and economic topics. In some studies, young male adults have expressed greater interest in financial topics than young female adults (for Germany, see Medienpädagogischer Forschungsverbund Südwest, 2016; Schweiger, 2007, p. 271; for the United States, see Chen & Volpe, 2002; Kim & Garman, 2003; for other countries, see OECD, 2013). Varying degrees of interest in financial and economic topics, *inter alia*, might stem from different understandings of the roles of men and women. Hence, women may have difficulty approaching financial and economic topics and may tend to perceive them as boring (Australian Government & Financial Literacy Foundation, 2008). In many cultures, men are the decision-makers about financial issues in the household. Such role patterns are likely to affect the adolescents growing up in these households and may result in young female adults developing less interest in financial and economic topics (Grohmann, 2016). The theory of interest (Prenzel, Krapp & Schiefele, 1986) postulates that people and their social and material environment have a functional relationship. This implies that people choose to deal with subject matter they find interesting; therefore, it can be assumed that interest in financial and economic topics may manifest in the use of the respective media to obtain information on those topics. Empirical findings also suggest that young adults interested in such topics often use media such as television and the Internet to stay up-to-date (for the United States, see Brown & Pardun, 2004; Media Insight Project, 2014, p. 29; for Germany, see Behrens, Calmbach, Schleier, Klingler & Rathgeb, 2014, p. 204; Schweiger, 2007). Based on these considerations, our second hypothesis is as follows:

¹ A major limitation regarding the content of assessments of knowledge of personal finance in Germany is that they focus mainly on content areas dealing with financial products (see e. g., Commerzbank Think Tank, 2003; ING-DiBa, 2013).

H₂: Young male adults will show greater interest in financial and economic topics and use media to obtain information on those topics more often than young female adults.

Results of some studies suggest that young adults' knowledge and understanding of personal finance and their use of media to learn more about related topics depend on their interest in financial and economic topics (Beal & Delpachitra, 2003; Cameron, Calderwood, Cox, Lim & Yamaoka, 2014). Accordingly, greater interest in financial and economic topics and more extensive use of media to obtain information on those topics should have a positive impact on knowledge and understanding of personal finance. This could also be underpinned by the theory of interest (Prenzel et al., 1986), according to which people construct knowledge by interacting with related subject matter, so that a longer-lasting and more intense involvement results in positive knowledge accumulation. When controlling for interest and media usage, the gender gap in knowledge and understanding of personal finance should be reduced. This leads to our third hypothesis:

H₃: When controlling for interest in financial and economic topics and domain-related media use, gender-specific differences in young adults' knowledge and understanding of personal finance will decrease.

3 Knowledge and understanding of personal finance, its operationalization, and sample

3.1 Knowledge and understanding of personal finance

According to Atkinson and Messy (2012), financial literacy enables a person to plan, execute, and manage financial decisions. These authors differentiate among financial knowledge, financial behavior, and attitude toward financial topics. The focus of most definitions of knowledge and understanding of personal finance is the knowledge component of financial literacy (cf. Council for Economic Education (CEE), 2013, p. v; OECD, 2017, p. 49). Thus, it is assumed that greater knowledge and understanding of personal finance leads to more appropriate decision-making behavior (Remund, 2010, p. 280). Nonetheless, it can be assumed that knowledge is a necessary - but often insufficient - precondition for making well considered financial decisions (Förster & Happ, 2018). The focus of this paper is the knowledge component of financial literacy as a cognitive measure and its relationship to the gender of the participants.

In this study, knowledge and understanding of personal finance is conceptualized as basic knowledge of financial products, economic connections, institutions, and the cognitive processes involved in making appropriate financial decisions. This conceptualization is in line with the National Standards for Financial Literacy (CEE,

2013), in which six content areas of knowledge and understanding of personal finance are distinguished (i. e., earning income; buying goods and services; saving; using credit; financial investing; protecting and insuring). There is some overlap in content between these standards for financial literacy and those adhered to in other studies (see Erner et al., 2016; Schuhen & Schürkmann, 2014), and some content areas are labeled differently in other studies. The National Standards for financial literacy define knowledge levels of students in grades 4, 8, and 12; however, in this paper, we focus on the standards for students in grade 12 (CEE, 2013) because the aim of our study is to assess young adults aged 17 to 25 who are beginning their higher education studies. First-year higher education students were chosen for this study because knowledge and understanding of personal finance is particularly important for them as they are entering a new phase of life during which they need to make a lot of finance-related decisions (e. g., how they will finance their studies, transport, and residence).

3.2 Operationalization and instruments

We administered a German version of the Test of Financial Literacy (TFL-G; Walstad & Rebeck, 2017) which comprises 45 items in line with the Council for Economic Education's (CEE, 2013) National Standards for financial literacy that assess knowledge and understanding of personal finance (for information on the six-month translation and adaptation process, see Förster, Happ & Molerov, 2017). Several analyses ensured that the TFL-G was a reliable and valid tool for measuring the underlying construct (see Förster et al., 2017). All six content areas of knowledge and understanding of personal finance are covered in the items of the test instrument. There are seven items about earning income, six about buying goods and services, five about saving, ten about using credit, eight about financial investing, and nine about protecting and insuring. In most studies of financial literacy, rather general measures in terms of content have been employed. Consideration of all the content areas permits analysis of the dimensionality of knowledge and understanding of personal finance. It also permits analysis of the extent to which gender-specific differences vary according to those content areas (for data on differences according to content areas based on results of the American Financial Fitness for Live Test, see Hill & Asarta, 2016). Results of a pretest of the TFL-G indicated that one item from the content area of financial investing was too difficult to understand from a linguistic perspective and therefore was omitted. Thus, our analyses were based on the participants' responses to 44 items (for further

descriptions of the test, item difficulty and response parameters, and discriminatory power, see Förster et al., 2017, p. 128)².

In addition to administering the TFL-G to assess participants' knowledge and understanding of personal finance, we had participants complete a questionnaire on which they rated on a six-point Likert scale ranging from "0 = never" to "5 = several times a day" how often they accessed media to stay informed about financial and economic topics. They also rated their level of interest in financial and economic topics on a five-point Likert scale ranging from "0 = not at all interested" to "4 = very interested". Results of previous studies indicate that an individual's choice of educational path may influence the amount and kind of opportunities he or she has to learn about finance (Förster et al., 2017). Therefore, students also reported on their previous opportunities to learn about financial and economic topics; more specifically, whether they had completed an economics course and/or a vocational education program at secondary school. Finally, they stated their secondary school grade point average (GPA).

3.3 Sample

The 1 108 young adults who participated in this study were assessed at the beginning of their studies during the winter term 2015/2016 and the summer term 2016. The sample was restricted to 17- to 25-year-olds because we assumed that older participants would have had disproportionately more opportunity to learn about personal finance issues due to their everyday practical experiences in financial situations. The average age of the participants was 20.02 years; 59.5 % were female. The great majority (nearly 88.4 %) had not completed a vocational training program. The mean secondary school GPA was 2.3 (standard deviation: .57)³. Interest in financial and economic topics rated on a five-point Likert scale ranging from "0 = not interested in financial and economic topics" to "4 = very interested in financial and economic topics" was 1.96 on average (standard deviation: 1.04), where 2 indicated the students were somewhat interested in financial and economic topics (for more information on the sample, see Förster et al., 2017). Table 1 provides an overview of the descriptive statistics for male students and female students in the sample:

² The omitted item was item 33 on the original test, which was about the development of price and interest rates of a stock when a corporation announces profits greater than expected.

³ In Germany, the best secondary school GPA is 1.0 and the worst is 4.0. The secondary school GPA is used to determine qualification for entry into university programs.

Table 1: Descriptive Statistics of the Sample by Gender

Sample Size	Female	Male
Number of Students	659 (59.5 %)	449 (40.5 %)
Commercial vocational training		
No commercial vocational training	618 (61.1 %)	393 (38.9 %)
Commercial vocational training	40 (42.1 %)	55 (57.9 %)
Missing observations for the variable		2
Means and Standard Deviation		
Secondary school GPA	2.24 (SD = 0.59)	2.38 (SD = .053)
Missing observations for the variable		18
Interest in financial and economic topics	1.68 (SD =0.98)	2.36 (SD = 1)
Missing values		6
Media usage	1.51 (SD = 1.17)	2.29 (SD = 1.3) ⁴
Missing observations for the variable		6

Annotations: Percentages are in parentheses; SD = standard deviation

4 Empirical modeling and results

First, we thoroughly investigated the dimensions of financial literacy to be assessed on the TFL-G to investigate whether each of the six content areas on the test represented one unique dimension of knowledge and understanding of personal finance. A one-dimensional structure was found to be reliable and to yield a very good data fit (Förster et al., 2017). We conducted further confirmatory factor analyses and found some content areas to be closely related to a correlation coefficient of over .90, rendering separation of the content areas ineffectual. The following three-dimensional model, however, yielded an adequate discriminatory power:

1. Everyday money management: earning income, buying goods and services
2. Banking: financial investing, saving, using credit
3. Insurance: protecting, insuring

⁴ Results indicate that female students use less than once a week media to inform themselves on financial topics while male students use more than once a week media.

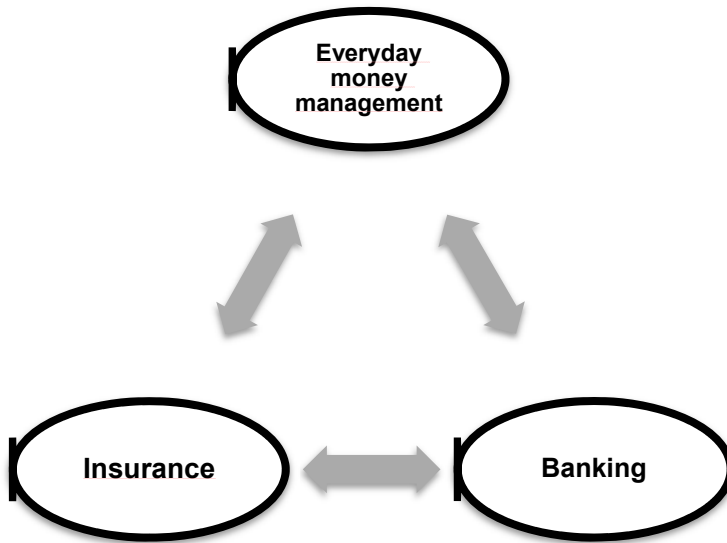


Figure 1: Three-dimensional model of knowledge and understanding of personal finance

In this model, there still was considerable correlation among the factors, indicating contextual interdependencies. For instance, the dimensions of banking and insurance correlated with an r of .838, and the dimensions of banking and everyday money management correlated with an r of .781. However, insurance and everyday money management could be more clearly distinguished with an r of .509. This model yielded highly acceptable fit indices ($\chi^2 = 1207.48$; $df = 899$; $RMSEA = .018$; 95 %-CI of the $RMSEA$ [.015; .020]).

First, we followed this three-dimensional model to determine whether gender differences in knowledge and understanding of personal finance varied according to the three dimensions. Model 1 in figure 2 and table 2 depicts the effects and the regression coefficients, respectively.

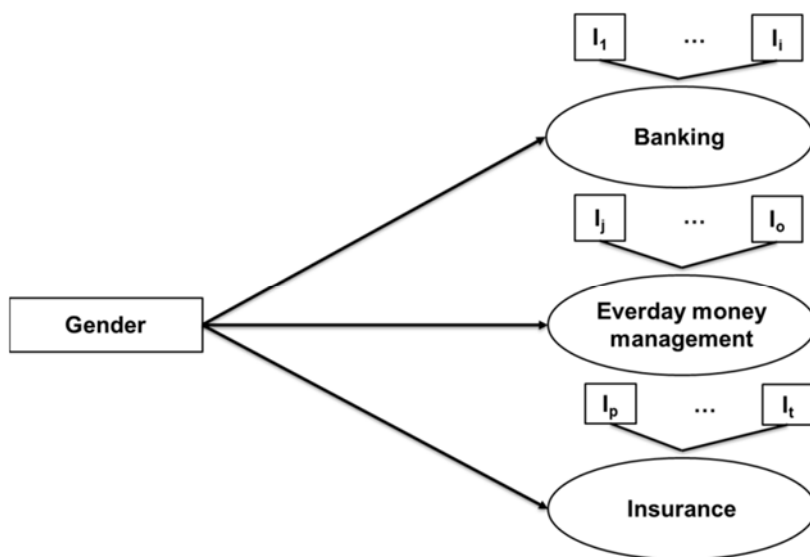


Figure 2: Model 1 - Gender effect on knowledge and understanding of personal finance

Table 2: Regression coefficients of gender on knowledge and understanding of personal finance

	Everyday Money Management		Banking		Insurance	
	b	β	b	β	b	β
Male	.155***	.341***	.180***	.582***	.076**	.373***
R ²	.028*		.082***		.034*	

Annotations: *p < .05, **p < .01, ***p < .001; b = non-standardized and β = standardized regression coefficients

Gender had a significant effect on all three dimensions of knowledge and understanding of personal finance. For dichotomous variables, the β -coefficient represents the effect size of Cohen's d for the standardization we used. The gender effect on the dimensions of everyday money management and insurance was small to medium-sized while the effect on banking was medium-sized to large. Young female adults thus had a significantly lower level of knowledge and understanding of banking services than young male adults. The dichotomous variable accounted for 2.8 % to 8.2 % of the variance in knowledge and understanding in the three

dimensions of personal finance in the model. Next, we investigated the extent to which interest in financial and economic topics and media usage correlated with young adults’ gender and if these differences mediated the relationship between gender and knowledge and understanding of personal finance. The postulated model and the results are as follows⁵:

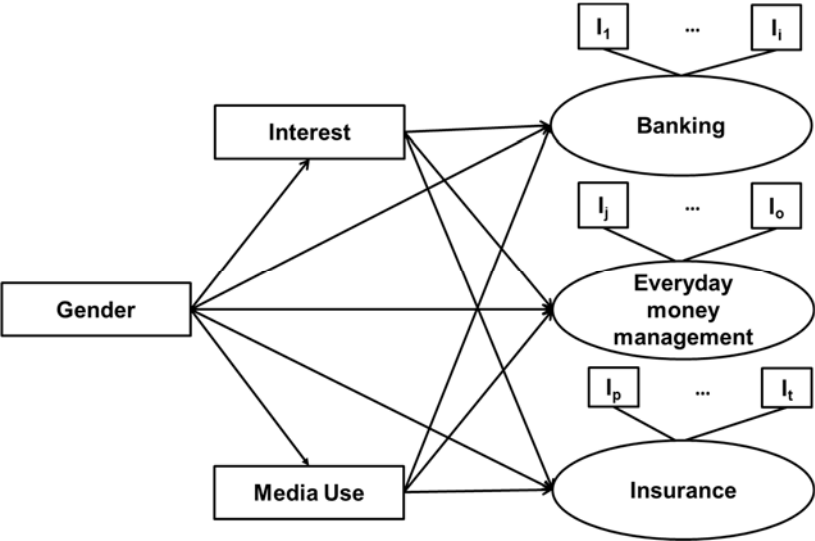


Figure 3: Model 2 - the relationship among gender, interest in financial and economic topics, and media usage and knowledge and understanding of personal finance

⁵ From a theoretical perspective, it would be justifiable to model media usage as a result of interest. Since our intention was to confirm the mediating effects of both variables rather than their relationship, we assumed an omnidirectional relationship.

Table 3: Regression coefficients of gender, interest in financial and economic topics, media usage, and knowledge and understanding of personal finance

Content areas	Everyday Money Management		Banking		Insurance	
	b	β	b	β	b	β
Male	.021	.046	.087**	.279***	.043	.206*
Interest	.099***	.230***	.072***	.240***	.025*	.124**
Media Usage	.084***	.240***	.059***	.242***	.023**	.143**
R ²	.128***		.187***		.066**	
	Interest		Media Usage			
Male	.673***	.674***	.785***	.612***		
R ²	.101***		.090***			

Annotations: *p < .05, **p < .01, ***p < .001; b = non-standardized and β = standardized regression coefficients

The gender effect on interest and media usage with a Cohen's d of approximately .6 was substantial: male participants had significantly more interest in financial and economic topics and used media to obtain information on those topics more frequently than female participants. The gender variable accounted for 9 % to 10 % of the variance in interest and media usage. Moreover, both interest and media usage had a significant effect on knowledge and understanding of personal finance in all three dimensions. The standardized β -coefficient represents the change in the dependent variable in percentages of the standard deviation when the independent variable rises by one unit. For example, if the media usage of a participant increased by one unit, the score in the dimension of insurance should have risen by .143 units of its standard deviation. From this, it follows that greater interest and more intense media usage were associated with a higher level of knowledge and understanding of personal finance in all three dimensions.⁶ When controlling for this relationship, the effect between gender and knowledge in the dimensions of banking and

⁶ Because interest and media use were measured categorically, it also would have been conceivable to encode them as dummy variables. However, when testing for the effects, a nearly perfect linear relationship was found between both variables and the test score. For this reason, both variables are included in the model.

insurance decreased, and the gender differences became insignificant in the dimension of everyday money management.

Finally, we included the three covariates of secondary school GPA, completion of a vocational education program, and age in the regression to control for the overall performance level of the beginning students and for additional opportunities to learn about personal finance through vocational training. The results are shown in figure 4 and table 4:

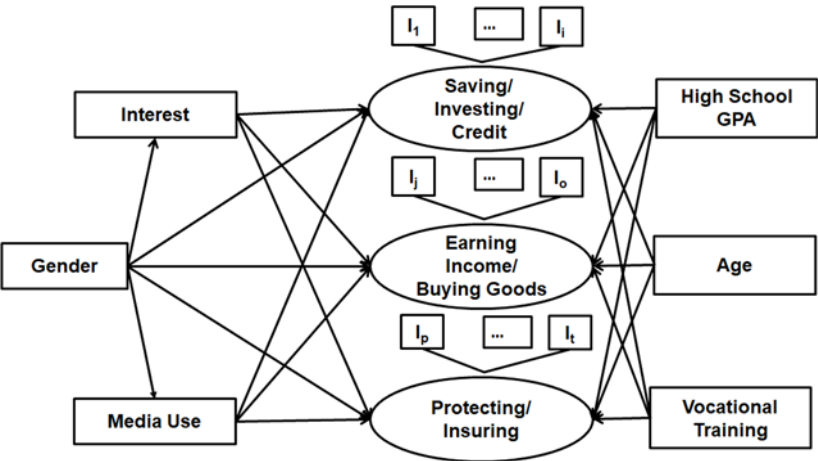


Figure 4: Model 3 - the effect of gender, interest, and media usage on knowledge and understanding of personal finance while controlling for secondary school GPA, vocational training, and age

Table 4: Regression coefficients of gender, interest, media usage, secondary school GPA, and vocational training on knowledge and understanding of personal finance

Content areas	Everyday Money Management		Banking		Insurance	
	b	β	b	β	b	β
Male	.051	.106	.109***	.337***	.053*	.263**
Interest	.076***	.162***	.050***	.160***	.013	.065
Media usage	.067***	.175***	.043***	.169***	.016*	.099*
Voc. Training	.490***	1.017***	.362***	1.120***	.118**	.587***
Secondary School GPA	-.168***	-.348***	-.118***	-.364***	-.086**	-.431***
Age	-.011	-.024	.011	.033	.015*	.074*
R ²	.177***		.264***		.141***	
	Interest		Media usage			
Male	.658***	.645***	.770***	.614***		
R ²	.100***		.091***			

Annotations: *p < .05, **p < .01, ***p < .001; b = non-standardized and β = standardized regression coefficients

In model 3 (see table 4) the relationship between gender and interest and media usage hardly changed in extent or significance from that in model 2 (see table 3). Both covariates had a significant relationship with knowledge and understanding of personal finance. A better secondary school GPA correlated with a higher score on the TFL-G in all three content areas. Moreover, the completion of vocational training correlated positively with the test score in all three content areas of knowledge and understanding of personal finance measured by the effect size of the β -coefficient. The age of the students had a significant effect on their score in insurance only. The inclusion of these covariates, however, led to a slight increase in the gender effect, which was due to the different distribution of vocational training for both genders (see table 1). When controlling for interest in financial and economic topics and use of media to obtain information on these topics, the direct effect of gender on knowledge and understanding of personal finance decreased. These influencing factors accounted for 13 % to 26 % of the variance in the scores in the three content areas of the TFL-G.

5 Implications and conclusions

The findings of studies conducted in various countries concerning the gender gap in knowledge and understanding of personal finance could be replicated for Germany within this study, confirming hypothesis 1 (for more findings, see Erner et al., 2016). Male students performed better in all three dimensions of financial literacy on the TFL-G, with the largest effects in the dimension of banking. Moreover, male students had greater interest in financial and economic topics and they claimed to stay up-to-date on these topics more often than their female counterparts, confirming hypothesis 2. A substantial part of the gender effect on knowledge and understanding of personal finance could be explained by differences in students' interest in financial and economic topics and their use of media to stay up-to-date on those topics, confirming hypothesis 3. However, we tested only the effect of interest on knowledge and understanding of personal finance. This effect could be reciprocal, meaning higher levels of knowledge and understanding could lead to greater interest in financial and economic topics. Greater knowledge may lead to better grades, which in turn further increase interest in the subject area (Denissen, Zarrett & Eccles, 2007; Marsh, Trautwein, Lüdtke, Köller & Baumert, 2006). This effect applies to our study only to a limited extent since beginning students did not learn that much about finance in school and thus did not receive any feedback in that regard. Hence, it can be assumed that many respondents were not aware of their actual level of knowledge and understanding of personal finance.

To understand better the causality in this relationship, a longitudinal study could be conducted in which the development of interest, media usage, and knowledge and understanding of personal finance are traced. In such a study, learning opportunities and feedback received regarding personal finance should be controlled for. With the help of autoregressive structural equation models, the relationship between interest and knowledge and understanding might become more evident. Although the one-dimensional model had a good data fit, the three-dimensional model differentiated better among the content areas even though they correlated significantly. Hence, our content-specific approach could be followed up in future studies. For instance, this could be done by administering the TFL-G to professionals who have their own families and are likely to have gained a lot of experience with financial and economic matters. Maybe such test takers would have a more differentiated cognitive structure of knowledge and understanding of personal finance, which would lead to weaker correlations among the content areas. The strong correlations among the content areas might have been due to a lack of experience of the young students participating in the study. The significant effect of age on the score in insurance might indicate that insurance matters become more meaningful with age.

The TFL-G was administered to young adults at the beginning of their higher education studies; at this stage of their life, many students run their own household, earn money, and manage a budget for the first time. However, it is unknown whether the participants in this study already had dealt with financial issues such as taking out insurance coverage, making investments, and raising funds. Our findings suggest that only a few of the participants were familiar with financial products when starting their university studies. In Germany, young adults' knowledge and understanding of personal finance are developed mostly outside of school (Frühauf & Retzmann, 2016); therefore, they may be fostered through socialization processes within the family and through experience with media, which would be supported tentatively by the preliminary evidence in this study. However, the actual sources of knowledge and understanding of personal finance, interest, and media usage cannot be clearly identified at this point. The final regression model at least showed that the completion of a vocational training program had a strong impact on the TFL-G score, which might be an indicator of the importance of the personal experience of earning money.

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Gender, country-level variables, and financial knowledge

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A gender gap in the financial knowledge of high school students has appeared over time in a variety of different countries, whereby male students tend to have more financial knowledge than female students (Atkinson & Messy, 2012; Lusardi, Mitchell & Curto, 2010). Previous research has attempted to explain this gender gap by exploring links between country-level variables and financial knowledge (Atkinson & Messy, 2012; Jappelli, 2010; Lo Prete, 2013). We built upon previous research by using data from the Programme of International Student Assessment (PISA) Financial Literacy Assessment and focusing on the potential influence that a country's macroeconomic indicators may have on individual student financial knowledge and the gender gap in financial knowledge. We utilized multilevel modeling procedures to best account for the variance in student performance and find that country-level variables do not seem to explain the gender gap in financial knowledge.

Keywords: country-level variables – financial literacy – gender – PISA

1 Introduction

Being financially knowledgeable is not just of individual concern, but it is also of global concern. The 2007-2009 financial crisis has shown the important relationship that exists between understanding the global financial system and making well-informed financial decisions (Klapper, Lusardi & Van Oudheusden, 2015; Lusardi, 2011). Around the world, recent economic conditions and financial crises have led to concerns about individual financial knowledge (Klapper et al., 2015; Lusardi & Mitchell, 2011; Widdowson & Hailwood, 2007). Additional research has suggested relationships between the economic landscape of a country and individual financial knowledge. Relationships between real gross domestic product (GDP) per capita and financial knowledge, the unemployment rate and financial knowledge, and income inequality and financial knowledge have been examined to explore if better financial outcomes for an entire country are correlated with increases in individuals' financial knowledge (Atkinson & Messy, 2012; Jappelli, 2010; Lo Prete, 2013). While correlations between a country's economic conditions and individual financial knowledge have been examined, few concrete statistical relationships have yet to be discovered.

The Organisation for Economic Co-operation and Development (OECD) defined financial literacy for the PISA dataset as the "knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such

knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life" (OECD, 2014a, p. 33). The analyses presented in this paper used hierarchical linear modeling (HLM), or multilevel modeling, to best account for the nested nature of the data. Through exploring a country's economic landscape, it was our hope to construct a more accurate picture of the international financial knowledge of high school-aged students as well as the gender gap in the financial knowledge of high school-aged students.

2 Literature review and research questions

2.1 Current findings in international financial literacy

Research has shown that most citizens of the world are financially illiterate. Adults in a variety of developed countries, including Germany, Russia, the United Kingdom, and the United States, have been found to lack basic financial knowledge and thus experience poorer financial outcomes, such as lower savings rates, lower wealth, and lower use of financial services (Atkinson & Messy, 2012; Klapper, Lusardi & Panos, 2012; Lusardi & Mitchell, 2011; Widdowson & Hailwood, 2007). Similar to adults, high school students around the world lack an understanding of financial matters (Borodich, Deplazes, Kardash & Kovzik, 2010; Cameron, Calderwood, Cox, Lim & Yamaoka, 2014; Lührmann, Serra-Garcia & Winter, 2012; Sohn, Joo, Grable, Lee & Kim, 2012). Results from the United States mimic results from around the world - American high school students lack a basic understanding of financial concepts in tests of financial knowledge, despite a growing number of financial education initiatives to combat this problem (Butters, Asarta & McCoy, 2012; Mandell & Klein, 2009; Peng, Bartholomae, Fox & Cravener, 2007; Walstad, Rebeck & MacDonald, 2010).

2.2 Gender gap in financial literacy

A gender gap in the financial knowledge of adults, whereby males have more financial knowledge than females, has been identified in many research studies (Atkinson & Messy, 2012; Förster, Happ & Maur, in this issue; Lusardi, 2011; Lusardi et al., 2010; Organisation of Economic Co-Operation and Development, 2013b). This is true for countries such as the Czech Republic, Germany, Ireland, Norway, Peru, South Africa, and the United Kingdom (Atkinson & Messy, 2012). Studies from the United States are no different, as American men tend to have more financial knowledge than American women do. Many of these findings come from studies of college students (Chen & Volpe, 1998, 2002; Manton, English, Avar & Walker, 2006), where male college students show greater levels of understanding of financial matters. Surveys

of American adults also show a gender gap favoring males (Lachance, 2014; Lusardi, 2011; Lusardi et al., 2010).

The gender gap in financial knowledge among high school-aged students is less clear. Some studies have shown that a gender gap favoring males does exist in countries such as Germany, Japan, New Zealand, and South Korea (Becchetti, Caiazza & Coviello, 2013; Jang, Hahn & Park, 2014; Lührmann et al., 2012). Yet, one study from South Korea found a gender gap favoring female high school students (Jang et al., 2014). Studies examining American high school students also reveal mixed results. Many studies found no significant difference in the financial knowledge of male and female high school students (Mandell & Klein, 2009; Tennyson & Nguyen, 2001; Walstad et al., 2010). Most recently, Hill and Asarta (2016) found that females performed slightly better than their male counterparts. Taken together, these studies seem to suggest that there is no gender gap in financial knowledge at the high school level in the United States. Other studies, however, point to a very prominent gender gap in financial knowledge in U.S. high schools (Butters et al., 2012; Lusardi et al., 2010; Peng et al., 2007; Varcoe, Martin, Devitto & Go, 2005). Thus, determining whether a gender gap in the financial knowledge of high school students exists requires further examination.

2.3 Macroeconomic variables and financial literacy

The literature regarding the relationship between macroeconomic variables and financial literacy is not extensive, but some macroeconomic variables do arise as being potentially statistically related to financial literacy. Gross domestic product was examined in some literature as a proxy measure for the wealth of a country. One international study found that GDP per capita was not related to economic and financial literacy (Jappelli, 2010). Expanding on that finding, Jappelli and Padula (2013) discovered that GDP growth was not related to financial literacy when analyzing a sample of European individuals over 50 years old. Income inequality, however, has been found to influence financial literacy (Lo Prete, 2013). More specifically, the author found, using Gini coefficients, that countries with less income inequality tended to have higher average levels of economic/financial literacy. Finally, the unemployment rate has been examined, as it was hypothesized that an increase in financial literacy would lead to higher employment and better employment outcomes for individuals. However, no relationship could be statistically determined in a study examining the country of Chile (Behrman, Mitchell, Soo & Bravo, 2010).

2.4 Research questions

Using the Programme of International Student Assessment (PISA) Financial Literacy Assessment, this study first examined financial knowledge around the world with a particular focus on gender. Then, country-level variables, such as real GDP per capita

and unemployment rates, are examined to determine if these variables influence a student's financial knowledge. Formally, the two research questions examined in this study are (1) How does financial knowledge vary by gender in students around the world? And (2) Are country-level variables related to a student's understanding of financial matters and to gender differences in financial knowledge?

3 Method

3.1 Data description

The inaugural Financial Literacy Assessment was administered in 2012 to students around the world as part of the Programme for International Student Assessment (PISA). A total of 29 041 students from 18 different countries completed the assessment. The countries who chose to administer the optional Financial Literacy Assessment were Australia, the Flemish Community of Belgium, the Czech Republic, Estonia, France, Israel, Italy, New Zealand, Poland, the Slovak Republic, Slovenia, Spain, and the United States (all OECD member countries); and Colombia, Croatia, Latvia, the Russian Federation, and Shanghai-China (non-OECD members) (OECD, 2014a).

To account for vast differences in educational systems around the world, the OECD targeted and sampled students between 15 years and three months of age, and 16 years and two months of age. A two-stage stratified sampling methodology was used to first select a sample of schools and then a sample of students within schools. In total, over 29 000 students from 5 260 schools completed the assessment. This sample of students is representative of around 9 million 15-year-old students from the 18 participating countries (OCED 2013a; 2014a). Students who completed the PISA Financial Literacy Assessment were required to complete a rotated-design, demographic questionnaire about themselves, as well as information about their families and home lives. Macroeconomic data for each country came from the World Bank. The measures included in our analyses were real GDP per capita, overall unemployment rates, and separate labor force participation rates for men and for women. All macroeconomic statistics were from the year 2011.

The assessment consisted of four 30-minute clusters of questions, two financial literacy clusters, one reading cluster, and one mathematics cluster. Each financial literacy cluster contained 40 test items, with a mix of multiple-choice and constructed response questions. The Financial Literacy Assessment measured a student's literacy with a proficiency measure rather than a raw score. Student "scores" were reported as plausible value (PV) data, and not as individual scores, to best account for the international nature of the dataset and the rotated design of the assessment. For the purpose of this study, PV scores represented likely proficiency measures for each

student (OECD, 2014a). Scores were reported as PV intervals, or ranges of estimated likely proficiencies to best represent the international population (OECD, 2014b).

3.2 Data statistics

The sample used in our analyses is smaller than the original sample of students who completed the Financial Literacy Assessment, as some students were missing data regarding their gender and/or their socioeconomic status. Individual student observations missing either of these variables were dropped from the analysis. The resulting sample includes 27 057 students from 4 927 schools in 18 countries. Table 1 presents sample sizes for both schools and students within each country.

Table 1: Sample Sizes for Schools and Students within Countries

Country (N = 18)	Number of participating schools	Number of participating students
OECD Member Countries/Economies		
Australia	745	3 132
Flemish Community (Belgium)	155	1 042
Czech Republic	240	1 007
Estonia	200	1 080
France	199	934
Israel	153	987
Italy	1 061	6 474
New Zealand	156	827
Poland	165	991
Slovak Republic	218	1 018
Slovenia	289	1 237
Spain	165	1 016
United States	151	1 071
Non-OECD Member Countries/Economies		
Colombia	315	1 902
Croatia	160	1 126
Latvia	190	895
Russian Federation	212	1 138
Shanghai-China	153	1 180
Total	4 927	27 057

Sample sizes varied greatly among countries and among schools. Italy had the largest number of participating schools at 1 061, and the United States had the smallest number of participating schools with 151 schools. Differing school sample sizes led to differing numbers of students participating within individual countries. Italy, once again, had the most students with 6 474 participating in the assessment, while New Zealand had the fewest students with 827 participants. Due to the differing sample sizes both at the student level and the school level, and to ensure there was not an overrepresentation of certain individuals and schools in the sample, the OECD provided student and school weights, as there were different probabilities in schools

and students being chosen for the assessment in the sampled countries (OECD, 2014a; 2014b).

The variables of interest in subsequent analyses occurred at the student level and the country level. At the student level, the student's gender (Male) and the student's socioeconomic status (ESCS) were examined. The variable ESCS is an indexed variable created by the OECD to account for socioeconomic differences across countries. At the country level, several variables were included to indicate a country's economic health at the time the assessment was administered. The variables used included real GDP per capita (GDP), labor force participation rate (LFPR), labor force participation rate for women (LFPRw), the unemployment rate (Unemp), and whether the country is an OECD member (OECD). Except for the variable OECD, all other country variables were obtained from the World Bank. The variable OECD was included in the original PISA Financial Literacy Assessment data. The variable GDP represents the real GDP per capita in 2011, and is measured in constant 2005 U.S. dollars. The variable LFPR represents the International Labour Organisation's (ILO) estimate of the percentage of all individuals 15 years of age or older who were members of the labor force in 2011, the year of analysis. The variable LFPRw is similar to LFPR, except that it represents the percentage of females 15 years of age or older who were members of the labor force in 2011. The variable Unemp represents the percentage of the total labor force that was not employed but was actively seeking work in 2011. Table 2 depicts the means and standard deviations, in parentheses, for all variables of interest. In the sample, half of the students were female and half were male. The equal split was intentional, as the OECD targeted equal numbers of male and female students for the assessment. The mean of ESCS is -0.08. The interpretation of this indexed variable indicates that most students came from an average socioeconomic background. The average real GDP per capita was just over \$20 000. This real GDP per capita is relatively high for an international sample; however, this finding seems appropriate given that the countries in the sample are mostly developed and industrialized.

Table 2: Sample Means for Student- and Country-Level Variables

Student-Level Variable	Mean (N = 27 057)	Explanation
Male	0.50 (0.50)	0 = Female; 1 = Male
Student's Socio-economic Status (ESCS)	-0.08 (0.96)	Index of economic, social, and cultural status
Country-Level Variable	Mean (N = 18)	Explanation
GDP	20 437.27 (12 858.23)	Real GDP Per Capita 2011 (in constant 2005 US\$)
LFPR	0.60 (0.06)	Labor Force Participation Rate (%)
LFPRw	0.53 (0.06)	Labor Force Participation Rate - Women (%)
Unemp	0.10 (0.04)	Unemployment Rate (%)
OECD	0.72 (0.46)	0 = non-OECD member; 1 = OECD member

Annotations: GDP, LFPR, LFPRw, and Unemp were obtained via the World Bank at www.data.worldbank.org/. Standard deviations in parentheses.

Across the sample of countries, the average labor force participation rate is 60 %. Given the fact that women still have lower labor force participation rates than men, LFPRw is, not surprisingly, lower at an average of 53 %. The average unemployment rate in 2011 was 10 %. That average rate was relatively high at the time as many of the countries in the sample were experiencing the effects of the most recent global recession. Finally, around 72 % of the students in the sample came from OECD member countries.

An examination of gender differences in demonstrated financial knowledge, using independent samples t-tests, is provided in table 3. That table includes information on the average male performance, the average female performance, the difference between average male and female performance, and whether this difference is statistically significant.

Table 3: Differences in Student Performance by Country and Gender

Country (N = 18)	Male (M)	Female (F)	Difference (M – F)	Effect Size (Cohen's d)
OECD Member Countries/Economies				
Australia	517.50 (109.22)	519.62 (97.24)	-2.12	0.02
Flemish Community (Belgium)	553.31 (96.43)	543.17 (92.98)	10.14	0.11
Czech Republic	533.57 (90.13)	522.83 (86.75)	10.74	0.12
Estonia	529.63 (81.21)	532.51 (73.35)	-2.88	0.04
France	490.98 (111.65)	493.23 (88.61)	-2.25	0.02
Israel	485.35 (117.73)	483.01 (97.30)	2.34	0.02
Italy	478.28 (92.07)	468.29 (80.91)	9.99**	0.11
New Zealand	529.45 (128.20)	524.69 (101.79)	4.77	0.04
Poland	516.07 (87.75)	512.53 (75.06)	3.53	0.04
Slovak Republic	472.20 (107.29)	477.00 (105.01)	-4.80	0.04
Slovenia	465.63 (90.19)	474.30 (83.09)	-8.67	0.10
Spain	488.07 (87.17)	485.44 (81.87)	2.63	0.03
United States	493.43 (103.65)	493.01 (96.31)	0.42	0.00

Country (N = 18)	Male (M)	Female (F)	Difference (M – F)	Effect Size (Cohen's d)
Non-OECD Member Countries/Economies				
Columbia	398.11 (104.59)	392.07 (99.97)	6.04	0.06
Croatia	482.14 (88.68)	478.98 (79.73)	3.16	0.04
Latvia	494.94 (79.65)	505.65 (73.97)	-10.71*	0.14
Russian Federation	486.31 (92.34)	487.98 (83.25)	-1.67	0.02
Shanghai-China	601.45 (86.60)	602.38 (81.50)	-0.93	0.01
Average	500.91	499.82	1.09	0.01

Annotations: Standard deviations in parentheses. **p < .001; *p < .01

There exists no statistically significant difference between the average scores of male and female students across the overall sample of students. Despite this finding, two countries exhibit statistically significant differences in their mean scores for male and female students: Italy and Latvia. Interestingly, the financial knowledge gender gap in Italy favors male students, while the financial knowledge gender gap in Latvia favors female students. When examining effect sizes for each of these gender differences, in both cases, Cohen's d coefficient is less than 0.2, indicating the statistical differences between the means in both countries are trivial.

3.3 Estimation methods

Multilevel modeling has become increasingly popular in educational research, as most educational data is nested in hierarchical levels. Because of the nested nature of such data, an individual observation will share a certain amount of variance with other individual observations, and observations cannot be assumed to be independent of one another; students in the same school may be more similar to one another than different (Hofmann, 1997). Multilevel modeling accounts for shared characteristics, or variance, by estimating fixed effects at the lowest level (i.e. the student level) and then uses these fixed effects to estimate higher-level effects (Hofmann, 1997; Woltman, Feldstain, MacKay & Rocchi, 2012). In this study, fixed effects were first estimated at the student level (level 1) and then subsequently used in the estimation procedure to estimate effects at both the school level (level 2) and then the country level (level 3).

To examine the relationships between country-level variables, student financial knowledge, and the gender gap in financial knowledge, educational production functions in the style of Hanushek (1979; 1986) were estimated. Our standard educational production function was estimated using the following form:

$$Y_{isc} = \alpha + \beta_1 G_{isc} + \beta_2 X_{isc} + \beta_3 S_{isc} + \beta_4 C_{isc} + \varepsilon_{isc} \quad (1)$$

where Y_{isc} is the overall achievement in financial literacy for student i in school s in country c .

G_{isc} is a dummy variable taking the value of 1 if the student is female.

X_{isc} is a vector of student characteristics, other than student gender.

S_{isc} is a vector of school characteristics.

C_{isc} is a vector of country-level characteristics.

ε_{isc} is a normally distributed error term.

In a multilevel modeling framework, equations are estimated at each level of analysis. As such, separate equations were estimated at the student level, the school level, and the country level. Additionally, slopes-as-outcomes models were estimated to examine factors contributing to a potential gender gap in financial knowledge. The equations followed the functional form from Raudenbush and Bryk (2002) in a multilevel modeling framework. More specifically, the student-level equation took the following form:

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk}(a_{ijk}) + \varepsilon_{ijk} \quad (2)$$

where Y_{ijk} is a measure of financial knowledge for student i in school j in country k .

π_{0jk} is the intercept for school j in country k .

a_{ijk} is a vector of independent variables at the student level.

π_{1jk} are the student-level fixed effects.

ε_{ijk} is the student-level random effect (or variance).

The school-level equations made use of the fixed effects from the student level in their estimate. They thus took the following forms:

$$\pi_{0jk} = \beta_{00k} + r_{0jk} \quad (3)$$

$$\pi_{1jk} = \beta_{10k} + r_{1jk} \quad (4)$$

where π_{0jk} is the intercept for school j in country k .

π_{1jk} is the slope for school j in country k .

β_{00k} is the intercept for the school intercept for school j in country k .

β_{10k} is the intercept for the school mean for school j in country k .

$r_{0jk} - r_{1jk}$ are the school-level random effects (or variance).

The country-level effects were modeled using separate equations and made use of the level-2 equations as outcomes. The equations took the following forms:

$$\beta_{00k} = \gamma_{000} + \gamma_{001}(W_{1k}) + u_{00k} \quad (5)$$

$$\beta_{01k} = \gamma_{010} + \gamma_{011}(W_{1k}) + u_{01k} \quad (6)$$

$$\beta_{10k} = \gamma_{100} + \gamma_{101}(W_{1k}) + u_{10k} \quad (7)$$

$$\beta_{11k} = \gamma_{110} + \gamma_{111}(W_{1k}) + u_{11k} \quad (8)$$

where γ_{000} is the average country intercept for country k .

W_{1k} is a vector of independent variables at the country level.

γ_{001} is the average effect of W on the country intercept.

γ_{010} is the average country slope.

γ_{011} is the average effect of W on the average country slope.

γ_{100} is the average intercept between countries.

γ_{101} is the average effect of W on the intercept between countries.

γ_{110} is the average difference between the countries' slopes.

γ_{111} is the average effect of W on the average difference between the countries' slopes.

$u_{00k} - u_{11k}$ represent the country-level random effects.

The multilevel models were estimated to examine differences across the international sample of students. Like previous research on international comparisons of student achievement, the socioeconomic status of the student was controlled for in all models estimated (Schmidt, Cogan & Houang, 2011). In addition, attempts to control for the opportunity to learn (OTL) yielded no accurate estimate of such a measure; the OTL measures tested did not account for any additional variance explained at the student level, and thus, no measure of OTL is included in any of the models.

4 Results

Table 4 presents multilevel regression estimates using both student- and school-level weights. First, model 1 controlled for the student's gender (Male) and socioeconomic status (ESCS). In model 1, the level-1 intercept and the variable ESCS were found to be statistically significant. Given that the independent variables were entered into the model as grand-mean centered, the intercept indicated that, on average, students scored 473.31 points. The coefficient on ESCS was positive and indicated that being a student from a higher socioeconomic background was associated with higher average financial knowledge. Male was not found to be statistically significant in this model specification, suggesting that there was no gender gap in achievement present.

Model 2 added the country-level variables OECD, GDP, LFPRw, and Unemp to examine the relationships between a country's economic situation and average student performance, as well as to examine how males and females scored on the assessment. Once again, the average performance (intercept) and ESCS coefficients were positive and statistically significant, indicating similar findings to those in

model 1. When examining the intercept as an outcome, OECD membership was significantly correlated with average student performance. The coefficient of 77.14 indicated that being a student from an OECD country was associated with an increase in financial knowledge scores of about 77 points. Yet, the finding was only marginally significant. Interestingly, no other country-level variables were significantly correlated with average student performance. Furthermore, when examining the gender slope as the outcome variable, none of the country-level variables were significantly correlated with gender.

Table 4: Multilevel Regression Estimates of Predictors of Financial Knowledge, Fixed Effects

	Model 1	Model 2	Model 3
Fixed Effects			
Level 1			
Intercept	473.31** (6.57)	477.85** (10.54)	481.81** (11.86)
Male	-0.01 (1.38)	0.68 (3.22)	0.53 (3.15)
ESCS	29.80** (3.86)	29.74** (4.59)	29.83** (4.55)
Level 3 – Intercept-as-Outcome			
GDP		-0.002 (0.001)	-0.001 (0.001)
OECD		77.14* (31.59)	30.84 (36.16)
LFPRw		420.09 (258.23)	
LFPR			-109.91 (282.48)
Unemp.		-140.99 (189.42)	-120.29 (201.55)

	Model 1	Model 2	Model 3
Level 3 – Gender Slope-as-Outcome			
GDP		-0.0002 (0.0004)	0.0002 (0.0004)
OECD		1.34 (9.25)	5.37 (9.74)
LFPRw		-7.12 (53.62)	
LFPR			32.41 (72.93)
Unemp.		-5.66 (61.59)	-12.20 (60.00)
% of level-1 variance explained	0.18	0.18	0.18
% of level-2 variance explained	0.31	0.31	0.34
% of level-3 variance explained	0.32	0.42	0.32

Annotations: Standard errors in parentheses. Level 2 is not included in this table, as analyses did not make use of any Level 2 variables. *p < .01; **p < .001

These results seem to suggest that the economic conditions within specific countries have little to no relationship with the gender gap in financial knowledge. Model 3 is similar to model 2 except that the variable LFPR was included instead of LFPRw. This new model yielded similar results to those found in model 2; again, none of the country-level variables were significantly correlated with either the intercept or the gender slope.

Table 5 shows the variance components, or random effects, at the school and country levels for the intercepts and gender variable using both the student- and school-level weights. In each of the three models estimated, the school intercepts and the country intercepts had statistically significant variance components, indicating that average scores for students vary depending on the school and the country. This finding further justifies the use of multilevel modeling for our analyses, as OLS cannot account for random effects. Gender randomly varied at the school level but not at the country level.

Table 5: Multilevel Regression Estimates of Predictors of Financial Knowledge, Error Variance

	Model 1	Model 2	Model 3
Error Variance/Random Effects			
Level 1 (Residual)	4468.24 (66.84)	4468.51 (66.84)	4468.38 (66.85)
Intercept (Levels 1 & 2)	2501.23** (50.01)	2504.33** (50.04)	2505.22** (50.05)
Gender (Levels 1 & 2)	2203.94** (46.95)	2188.17** (46.78)	2186.61** (46.76)
Intercept (Level 3)	821.99** (28.67)	702.43** (26.50)	857.33** (29.28)
Gender (Level 3)	1.61 (1.27)	0.65 (0.81)	1.32 (1.15)

Annotations: Standard deviations in parentheses. Level-1 residual values do not report statistical significance. *p < .01; **p < .001

5 Discussion

One goal of this study was to determine whether economic conditions within the student's home country influenced the student's financial knowledge as well as the gender gap in financial knowledge. For the sample of students participating in the 2012 PISA Financial Literacy Assessment, no overall gender gap in financial knowledge was found in the data, though a few individual countries exhibited a gender gap in knowledge. This overall finding is consistent with other research results derived from samples of U.S. high school students (Hill & Asarta, 2016; Walstad et al., 2010).

In terms of overall student performance, none of the country-level variables examined were correlated with average student performance. Findings here are similar to those of past research, which found no statistical relationships between GDP and financial knowledge, or between unemployment and financial knowledge (Behrman et al., 2010; Jappelli & Padula, 2013; Lo Prete, 2013). It is difficult to determine why macroeconomic indicators were not correlated with the financial knowledge of the students in the PISA sample. Many students in this sample are too young to work, thus affecting their role in the economy, which may have contributed to the findings. However, because the sample included many different countries, we cannot comment with certainty. Given that each country had different economic and cultural

landscapes, it is difficult to fully control for a student's economic and cultural surroundings within the student's home country. Yet, the fact that macroeconomic variables do not seem to influence financial literacy may strengthen the literature findings that support the idea that proper educational methods and teacher training are the key to success in personal finance education (Asarta, Hill & Meszaros, 2014; Harter & Harter, 2009).

Similar to overall student performance, the gender gap in achievement is not correlated with the country-level variables. There are a few possible reasons for the lack of a relationship in the findings. First, since no gender gap was found in analyses before adding the country-level variables, there may have not been a gender gap to explain. Secondly, there could have been a misspecification error in the country-level variables used. More specifically, incorrect regressors could have been examined. Furthermore, it may have been the case that some country-level variables were related to student financial knowledge, but the correct regressors were not included in the model. Efforts to avoid misspecification errors were taken early in the analysis process, but there are always possible contributing factors that could have been overlooked. The interpretations provided in this study discussed the coefficients of the fixed effects and possible implications, though the estimates presented were limited by both small standard errors and low amounts of variance explained.

It should be noted that the statistical power of the models estimated may be limited due to the small sample size at level 3 (the country level). When estimating multilevel models, the typical rule of thumb is to ensure that there are at least 30 observations or groups at each level of analysis (Bell, Morgan, Kromrey & Ferron, 2010a; Maas & Hox, 2005). However, given the limited number of countries that administered the PISA Financial Literacy Assessment, it was not possible to increase the number of groups (or countries) at level 3. Through a series of simulation studies, some authors argue that decreasing the number of groups will bias estimates (Bell et al., 2010a; McNeish & Stapelton, 2016), but others argue that this is not the case (Bell et al., 2010b; Maas & Hox, 2005). However, most agree that decreasing the number of groups for analysis will reduce the statistical power of the models (Bell et al., 2010b; Snijders, 2005). These simulation studies were conducted for 2-level multilevel models and are theoretical in nature rather than applied. Therefore, findings from previous research may not accurately apply to the models estimated in this study. Given the fact that it was impossible to increase the sample size at level 3, other measures are taken to ensure unbiased estimates and increased statistical power. Also, as this study uses cross-sectional data and regression analysis, causal relationships cannot be posited. While we can discuss potential relationships between the variables, we cannot comment on causal effects. Future research should attempt to examine different macroeconomic variables, causal effects, and expanded samples of students

from different countries to not only examine more countries but to also increase the country-level sample size, and samples of students from different time periods. Finally, future studies may want to lag the macroeconomic statistics by longer time periods (e. g., five or ten years prior to the Financial Literacy Assessment) to get a long-run sense of their potential influence on financial literacy.

Our work adds to the growing body of literature on the financial knowledge of high school-aged students around the world as well as on the gender gap in financial knowledge. Though few relationships between gender, country-level variables, and financial knowledge were discovered, future research should seek to better understand how country-level variables influence financial knowledge.

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The importance of controlling for language skills when assessing the correlation between young adults' knowledge and understanding of personal finance and migration background

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In the majority of studies of knowledge and understanding of personal finance young adults with a migration background (MB) perform significantly worse than those without a MB. To be able to support young adults with a MB in their development of knowledge and understanding of personal finance it is important to know whether their underachievement in this area is predominantly due to deficits in the language of their country of residence (Germany) or to other factors. In this paper, we examine the correlation between the knowledge and understanding of personal finance and MB of young adults in Germany. We administered a shortened version of the German adaptation of the American test of Financial Literacy to 152 beginning higher education students in Germany. While the participants' home language and their parents' country of origin served to operationalise MB, the German language skills of all the participants were measured using the reading comprehension scale from the test Deutsch als Fremdsprache. Participants with a MB performed worse than participants without a MB. Further, the participants with a MB who did not speak predominantly German at home performed significantly worse than those whose main home language was German. The effect of a MB was reduced only moderately when incorporating reading comprehension in the regression models. Our findings suggest that other influences such as gender and/or cultural values and norms concerning financial matters also may contribute to the differences in knowledge of personal finance between migrants and non-migrants.

Keywords: knowledge and understanding of personal finance – migration background – reading comprehension – test of Financial Literacy

1 Relevance

Findings from a large number of studies indicate that young adults in many countries lack knowledge and understanding of personal finance (cf. De Bassa Scheresberg, 2013; Erner, Goedde-Menke & Oberste, 2016; Lusardi & Mitchell, 2014). Not only have young women (cf. Chambers & Asarta, in this issue; Chen & Volpe, 2002; Driva, Lührmann & Winter, 2016; Förster, Happ & Maur, in this issue) and socioeconomically disadvantaged youths (cf. Lusardi, Mitchell & Curto, 2010; OECD, 2017, pp. 97-98) exhibited notable gaps in knowledge of personal finance, but so have young adults with a migration background (MB) (cf. Atkinson & Messy, 2012; Lusardi & Mitchell, 2014; OECD, 2014). In (inter)national studies of knowledge of personal finance, MB often is explored as a control variable only and rarely is a

main focus (cf. Cameron, Calderwood, Cox, Lim & Yamaoka, 2014; Worthington, 2006). Nonetheless, the overwhelming majority of findings indicate that young adults¹ with a MB have less knowledge of personal finance than young adults without a MB (see table 2 in Section 2.2).

In international studies conducted in the school and higher education sectors, investigation has been made into the importance of participants' language skills, particularly in their mother tongue or the language they speak most at home (home language), for their knowledge of personal finance (cf. Ali, Anderson, McRae & Ramsay, 2016; OECD, 2014, p. 68). In many studies, mother tongue and home language have been chosen as indicators to operationalise MB. However, it is unclear the extent to which differences in knowledge of personal finance can be traced back to language skills or whether other or additional migration-related issues such as culture- or ethnicity-related values and norms play a role in understanding financial matters. Ostensibly, only two international studies of knowledge of personal finance have been conducted in which language skills have been assessed systematically using validated measurement instruments (cf. Gramaŭki, 2016; OECD, 2014); no such study has been conducted in Germany. In this study, we examine the relationship between the knowledge and understanding of personal finance and the MB of young adults in Germany while controlling for their German language skills.

First, we define the fundamental constructs knowledge and understanding of personal finance and MB (Section 2.1). Second, we discuss the current state of research regarding the relationship between knowledge of personal finance and MB, which forms the basis of our three hypotheses (Section 2.2). Third, we describe the test instruments we employed to assess knowledge and understanding of personal finance and German language skills as one part of our definition of MB (Section 3.1) and describe our sample (Section 3.2). Fourth, we examine the relationship between knowledge of personal finance and MB while controlling for participants' German language skills and additional personal characteristics by means of regression analyses (Section 4). Lastly, we describe the limitations of the study and explore the implications of our findings for educational practice (Section 5).

¹ The United Nations (1982, p. 3) define six groups in their Standard International Age Classification ("infancy" (under one year), "youth" (1 - 14 years), "young adulthood" (15 - 24 years), "middle adulthood" (25 - 44 years), "older adulthood" (45 - 64 years), and "retirement" (65 years onward)). In our study we focused on young adults aged 17 to 25 (see section 3) who were at the beginning of their university studies. This group is comparable to the young adulthood group defined by the United Nations.

2 Theoretical background

2.1 Definitions of the target constructs

In studies of personal finance, diverse terminology and definitions of various terms are used (cf. Antonietti, Borsetto & Iannello, 2016; Frühauf & Retzmann, 2016, p. 268; Hung, Parker & Yoong, 2009, p. 5). In this paper, we adhere to Atkinson and Messy's (2012, p. 14) definition of financial literacy as being the skills which enable a person to plan, execute, and control financial decisions. According to these authors (2012, pp. 6-12) financial literacy comprises (financial) knowledge, behaviour in financial decision-making situations, and attitudes toward financial matters. In most definitions of financial literacy, knowledge plays a decisive role and is a common denominator (cf. Council for Economic Education (CEE), 2013, p. V.; OECD, 2017, p. 49). It seems plausible to assume that a higher level of knowledge of personal finance is linked to better decision-making behaviour because no informed judgement can be made without the necessary knowledge (Remund, 2010, p. 280)². Furthermore, there is evidence of the impact of increasing levels of knowledge (in terms of Financial Education Mandates) on credit behaviour (see Urban, Schmeiser, Collins & Brown, 2015). Nonetheless, it can be assumed that knowledge is a necessary – but often insufficient – precondition for making sound financial decisions (Förster & Happ, 2018). Accordingly, the focus of this paper is knowledge as a cognitive dimension of the construct of financial literacy.

Various approaches have been taken to define and operationalise MB in qualitative and quantitative research (cf. European Union, 2015; German National Contact Point for the European Migration Network (EMN), 2011; Salentin, 2014). Indicators commonly chosen to operationalise MB (cf. Poulain, 2008, p. 46) have been a participant's nationality, his/her country of origin, his/her parents' country of origin, and his/her linguistic background. In Germany, nationality is believed to have little to do with MB (cf. Hartnell, 2006; Stronks, Kulu-Glasgow & Agyemang, 2009) because people born in Germany can acquire German citizenship if one of their parents has been living lawfully in Germany for at least eight years. Therefore, nationality is not taken into consideration in the operationalisation of MB in this study. We do, however, consider the parents' country of origin to be a significant indicator of MB, as parents' cultural values and orientations can influence their children's knowledge of personal finance (cf. Breitbach & Wagner, in this issue; Jang, Hahn & Park, 2014; Shim, Barber, Card, Xiao & Serido, 2010). Gudmunson and Danes (2011, p. 645) refer

² Attitude, beliefs, motivational components and other contextual factors also play an important role in decision-making behavior (see Amagir, Wilschut & Groot, in this issue; Grohs-Müller & Greimel-Fuhrmann, in this issue); therefore, the conclusions drawn from the findings regarding the young adults' financial decision-making behaviour are limited.

to this influence as “family financial socialization”. In this study, therefore, the parents’ country of origin is a main indicator of the operationalisation of MB (cf. Erner et al., 2016; OECD, 2017).

In many studies, language is considered an indicator of MB (cf. Ali et al., 2016; OECD, 2014). Language has great significance in pedagogical research because it is of central importance for knowledge acquisition (“linguistic relativity”, cf. Caleb, 2013; Kövecses, 2006). The language learned first (mother tongue³) and the language spoken predominantly at home (home language) have been found in empirical studies to be of central importance to an individual (cf. Esser, 2006; OECD, 2017, p. 256). This is because social circles tend to change frequently, but family as a socialisation authority remains stable over time (see also Ali et al., 2016; Worthington, 2006).

In this study, a participant is considered to have a MB when at least one of his/her parents is not originally from Germany and/or his/her home language is not German. Accordingly, we categorised participants into the following three groups (see table 1):

Table 1: Classification of participants

Group	Designation	Parents’ country of origin	Home language
1	Native speakers of German with no MB	Germany	German
2	Native speakers of German with MB	At least one parent not from Germany	German
3	Non-native speakers of German with MB	At least one parent not from Germany	Not German

2.2 Recent research and hypotheses

In table 2 an overview is given of recent studies in which a correlation between knowledge of personal finance and MB was found. We purposely included in the table the country where the sample for each study was drawn because participants with a MB living in a country where English is the predominant and official language of the community might find it easier to learn the target language (i. e., English) due to its global ubiquity. Also, participants with a MB whose mother tongue differs significantly from the target language (e. g., in terms of syntax, morphology,

³ In the literature, mother tongue also often is referred to as “first language” (Rösselet, 2012, p. 35).

phonology, etc.) might have more difficulty acquiring the target language (Esser, 2006).

Table 2: Studies of the relationship between knowledge of personal finance and MB

Authors	Country	Indicators of MB	Sample size	Results
Ali et al. (2016)	Australia	Linguistic background (language other than English spoken at home)	N = 207	Statistically significant positive effect of a language other than the national language spoken at home
Brown & Graf (2013)	Switzerland	Nationality and mother tongue of the participants	N = 1 500	Migrants performed significantly worse in tests, especially migrated non-native speakers of German
Cameron et al. (2014)	New Zealand	Mother tongue	N = 335	Native speakers performed better on tests
Chen & Volpe (2002)	United States	Nationality and race of the participants	N = 924	Small, not significant, negative effect of MB on the test score
Driva et al. (2016)	Germany	Language spoken at home	N = 418	Small, not significant, negative effect of MB on the test score

Authors	Country	Indicators of MB	Sample size	Results
Erner et al. (2016)	Germany	Participants' country of birth and language spoken at home	N = 1 416	Participants born in the country who speak the national language at home performed better on tests
OECD (2017), OECD (2014)	15 countries from the PISA study	Country of birth of the participants and their parents, language	Between N = 1 365 and N = 14 530 in the different countries (a total of N = 45 899 in the financial literacy part)	Migrants performed significantly worse on tests (even when controlling for their socioeconomic status and the language spoken at home)
Worthington (2006)	Australia	Language spoken at home	N = 3 548	Worse test results when the language spoken at home was not the national language

Annotations: This list is not comprehensive, but it provides a preliminary overview of results of recent research in this area.

The findings of these studies are far from homogeneous. In their study of a sample drawn in Australia, Ali et al. (2016) found students who spoke a language other than English at home achieved better results on a test designed to assess financial literacy, which is unusual. In the studies by Chen and Volpe (2002) and Driva et al. (2016) no significant correlation between financial literacy and MB was found; however, the nationality and race of the participants or their mother tongue was used as indicators of MB. In the majority of these studies, a significant negative correlation between financial literacy and MB was found. Indicators of MB varied from language spoken at home, mother tongue, nationality, and place of birth of the participants to the place of birth of their parents. Perhaps differences in the findings of the studies in table 2 are attributable to the indicators chosen to operationalise MB⁴. Results of studies in which the participants' language skills and their parents' country of origin are combined to operationalise MB (cf. Erner et al., 2016; OECD, 2017, 2014) indicate that there is a significant negative correlation between

⁴ The samples of the studies also varied in size, which could have affected the results and interpretation of their significance.

knowledge of personal finance and a MB. On this basis, our first hypothesis is as follows:

H₁ Young adults with a MB in Germany have less knowledge of personal finance than young adults without a MB.

In most of the aforementioned studies of the knowledge of personal finance of migrants linguistic characteristics such as mother tongue or home language were taken into account (see table 2). The OECD (2014) and Worthington (2006) verified an effect of home language on knowledge of personal finance. In all of the studies listed in table 2 except for the study conducted by Ali et al. (2016), if the home language of the participants was other than the primary language spoken in the community in which the participants currently lived, participants performed worse on tests of knowledge of personal finance. This could be because participants lacked finance-specific vocabulary. In the analyses conducted by the OECD (2014, 2017) in the context of the Programme for International Student Assessment (PISA) study of financial literacy, the effect of language deficits is taken into consideration and young adults with a MB were found to have significantly less knowledge of personal finance than local inhabitants. In the comprehensive modelling of PISA data by Gramařki (2016), who took numerous additional control variables into consideration such as home language and reading comprehension, the effect of a MB was still significantly negative. While Germany participates in the PISA study, it does not participate in the part on financial literacy. However, with regard to the international state of research, our second hypothesis is as follows:

H₂: Young adults with a MB will continue to exhibit less knowledge of personal finance than young adults without a MB when their German language skills are controlled.

The combination of indicators to operationalise MB makes it possible to perform differentiated analyses within the two groups of migrants. We expect migrants who speak predominantly German in the family context will have an advantage in terms of developing knowledge of personal finance in Germany because they probably will be more familiar with finance-related vocabulary in German. Thus, our third hypothesis is as follows:

H₃: Young adults with a MB who do not speak predominantly German at home will perform worse on tests of knowledge of personal finance than young adults with a MB who speak predominantly German at home.

3 Test instruments and sample

The knowledge and understanding of personal finance of the participants was assessed using the internationally renowned Test of Financial Literacy (TFL; Walstad

& Rebeck, 2017). Because the original TFL was developed in English for use in the United States, it had to be translated and adapted for use in Germany; then the German version of the test (TFL-G⁵) had to be validated to ensure its suitability (see Förster, Happ & Molerov, 2017). The TFL-G comprises 45 multiple-choice questions and participants need approximately 45 minutes to complete it. However, in this study, we administered a shortened version of the TFL-G (called TFL-G-S) because we needed to assess participants' language skills as well, and we did not want results to be skewed due to fatigue. When choosing items to include in the TFL-G-S, we ensured that all content areas of the TFL (saving, using credit, protecting and insuring, earning income, financial investing, buying goods and services) were covered. In addition, items were chosen for the TFL-G-S according to key statistical figures determined during the validation process of the TFL-G: 25 items with a high corrected item-total correlation ($> .2$) as well as a balanced distribution of item difficulty ($0.40 - 0.70$)⁶ were selected, which also raised expectations for a Cronbach's alpha of $> .8$.

In this study, we assessed participants' language skills using freely available sample versions of the German Test Deutsch als Fremdsprache (TestDaF). This test is a standardised language proficiency test developed especially for young adults in the transitional phase between school and higher education. It covers the areas reading comprehension, listening comprehension, written expression, and oral expression (Eckes, 2008). For the area of reading comprehension, items related to economic topics were administered. These items covered topics such as choosing a part-time job or doing internships. In this study, due to test time restrictions, only the reading comprehension part of the TestDaF was administered to assess the participants' language skills⁷.

Participants took approximately 60 minutes to complete a questionnaire about their personal background, the 25 items of the TFL-G-S, and the reading comprehension part of the TestDaF. This cross-sectional survey of students was conducted at the beginning of the summer semester 2017 at Johannes Gutenberg University Mainz in Germany. Because the focus of our study was young adults, only the responses of participants younger than 25 years of age were taken into consideration in the analyses. Similarly, the data of participants with missing values for central variables

⁵ In the following, the German version will be referred to as the TFL-G.

⁶ With regard to item difficulty, the goal was to achieve a good distribution of difficulty, ranging from easy to difficult.

⁷ Due to the strong correlation between reading comprehension and language skills (cf. Cutting & Scarborough, 2006; Joshi & Aaron, 2000), a large part of the construct can be depicted thusly. Furthermore, understanding documents, materials, and contracts is especially vital for making financial decisions (Huston, 2010, p. 306).

(information on their home language, country of origin, their parents' educational level) were not included in the analyses. Moreover, data of participants who responded to less than 50 % of the questions on at least one of the tests were not taken into consideration. The final sample size was $N = 152$, of which 63.8 % was female. Of the 152 participants 28.9 % had at least one parent who was not originally from Germany, and 18.4 % had parents who both were not originally from Germany. Of the participants 11.2 % did not speak German at home⁸. In table 3 the distribution of the participants into the three groups is shown⁹.

Table 3: Distribution of Participants in Migration Groups

	Frequency	Percent
Native speakers of German	107	70.4
Native speakers of German with a MB	28	18.4
Non-native speakers of German with a MB	17	11.2

On average, the participants scored 18.67 out of 25 points (SD 3.92) on the TFL-G-S and 23.24 out of 30 points (SD 4.24) on the TestDaF-R.¹⁰ According to the test developers, both the TFL and the TestDaF measure the underlying constructs one-dimensionally (Walstad & Rebeck, 2017 for TFL; Eckes, 2008 for TestDaF). For the full TFL-G, one-dimensionality also could be established by means of a confirmatory factor analysis (CFA; cf. Förster et al., 2017). For the short versions of the tests referred to in this paper, based on a sample size of $N = 152$ with dichotomous items, the CFA showed good and mediocre fit indices: the goodness of fit for the TFL-G-S (chi-squared = 376.522; df = 275; RMSEA = .049, 90 % - confidence interval for the RMSEA [.036; .061]) and the TestDaF-R (chi-squared = 574.507; df = 405; RMSEA = .053, 90 % - confidence interval for the RMSEA [.042; .062]) support the adequacy of the one-dimensionality of the two test instruments. However, in view of the small sample size, these statistics have to be viewed critically.

⁸ These figures indicate that there were slightly more female students in this sample. Furthermore, the proportion of students with a MB was rather large. This probably can be explained by the fact that the University of Mainz, where the sample was drawn, is located in an urban area, and the majority of people with a MB in Germany live in urban areas.

⁹ Foreign students who came to Germany for academic purposes (guest students) were excluded from these analyses.

¹⁰ In the following, the scale "reading comprehension" will be referred to as TestDaF-R.

4 Empirical modelling

The correlation between knowledge of personal finance and MB was examined by means of multiple linear regression analyses (see table 4). For this purpose, the normal distribution of the TFL-G-S's score as well as the homogeneity of variance, among others, were examined in advance as essential requirements. Models 1 and 2 (see table 4) summarise Groups 2 and 3 (native speakers of German with a MB and non-native speakers of German with a MB). In addition, to avoid bias and to increase the explanatory power of the models, we controlled for further personal characteristics which have been found to influence knowledge of personal finance including school leaving grade (Erner et al., 2016), gender (Hill & Asarta, 2016), and educational background of the participant's family (Gramatki, 2016). The variable educational background of family (low level) refers to participants whose parents have no secondary school diploma or lower secondary education at most. Model 1 (see table 4) is of the difference in knowledge of personal finance between participants with a MB and those without while controlling for these three personal characteristics (hypothesis 1). In model 2 the participants' scores on the TestDaF-R are incorporated to control for reading comprehension in German (hypothesis 2).

Table 4: Regression models of knowledge of personal finance according to MB

	Model 1		Model 2	
	β (non-standardised)	B (standardised)	β (non-standardised)	B (standardised)
Constants	21.290***		14.523***	
Migration background	-2.326***	-.273	-1.946*	-.228
Gender (male)	2.052**	.256	2.136***	.266
School leaving grade	-1.040*	-.141	-.625	-.085
Educational background of the family (low level)	-2.594	-.142	-2.310	-.126
Test score reading comprehension			.241**	.257
Corrected R-squared	.182		.238	

Annotations: * $p < .05$, ** $p < .01$, *** $p < .001$

The findings from model 1 show highly significant ($p = .000$) differences in knowledge of personal finance between the young adults with a MB and those without a MB (hypothesis 1). On average, the participants with a MB responded correctly to two and a half fewer items than participants without a MB (see table 4).

Male participants responded correctly to two items more than female participants ($p = .001$). A better school leaving grade also correlated with greater knowledge of personal finance ($p = .042$)¹¹. With $p = .063$, the negative effect of a low level of family educational background may not be considered significant at the 5 % significance level; nonetheless, it still is rather substantial, with 2.6 correct responses. However, in view of the small sample size ($N = 152$), the significance of this result should be regarded rather critically. Overall, the sample included only eight participants with a low level of family educational background, 75 % of whom had a MB¹². This made it impossible to compare these participants with other participants who had no MB but a low level of family educational background. Overall, model 1 explains 18.2 % of the variance in the results on the TFL-G-S.

In model 2, table 4, reading comprehension was additionally controlled for (hypothesis 2). The correlation between knowledge of personal finance (TFL-G-S score) and reading comprehension (TestDaF-R score) was calculated according to Bravais-Pearson. A small positive correlation was found at .343 ($p = .000$), which was expected. A small positive correlation between school leaving grade and reading comprehension also was found at $-.238$ ($p = .003$), which was expected. Here, again, the coding of the German grading system must be kept in mind when interpreting the negative sign (see footnote 11). The findings indicate that at $p = .001$, reading comprehension had a significant influence on knowledge of personal finance. This means, for example, that a participant who obtained a reading score of 24 points had a score on knowledge of personal finance almost one point higher than a participant who had a reading score of 20 points. In line with our expectations, the difference in knowledge of personal finance between participants with a MB and those without decreased when incorporating reading comprehension in model 2 (see table 4). Nonetheless, the difference in knowledge of personal finance between young adults with a MB and those without still lies at nearly 2 points and, at $p = .003$, can still be considered significant (hypothesis 2). This model can account for 23.8 % of the variance in knowledge of personal finance through the aforementioned influence factors. It thus becomes clear that the mere inclusion of the test score in reading comprehension led to an increase of 5.6 % in the corrected R squared.

To explore differences within the migrant groups (hypothesis 3) dummy coding was used. The non-native speakers of German with a MB served as a reference group

¹¹ The negative sign in the school leaving grade is due to the coding of the German grade system. In Germany, the best school leaving grade is 1 and worst is 6.

¹² Of the eight participants with a low level of family educational background, five belonged to the group of non-native speakers of German with a MB (Group 3). In this group, 29.4 % of the participants had a low level of family educational background.

and were tested against the native speakers of German with a MB and the German native speakers without a MB (see table 5).

Table 5: Regression models with dummy coding of the migrant groups

	Model 3		Model 4	
	β (non-standardised)	B (standardised)	β (non-standardised)	B (standardised)
Constants	17.428***		11.284***	
Migrated native speakers of German	2.513*	.251	2.369*	.236
Native speakers of German	3.982***	.468	3.517***	.413
Gender (male)	2.054**	.256	2.135***	.266
School leaving grade	-1.097*	-.148	-0.690	-.093
Educational background of the family (low level)	-1.745	-.096	-1.516	-.083
Test score reading comprehension			0.235**	.251
Corrected R-squared		.204		.257

Annotations: * $p < .05$, ** $p < .01$, *** $p < .001$

Significant differences in knowledge of personal finance were found between native speakers of German with a MB and non-native speakers of German with a MB (hypothesis 3).

These differences are obvious in models 3 and 4, where reading comprehension was assessed. As model 3 shows, native speakers of German with a MB scored two and a half points more on the TFL-G-S than non-native speakers of German with a MB ($p = .028$). Interestingly, model 3 can explain scarcely 2 % more of the variance than model 1; therefore, it is expedient to differentiate between the migrant groups.

As model 4 shows, when controlling for language skills, migrants who spoke predominantly German at home had a significantly ($p = .032$) better score than migrants whose home language was not German. Model 4 can predict 25.7 % of the variance in the TFL-G-S score. Again, it is interesting that models in which differentiation is made within the migrant groups explained scarcely 2 % more of the variance than model 2, which makes no distinction between the groups. Thus, these findings confirm hypothesis 3 that differences in scores on the TFL-G-S between the

two migrant groups were connected to the home language. Since this was even the case after controlling for reading comprehension (model 4), the effects of MB very likely were not due to language skills but rather to other migration-related characteristics.

5 Limitations and implications

The findings of this study indicate that differences in knowledge of personal finance of young adults in Germany are connected with MB (hypothesis 1). These differences also exist when controlling for reading comprehension in German as an indicator of language skills (hypothesis 2). Distinguishing between native speakers of German with a MB and non-native speakers of German with a MB and determining whether they spoke German at home, revealed further differences which would not have been obvious from merely examining MB: Participants with a MB who spoke mostly German at home exhibited significantly more knowledge of personal finance than those whose home language was not German. From this result, we conclude that a young adult's home language plays a significant role in the development of knowledge of personal finance¹³. In Germany and most other European countries, migrants comprise a quantitatively substantial part of society (European Union, 2015). For migrants, fundamental knowledge of personal finance is an important step toward integration (OECD & INFE, 2015), as it is needed to participate in society (Remmele, 2016, p. 50).

By administering a reading comprehension test to assess migrants' language skills in German, we found indications that language deficits were not likely to be the only factor leading to migrants' lower level of knowledge of personal finance. The effect of a MB was reduced only moderately when incorporating reading comprehension in the regression models. If language deficits were the only factor responsible for the lower scores on the financial knowledge test, there should have been a larger decrease in the effect of MB between models 1 and 2 (see table 4) and between models 3 and 4 (see table 5). Providing young adults whose home language is not German with additional German language training particularly on financial and economic topics should help bridge some of the gap in financial knowledge between migrants and non-migrants. Further, cultural values and norms concerning financial matters also may contribute to the differences in financial knowledge

¹³ This finding confirms those of studies conducted in Germany of the effects of mother tongue and first language on learners' acquisition of knowledge (cf. Rauch, Mang, Härtig & Haag, 2016; Troesch, Keller, Loher & Grob, 2017); however, the focus of the other studies was not knowledge of personal finance. Current approaches to combining subject-specific classes with language classes can be found in the literature on language-sensitive, subject-specific teaching (Pineker-Fischer, 2017).

between migrants and non-migrants; however, determining the influence of these factors goes beyond the scope of this study. Our findings indicate that merely teaching financial terms and the target language will not necessarily suffice to close the migration gap. To be able to lead a financially responsible life in line with the standards of a country, migrants need to be aware of some of the norms and values of its people. Which cultural norms and values differ between migrants and non-migrants is not clear from the findings of this study. These potentially influential factors could be explored in future studies of the impact of MB using the think-aloud method during cognitive interviews (cf. Leighton, Heffernan, Cor, Gokiart & Cui, 2011).

The findings presented in this paper must be viewed critically due to the small sample size. Because this study was of university students, the results should not be generalized to all young adults in Germany but rather to those who pursue higher education. It also should be taken into account that university students in Germany usually have to have a particular level of education in order to qualify for studying; therefore, the students of this sample probably had a higher level of education than the general population of young adults. Thus, knowledge and understanding of personal finance of all young adults in Germany on the whole should be significantly lower than that of the particular participants in this study. Nevertheless, the study provided a preliminary, differentiated insight into the relationship between knowledge and understanding of personal finance and MB.

Due to the diverse indicators chosen to operationalise MB in many studies (see table 2), results of those studies are difficult to compare. In the present paper we underline the importance of clearly defining the indicators at the outset and conducting differentiated analyses, particularly with participants with a MB. In this paper, this differentiation is reflected in the categorisation of the migrants according to whether German was spoken at home or not. A general comparison of participants with a MB and those without would ignore very important differences within those groups that could affect the development of knowledge of personal finance.

In addition to the participants' home language and their parents' place of birth, ethnicity-related characteristics of migrants with regard to financial matters should be explored in future studies (cf. Peña, 2016), for example, the prohibition on usury under Islamic law (known as *Riba*, the unjust or exploitative gains made in trade or business (Iqbal, 1997, p. 43)). This example illustrates how certain content areas of knowledge of personal finance such as saving can have very different significance depending on participants' ethnic backgrounds. Risk-taking inclinations can vary depending on participants' ethnic background (Schneider, Fehrenbacher & Weber, 2017). A quantitative assessment of such characteristics is particularly complex due to the large number of ethnicities and countries of origin as well as the multitude of

characteristics to be considered (Phinney, 1996). For these reasons and due to the small sample size, ethnic background was not taken into account in this study. Culture was at least partially reflected in the language component of this study (see also Brown, Henchoz & Spycher, 2017, pp. 2-3); however, a differentiated analysis of ethnicity-related influences on financial knowledge would be a desirable aim for follow-up studies.

Overall, family has a central role in young adults' development of knowledge of personal finance (see Breitbach & Wagner, in this issue). However, it is difficult to determine the extent to which financial matters are discussed and which finance-related attitudes and values are fostered within a family. Knowledge of personal finance should not be seen purely as a result of parental socialisation but rather as something to be developed and supported through the education system. Migrants require more than German language courses to develop their knowledge of personal finance in Germany; they need to learn about the underlying cultural and ethnic values and norms of various concepts and behaviour related to personal finance in Germany. This is particularly important in study domains such as business and economics, which attract a large number of migrants. For migrants to understand better the values, norms and mechanisms of the German financial system, it could be helpful for them to make financial decisions with non-migrants. Since this may not be possible in private life, such processes could be initiated in school contexts, for example, through group work on budgeting. Before the aforementioned ideas for helping migrants develop their knowledge of personal finance can be implemented effectively, the challenges migrants face need to be addressed adequately in teacher education programs (see Kaminski & Friebe, 2012, pp. 2-3). To date, such approaches seldom have been implemented at schools in Germany (Frühauf & Retzmann, 2016). However, there are extracurricular opportunities for migrants to learn about the financial system in Germany and to expand their knowledge of financial services and saving (see also Gibson, McKenzie & Zia, 2012; for online opportunities see Fürstenau & Hommel, in this issue; Méndez-Carbajo & Wolla, in this issue). For example, the Financial Education for Young Migrants project initiated by the "Deutschland im Plus" foundation helps migrants not only develop their German language skills but also understand culturally based financial matters. If similar initiatives could be integrated in the school curriculum, disparities in knowledge of personal finance between migrants and non-migrants could be minimised. A further step could be to expand cooperation among universities, schools and the financial sector (through information events and excursions) in order to strengthen the relationship between theory and practice and to create opportunities for migrants to learn about the German financial system independently, for example, by teaching them where to seek advice.

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Family matters: Financial literacy and the incoming college freshman

Elizabeth Breitbach and Jamie Wagner

Research surrounding the determinants of financial literacy is an area that has been gaining interest since the Great Recession. Most existing literature focuses on demographic characteristics and formal financial and economic education. Does education and ability alone determine financial literacy or are there ways that parents can ensure their children become financially literate young adults? This study examines the financial literacy of incoming freshman at a major public university in the United States and their financial background. Results confirm the low level of financial literacy among this cohort; on average, students answer five out of ten questions correctly. Demographic results are consistent with previous literature, females and those with low levels of math ability have among the lowest levels of knowledge. However, results from this paper suggest that parents have a significant role, both directly and indirectly, in improving the level of financial literacy among this cohort. The authors hypothesize that parents can teach students to value financial information. Our indicators of value, student perception of parents financial knowledgeable and frequency with which financial topics are discussed, result in higher levels of literacy.

Keywords: college students – family – family background – financial literacy

1 Introduction

As young adults graduate high school they are faced with significant financial decisions that will affect their current and future financial situation. During this time, high school students make choices impacting their career path, possibly moving out of their childhood home, and experiencing greater independence than ever before. Whether the individual chooses to continue their education or enter the workforce, both decisions move young adults toward greater financial independence.

For those choosing college, students have already made a set of significant financial decisions. The average cost of in-state tuition at a public, four-year University was \$20 090 in 2016 (The College Board, 2017a). While many incoming freshmen live on campus with meal plans, expenses beyond direct college costs are incurred. The average student spends almost \$3 700 per school year on transportation and other expenses not directly associated with the cost of college (The College Board, 2017b). In 2016 the average college student graduated with \$28 773 in student loans (Powell, 2017). Understanding the financial knowledge this cohort has is important due to the increased level of independence and financial responsibility.

Existing research has found young adults, whether in college or directly entering the workforce, have among the lowest levels of financial literacy across all age groups (Allgood & Walstad, 2013; Lusardi & Mitchell, 2014). One might expect the low level of literacy to be the result of a lack of financial experiences and education by this group. Young adults have limited experience making financial decisions and deal with fewer consequences of those decisions. This cohort is also less likely to have encountered education on financial topics, since much of financial education occurs after high school (FINRA, 2015). However, researchers argue that the low levels of literacy are not solely the result of a lack of experience (Lusardi & Mitchell, 2014; Mandell & Klein, 2009). Some have also made the claim that formal education will not improve the literacy of young adults, because this cohort does not place value on financial information (Mandell & Klein, 2007; Mandell & Klein, 2009).

The purpose of this research is to begin exploration of a newer avenue of research, the impact that value has on Financial Literacy. The authors hypothesize that differences in financial literacy may not only be the result of ability, but rather differences in value placed on financial information. If a student places more value on financial information, they are more likely to retain information and education on that topic. While it is difficult to directly measure value, this study includes data on the frequency with which the student reports discussing financial matters with their family and student-reported level of their parent's financial knowledge. These variables will be used as proxies to measure value. If a student reports that their family discusses financial matters frequently or very frequently we hypothesize this signals to the student that the information is valuable, and encourages them to retain that information. Also, if students strongly believe their parents are financially knowledgeable, it may be a result of the parents emphasizing the importance of managing finances. If students perceive financial information as valuable, they will likely retain information, and therefore have higher levels of Financial Literacy.

The survey data employed in this study is part of a larger project, entitled the Financial Literacy Project, which took place during fall 2015 at a four-year U.S. state university. The project's goal was to measure financial literacy of incoming freshman to the university and a follow-up to see if their first semester of college had an impact on their level of financial knowledge. The program utilized a course introducing students to the university, in which 75 % of incoming students participate.

Consistent with results from existing literature, data show that incoming students have low levels of Financial Literacy. This is especially true among females and those with low levels of math ability and high school GPAs. Significant and of similar magnitude, parents' financial knowledge, as reported by the student, and the

frequency with which the student reports discussing financial matters with their family increases the level of Financial Literacy.

Our findings offer insight into the level of financial literacy of incoming college freshman, but more importantly, characteristics other than demographic and ability indicators are found to influence these young adults' level of Financial Literacy. With the expanding financial independence of this cohort, it becomes essential that they have the tools to make informed decisions. This research provides further ways of increasing financial literacy that may be of interest to policy makers, educators, and parents.

2 Literature review

Previous research examining the financial literacy young adults have found lower levels of Financial Literacy, relative to older cohorts (Allgood & Walstad, 2013; Lusardi & Mitchell, 2014). Lusardi, Mitchell and Curto (2010) use the National Longitudinal Survey of Youth and find that young adults (not necessarily only college students) between the ages of 23-28 lacked Financial Literacy. Only 29 % of those surveyed could answer all three financial literacy questions correctly. One potential reason offered for lower levels of literacy among young adults is a lack of experience making financial decisions. Lusardi and Mitchell (2014), however, argue that while older adults score relatively better on measures of Financial Literacy, they still have low levels of Financial Literacy. It does not appear that experience, based on age alone, increases Financial Literacy.

Research focusing solely on college students finds that this cohort answered less than half of financial literacy questions correctly (Chen & Volpe, 1998). This result was confirmed by another study of the general financial literacy of incoming freshman enrolled in an introductory English course (Avard, Manton, English & Walker, 2005). When examining the demographic characteristics of college students in relation to their Financial Literacy, results are mixed. Some research indicates levels of financial literacy are particularly low among lower classman, traditional students, those with little work experience, and female students (Chen & Volpe, 1998, 2002). Whereas another study finds no significant difference across gender and previous financial and economic education courses (Avard et al., 2005). These results are contrary to the population as a whole; Hispanic and black Americans (Lusardi & Mitchell, 2011; Lusardi & Tufano 2015), females (Fonseca, Mullen, Zammaro & Zissimopoulos, 2012; Jappelli & Padula, 2013; Lusardi & Mitchell, 2008), and individuals with less education have lower levels of financial literacy (Lusardi & Mitchell, 2011; Monticone, 2010).

Research focusing on family and other household characteristics affecting financial literacy is somewhat limited. Research by Van Campenhout (2015) discussed the importance of both the teacher and parents being involved with financial education to act as a socialization agent. Shim, Barber, Card, Xiao and Serido (2010) find that the role of parents can significantly influence a college student's level of financial literacy and behavior. Additionally, another study finds that parents could help mentor college students to make better credit card decisions (Norvilitis & MacLean, 2010). Another study of European young adults (age 14-15) find that parents can even help at a younger age improve financial behaviors (Webley & Nyhus, 2013). The limited research about parents' influence shows that there is a relationship between parents and their student's financial literacy and therefore the topic needs to be examined more closely.

Most research has focused on young adults in general, the focus of this paper will be on those young adults entering college. Significantly less research has focused on this segment of the population, specifically when they enter college and while they are enrolled. Even with the few studies done at the college level, the bulk of research on this cohort has focused on specific behaviors, such as credit card and student loan, while little has been done to determine why levels of financial literacy varies across these young adults. There is specifically a lack of existing research looking at the impact to financial literacy from family and household dynamics for college students. The purpose of this research is exploring possible avenues that suggest why students have different levels of Financial Literacy. Differences in financial literacy may not only be the result of general and math ability, but also a result of variations in the value students place on financial information.

3 Data

The data collected for this paper is part of a semester project entitled The Financial Literacy Project which took place in the fall semester of 2015 at a large public university in the United States. Incoming students to the university were asked to participate in this project through their enrollment in a course introducing them to the university (UNIV 101). This course is designed to familiarize students with the college experience and was chosen due to the large percentage of incoming students enrolled in the course.

Of all incoming students to the university, 75 % enroll in the course¹. The purpose of UNIV 101 is to "build trust, understanding, and open lines of communication

¹ University 101 is not a required course although strongly recommended by first year advisors. The students that are not enrolled may be transfer students who took the equivalent course. Others may not take the course due to major course requirements who already have too many credits.

between students, faculty, staff and administrators" (USC, 2016). Instructors vary across sections of the course, but a set of common course requirements have been established to ensure consistency. Sections are capped at 20 students, encouraging enrolled students to bond and allow instructors the opportunity to develop personal relationships with students.

The Financial Literacy Project was divided into three parts: presurvey, intervention, and postsurvey. In the first phase of the project a presurvey was distributed to inquire into the demographic and socioeconomic characteristics of the student and their primary household before college, along with their financial experiences, behaviors, and discussions with others. The presurvey also included a set of ten financial questions that were used to calculate the student's level of Financial Literacy. The presurvey data is used in this study to examine the level of financial literacy among incoming college freshman.

Other components of the project, that are not the focus of this study, are the intervention and postsurvey. The intervention provided an interactive financial literacy presentation to a subset of students within the UNIV 101 program. To measure any changes that occur during the first semester of college, along with the effect of the presentation, a postsurvey was distributed at the end of the semester. This survey included questions on whether the student participated or was offered financial education, either through the intervention, the university, or an outside event. The same presurvey financial literacy questions were also included in order to measure any changes in knowledge. While the intervention and postsurvey have important findings for college financial literacy programs, the presurvey is the only component of the Financial Literacy Project utilized in this research.

4 PreSurvey

Data collected for this research comes only from the presurvey, discussion will be limited to this part of the project. For more information on other portions of the project see (Breitbach, Wagner & Walstad, 2016). The director of the University 101 program sent an email invitation to all instructors asking their students to participate in the presurvey. Instructors were provided with some background on the project and a write-up was sent to students through the learning management system inviting them to participate in the presurvey. To encourage participation among instructors, two \$50 VISA gift cards were raffled off if class participation rates were 75 % or above. The survey was open during the first two weeks of classes, from August 17 to August 31, 2015.

Table 1: Section response rates

	Sections with 0 response	Sections with at least 1 response
Average number of students	17.8	17.6
Meeting 3 days a week	32	26
Meeting 2 days a week	78	83
Start time in morning	61	47
Start time after noon	37	38
Start time after 4:00 pm	12	24
Average response rate	0	54.20 %
Number of sections	110	109
Total number of sections	219	

Table 1 is divided into two columns. First, sections with no student participation and second, at least one student participant. The researchers offered incentives for distributing the survey to students, but were unable to require instructors pass the information on to students. Based on the data presented, it appears that approximately half of the sections did not receive any notification of the project from their instructors. While this is not the ideal result, it is not expected to alter results significantly. There are often multiple sections of the course offered at same time and instructors' names are not posted until after students have signed up for the classes. Participants are incoming freshman and are not likely to have a preference on instructor, room location, or other course specific factors upperclassman may have. Students were also unaware of which sections would be participating and which would not. For these reasons we conclude that while our sample is not completely random, the sample should be representative of the incoming freshman class.

Table 2² provides data on the characteristics of the sample relative to all incoming freshman. The participation rate is just over 20 % for all incoming students. While it is always ideal to have a greater sample size, it is expected these numbers accurately depict the typical incoming student. The presurvey data is combined with student

² A t-test is unable to be performed. The university only provided the authors with the means, not with the variances for data on all incoming freshmen.

level information obtained from the university, including demographics, high school GPA, and math placement score³.

Table 2: Participation rates for Financial Literacy project

	All Incoming Students	Participating Students
Number of incoming students	5190	1056
Female	.552	.614
White	.813	.882
Weighted high school GPA	4.018	4.019
Algebra placement score	13.00	13.74
Calculus placement score	22.00	20.64

Project participants represent a slightly higher percentage of female student and white students relative to all incoming students. The average weighted high school GPA was collected from the university, along with the GPA of the sample. The average weighted GPA for the sample is 4.019, identical to the GPA for all incoming freshman⁴. The average Algebra placement score for all incoming freshman is slightly lower relative to the sample, but by a difference of one question. The gap is reversed and slightly larger for the Calculus placement test. The average incoming score is one question higher than the sample compared to all incoming freshmen.

5 Results

5.1 Descriptive statistics

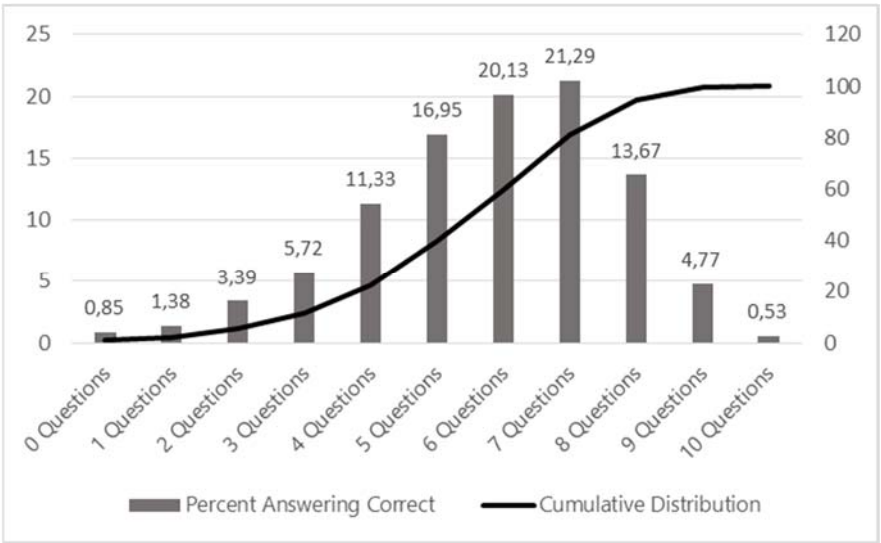
The financial literacy measurement tool is slightly longer than most financial literacy question sets and includes a wider variety of topics. This was done for a couple reasons. First, the researchers wanted to ensure clear distinctions could be made among participants. While there are some questions that are quantitative in nature, others are topic based. The decision to use numerical and topic based questions allow for a more holistic understanding of the student's financial knowledge. Second, the researchers wanted to examine the effectiveness of a short, in-class

³ Each student, upon entering the university must complete a math placement exam, either in Algebra or Calculus. The program a student plans to major in will determine which placement exam they must take. Please see appendix B for even more details.

⁴ Advanced Placement (AP), International Baccalaureate (IB), and honors courses are given more weight than traditional high school courses. The state offers financial assistance to students completing these exams, increasing the average GPA to over 4.0.

financial literacy intervention. Some of the included questions were meant to cover content in the intervention, others were not.

Past literature has found that this cohort of adults has very low levels of Financial Literacy, answering only 50 % of questions correctly (Chen & Volpe 2002; Mandell & Klein 2007). Consistent with previous literature, the average number answered correctly is 5.8 out of 10 questions. Figure 1 reports all possible score outcomes, from answering no questions correctly to all ten questions correctly, with the percentage of students falling into each category. The distribution of the test is skewed to the left, indicating that very few students have the very low levels of literacy.



Annotations: Figure 1 reports the percent of students who answered no questions correctly to all ten correctly. The trend line shows the cumulative distribution.

Figure 1: Number of questions answered correctly

All questions included in the analysis can be found in appendix A. The statistics for each question are included as well, the percentage of students answering the question correctly and the response rate for each distractor. The easiest question (question 4) on the test, was answered correctly by nearly 95 % of student respondents. This question focused one's ability to purchase a good now and pay for it later (using a credit card). Question 6 was also relatively easy with 83 % of students understanding that compound interest works better by saving earlier. The two most

difficult questions concerned the personal income tax structure including marginal and average tax rates (question 8), and information found on a credit report (question 2). Both questions were answered correctly by less than 25 % of incoming students. All other questions were answered correctly by about half of the students (46.64 %).

The first set of variables included in table 3 are the financial literacy groupings. Study participants are divided into four categories based on their financial literacy score. Those answering two or less questions correctly are considered to have the lowest level of literacy. These students represent 5.6 % of the sample. Students in earning the highest score, answering nine or more questions correctly represent at similar percentage (5.3 %). The median score on the test was six out of ten questions. This represents the middle, median score with 20 % of students falling into this category. There are 34 and 35 % of students that fall into the low-average and high-average respectively⁵.

⁵ Due to space limitations for the regression analysis not all scores will be analyzed individually. Multiple iterations of the analysis was completed with very little variation in results.

Table 3: Descriptive statistics (N = 944)

Variable category	Variable	Mean	Standard deviation
Financial literacy:			
	Financial literacy score	5.827	1.891
	0-2 Correct	.056	
	3-5 Correct	.340	
	6 Correct	.201	
	7-9 Correct	.350	
	9-10 Correct	.053	
Student information:			
	Female	.614	
	White	.896	
	Oldest child	.335	
	Middle child	.159	
	Youngest child	.308	
	Only child	.198	
	First gen. college student	.131	
	High school GPA	4.026	.504
	Lowest math	.084	
	Average math	.341	
	Highest math	.575	
Parent information:			
	Mother college degree or higher	.755	
	Father college degree or higher	.717	
	Parent's financial knowledge	.902	
	Talk to family	.456	

Table 3 also provides data on student reported demographic characteristics and family structure variables and ability measures collected through the university. The sample includes a slightly higher percentage of female respondents (61.4 %), relative to males. Though students could report multiple race/ethnicity options, the vast majority, 89.6 %, reported white.

Also reported is information on the general and mathematics ability of participants. Data could not be obtained for all students completing the survey, some students did not provide an accurate identification number which made finding them in the system difficult and others had not yet completed the exam⁶. The average weighted high school GPA for incoming students was a 4.026. The average score on the algebra placement test was just under 14 out of 25 questions and the average for the calculus placement was 21 out of 32 questions. Using the raw scores on the math placement exam is difficult due to the different scale and level of difficulty across exams. These scores vary based on the test that the student took and the level of math course the student qualified for based on their score. Instead math ability has been divided into low, middle, and high scores. More information on this division can be found in appendix B.

Researchers also wanted to examine the effect of a variety of family variables on Financial Literacy. The distribution of where an individual falls in line with their siblings is presented. A third of students reported that they were the oldest child, 16 % said they were the middle child, and 31 % said they are the youngest child. The omitted category, self-reported as an only child, represents approximately 20 % of respondents. Student-reported parental education level, while these are student reported, it is expected the student has relatively accurate information on their parents' level of education. Most respondents report their parents have a college degree or post college education – 76 % of mothers and 71 % of fathers. 13 % of students report being a first-generation college student; that is their parents or legal guardians have not completed a bachelor's degree.

The proxies for value of financial information, parents' financial knowledge and frequency of discussion, are also found in table 4a and 4b. When measuring a student's level of Financial Literacy, it is expected that those that have higher level have been taught to place value on financial information. It is difficult to directly measure value, so student reported level of financial knowledge and frequency with which family discusses financial matters are included as proxies. These questions were asked on a scale of 1 to 5, where 1 is strongly disagree and 5 is strongly agree. The majority of students also report they agree or strongly agree their parents are financially knowledgeable (90 %). This result is higher than expected as the 2015 FINRA National Capability Study finds that 63 % of adults in the United States answer three or fewer questions correctly on a five-question financial literacy test

⁶ Of the total 1 053 respondents participated in the pre-survey. Both math ability and high school GPA measures were collected for 944 respondents. The analysis portion of this paper will focus only on participants with all information available. A regression analysis was run with the full sample when available with similar results found.

(FINRA 2015). Nearly half of responding students report talking to their families frequently or very frequently about financial issues such as savings, investing, and debt.

In general, results from the presurvey are similar to both the characteristics of incoming freshmen and the large state university and also similar to national survey results which improves the generalizability of results to improve financial literacy of college students.

5.2 Regression analysis

The regression analysis in this section uses two specifications. In the first, only demographic and ability characteristics are used (table 4a), in the second family characteristics are also included (table 4b). An ordered probit is used to examine the categorical financial literacy scores. This method of analysis was used since the dependent variable is a discrete, non-continuous variable. It cannot be assumed that the distribution of this variable is normally distributed due to the upper and lower bounds (0-10). For these reasons the results presented in this paper are the ordered probit results, though other methods were also examined⁷. The marginal effects for each category are reported, where all independent variables are set at their mean values.

⁷ The authors also used a probit model, dividing the results into low scores, less than 7 questions answered correctly, and high scores, 7 or more questions answered correctly. An OLS model, with the number of questions answered correctly as the dependent variable, was also applied. In both cases, comparable coefficients and similar levels of significance were obtained.

Table 4a: Marginal effects: Specification I

	0-2 correct	3-5 correct	6 correct	7-8 correct	9-10 correct
Female	.024** (3.17)	.065** (3.19)	.002 (.85)	-.066** (3.22)	-.025** (2.95)
White	-.008 (.63)	-.021 (.67)	0 (.24)	.022 (.66)	.007 (.69)
First generation college student	.017 (1.30)	.04 (1.45)	-.001 (.57)	-.042 (1.41)	-.014 (1.54)
Weighted high school GPA	-.031** (3.63)	-.079** (3.76)	-.001 (.25)	.082** (3.77)	.029** (3.60)
Lowest math ability	-.02 (1.81)	-.059 (1.57)	-.004 (.80)	.058 (1.64)	.025 (1.37)
Highest math ability	-.027** (2.95)	-.067** (3.17)	0 (.23)	.069** (3.14)	.024** (3.09)
Pseudo R-Squared	.0153	.0153	.0153	.0153	.0153
Observations	944	944	944	944	944

Annotations: Standard errors in parentheses. *p < .1, **p < .05, ***p < .01

Omitted categories include: male, non-white and Hispanic, at least one parent completed college, middle math ability.

Table 4b: Marginal effects: specification II

	0-2 correct	3-5 correct	6 correct	7-8 correct	9-10 correct
Oldest child	-.009 (.88)	-.025 (.86)	0 (.36)	.025 (.86)	.009 (.84)
Middle child	-.002 (.16)	-.005 (.16)	0 (.10)	.005 (.16)	.002 (.16)
Youngest child	-.004 (.37)	-.01 (.36)	0 (.19)	.011 (.36)	.004 (.36)
Mother college degree or higher	-.017 (1.29)	-.043 (1.40)	.001 (.52)	.045 (1.38)	.014 (1.46)
Father college degree or higher	.005 (.50)	.014 (.49)	0 (.24)	-.014 (.49)	-.005 (.48)
Parents financially knowledgeable	-.05* (2.40)	-.1** (3.33)	.011 (1.41)	.11** (3.09)	.029** (3.66)
Talk with family about finances	-.023** (3.11)	-.065** (3.20)	-.001 (.40)	.065** (3.22)	.023** (3.01)
Pseudo R-Squared	.0252	.0252	.0252	.0252	.0252
Observations	944	944	944	944	944

Annotations: Standard errors in parentheses. *p < .1, **p < .05, ***p < .01
 The demographic and ability characteristics variables were included in the regression analysis, but not included in the table due to limited space. Omitted categories include: Only child, mother less than college degree, father less than college degree, less than agree with the statement "parents are financially knowledgeable," talk with their family about finances infrequently or not at all.

Table 4a includes results from specification I, demographic and ability controls. Table 4b includes the results from specification II, the demographic and ability controls, but also family controls. The results are divided by score for ease of interpretation of coefficients. The results for specification I confirm effects found in much of the previous literature. The marginal effects show that women are significantly more likely to fall into the lowest scores on the financial literacy test and significantly less likely to score high, even after controlling for general ability and math scores. White respondents score higher on the set of financial literacy questions, but the

results are not significant. The coefficient for first generation college students show conflicting signs, but none are large in magnitude or significant.

Ability, both general and math, are also statistically significant indicators of financial literacy. For each additional point higher in GPA, the student becomes significantly less likely to have low levels of financial literacy and are significantly more likely to fall in the higher literacy categories. Smaller in magnitude, but still significant is the indicator for students scoring in the high math ability category. Compared to students falling into the middle ability level, those with the highest math ability are significantly more likely to have financial literacy above the median score.

The second table includes controls for the student characteristics and a set of family situation characteristics, but only reports the former⁸. Adding these indicators increases the gender difference slightly for those answering 3-5 and 7-8 questions correctly. White and first-generation college students remain similar and magnitude and continue to not be statistically significant.

Controlling for family characteristics has small impacts on the magnitude of math ability among those in the highest group. Those falling into the lowest level of math ability are significantly less likely earn lower scores and more likely to earn higher financial literacy scores, relative to those in the middle level math ability. There are a couple explanations for this unexpected result. First, the small number of students who fall into the lowest math ability may skew the results. It may also be the case that these students were in elementary math courses in high school. These math courses may have focused less on algebraic and calculus skills and more on application topics such as consumer math or personal finance.

Parents' education level does not significantly impact a student's Financial Literacy. This may be because financial knowledge specifically, not general knowledge, influences a student's level of Financial Literacy. Students' perceptions of their parents' knowledge affect literacy in the expected direction and the result is significant. Those students who report their parents are financially knowledgeable are significantly more likely to correctly answer more than the median number of questions and less likely to answer fewer than the median number correctly.

The proxies for valuing financial information are found to be significant and relatively large in magnitude. Students who report frequently discussing financial topics with their families are significantly more likely to possess higher levels of financial literacy and less likely to exhibit lower levels, relative to those who report rarely or infrequently discussing these matters. Student perceived parental financial knowledge is also positively related to college students' Financial Literacy. These

⁸ A copy of full table can be provided upon request.

results suggest that parents can indirectly affect financial literacy by teaching their students to value financial information. These results are especially important as many questions are raised about what a parent can do to set their kids on the right path to financial success.

6 Conclusion

The results of this research confirm those found in previous literature. Young adults have low levels of financial literacy as measured by a 10-question test. This result is particularly true among females, even after controlling for ability. Those scoring high enough on the math placement exam to qualify for advanced math courses, relative to those qualifying for intermediate math courses, are significantly more likely to fall into higher levels of Financial Literacy. The same is true for the general ability indicator, high school GPA.

The research presented from this study offers insight into potential methods for improving financial literacy among this cohort. General ability levels, along with math ability, are found to have some of the most significant effects on Financial Literacy. However, this leaves few opportunities for improving the financial literacy of those with low levels. This paper offers initial results on alternative methods for improving financial literacy levels. The primary contribution of this research is to suggest an alternative method for improving financial literacy that does not rely on level of ability, or sometimes costly financial education programs.

Students reporting their parents are financially knowledgeable answer significantly more questions correct. This effect is larger in magnitude than GPA and math ability indicators. Not only is the student's belief about their parents' level of financial knowledge significant, the frequency with which the family discusses financial issues is also positively associated with literacy. Slightly smaller in magnitude, but still comparable to ability indicators, students who reported frequently discussing financial matters with their family score significantly higher on the financial literacy test. The authors hypothesize these variables are proxies for the value students place on financial information, it is expected that value will increase the likelihood that students retain financial information presented to them.

While we cannot conclude this causal effect, our results call for expanded research in this area. Further investigation should be done to further explore how parents and family can affect a person's financial literacy level. When thinking about promoting Financial Literacy, the discussion no longer needs to solely focus on education and ability, families can have a larger role in improving a student's financial knowledge. Encouraging families to discuss financial matters may be difficult, but

the benefit of increased financial literacy for the student strengthens the cause and encourages students to value the information.

While this research does examine the contribution of one's family, it is crucial to recognize that all variables are student reported. Students may not have an accurate sense of their parents' financial capabilities, therefore overstating the level of financial knowledge. Having more information on parents' actual level of financial knowledge and situation may offer further insight into the determinants of financial literacy among young adults.

Another limitation in this study is that only young adults attending a single four-year public university in the United States are included. Determining whether these results translate to young adults who enter directly into the workforce or others who attend a technical college is also of interest. While further educational opportunities can easily be offered to college students, after young adults enter the workforce it becomes more difficult. Relative to those attending college, individuals directly entering the workforce are making important financial decisions sooner, including how much to save for retirement and whether to purchase health insurance.

Although the self-reported data in this study can be considered a limitation, it does offer interesting insight. Discussion of financial topics and the perception of high levels of financial literacy may signal to students that their parents consider financial content valuable. As a result, if these students receive financial education, through formal or informal methods, they may be more likely to retain that information. Encouraging parents to communicate the importance of financial education even indirectly, through discussion and good practice, can increase financial literacy among this cohort.

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Appendix

Appendix A: Financial literacy questions

1. The Jackson's budget includes fixed and variable expenses. Their monthly expenses include rent, car insurance payments, dues for a fitness club, and groceries. Which of these is a variable expense?
 - a. Dues for a fitness club (28 %)
 - b. *Groceries (60 %)
 - c. Car insurance payments (2 %)
 - d. Rent (2 %)
 - e. Don't know (7 %)
2. Bob earns \$45,000 a year and Elizabeth earns \$75,000 per year. Which is true about how much each pays in federal income taxes?
 - a. *Bob pays a lower average tax rate and lower rate on the last dollar earned (24 %).
 - b. Elizabeth pays a higher rate on the last dollar earned, but the same average tax rate (36 %).
 - c. Bob pays a higher average tax rate, but a lower rate on the last dollar earned (5 %).
 - d. Elizabeth pays a lower average tax rate and lower rate on the last dollar earned (2 %).
 - e. Don't know (33 %).
3. Jennifer is deciding between a 2-year and a 5-year car loan. If she decides to take the 5-year loan, compared to the terms of the 2-year loan, the interest rate will likely be:
 - a. Lower and the monthly payment will be lower (22 %).
 - b. Lower and the monthly payment will be higher (9 %).
 - c. *Higher and the monthly payment will be lower (60 %).
 - d. Higher and the monthly payment will be higher (4 %).
 - e. Don't know (6 %).
4. Which of the following methods lets someone buy a good now, but pay for it later?
 - a. *A credit card (95 %)
 - b. A debit card (1 %)
 - c. A money order (2 %)
 - d. A personal check (1 %)
 - e. Don't know (2 %).

5. Maria has a monthly income of \$2,00. For the past six months, after paying taxes and expenses, she has contributed \$50 a month to a savings account. Maria needs to pay for \$400 in unplanned car repairs. To what extent will she have to adjust her budget to cover these expenses?
 - a. She will not need to adjust her budget because she has enough in her savings account to cover the cost (13 %).
 - b. She will not need to adjust her budget because she earns enough income each month to cover the cost (10 %).
 - c. *She will need to adjust her budget by reducing her expenses (64 %).
 - d. She will need to adjust her budget by reducing her taxes (1 %).
 - e. Don't know (12 %).
6. People who start saving for retirement earlier in life usually save more money, relative to those who wait, because early savers
 - a. are paid higher interest rates (5 %).
 - b. *start earning compounding interest sooner (83 %).
 - c. likely earn higher salaries (3 %).
 - d. are less likely to lose any of their savings (5 %).
 - e. don't know (6 %).
7. Tamara likes to shop. She often purchases expensive products without thinking about the consequences. Tamara's tendency to buy on impulse
 - a. reduces her earned income (12 %).
 - b. increases the amount she saves. (3 %).
 - c. *increases the interest rate on her credit card. (20 %).
 - d. reduces her opportunities to buy things in the future. (60 %).
 - e. don't know (5 %).
8. Which of the following is found on a credit report?
 - a. Checking account balance (24 %)
 - b. Value of primary residence (8 %)
 - c. *Unpaid medical bills (22 %)
 - d. Brokerage account balance (14 %)
 - e. Don't know (31 %)
9. Suppose you had \$100 in a savings account and the interest rate was two percent. After five years, how much do you think you would have in the account if you left the money to grow?
 - a. *More than \$102 (68 %)
 - b. Exactly \$102 (6 %)
 - c. Less than \$102 (4 %)
 - d. Unknown, it will depend on the inflation rate (11 %).
 - e. Don't know (10 %).

10. A new car loan will likely have a higher interest rate if the borrower
- a. earns a higher income. (5 %).
 - b. has a higher credit score. (15 %).
 - c. wants a shorter term loan. (22 %).
 - d. *makes a lower down payment. (46 %).
 - e. don't know (12 %).

Appendix B: Math Placement Test (MPT) equivalencies

The Calculus placement exam has 32 questions and covers “pre-Calculus and Trigonometry” content. Students taking this exam are typically enrolled in a major that requires the normal calculus sequence. The Algebra placement exam has a total of 26 questions and covers “basic high school Algebra II” content. Students completing the Algebra exam take an applied mathematics course in the area of business, social science, pharmacy, or other discipline with specific mathematical applications.

Course Level	MPT	Score	Percentage of Students
Low	Algebra	0–7 points	8.4
	Calculus	0–6 points	
Middle	Algebra	8–13 points	34.1
	Calculus	7–18 points	
High	Algebra	14–26 points	57.5
	Calculus	19–32 points	

Students scoring in the lowest bracket of the Algebra exam are required to take a basic mathematic course focusing on “development of algebraic methods” with additional support in the form of smaller class sizes and more class time each week. Students falling into the middle category are also enrolled in a course with similar content, but do not receive the additional support. Students scoring in the highest category are eligible to directly enroll in the application math course needed for their major.

Students scoring in the lowest bracket of the Calculus exam enroll in the same course as the low scoring Algebra test takers, either with or without additional support. Those scoring in the middle category will be required to take pre-calculus course before moving on in the calculus sequence, whereas those scoring the highest can enroll directly into the first calculus course.

Students' money attitudes and financial behaviour: A study on the relationship between two components of financial literacy

Stefan Grohs-Müller and Bettina Greimel-Fuhrmann

So far, most studies on financial literacy have focused on the respondents' financial knowledge and skills. The assessment of knowledge and skills is also predominant in the OECD PISA framework measuring the levels of financial literacy of 15-year-olds (Lusardi & Mitchell, 2011; OECD, 2017). However, other dimensions of financial literacy of young people such as money attitudes and financial behaviours are also important components of financial literacy (OECD, 2013) and have received less attention so far. It is the aim of this paper to examine students' money attitudes and financial behaviours in terms of consumption and saving and to identify potential relationships between these two components of financial literacy. The empirical research is based on a survey among students in their eighth grade of schooling, aged 13 to 15. The survey instrument was developed by integrating the results of a qualitative pre-study and existing instruments for the measurement of money attitudes and consumption (Barry, 2014; Lange, 2004). Confirmatory factor analyses as well as a structural equation modelling were used to identify relationships within and between attitudinal and behavioural factors. A positive correlation between the attitudinal factors of "happiness and power", "quality achieved for money" and "anxiety" was found. Rational consumption is positively related to the extent of saving (in % of disposable money) as well as to distinct motives for saving money. In contrast, demonstrative and compensatory consumption are negatively related to saving money. Moreover, specific attitudes can be associated with certain forms of financial behaviour. Respondents with a high level of financial planning also show a higher level of rational consumption and savings. Students who associate money with a higher quality of goods and services show a lower tendency toward rational consumption and a lower level of savings. This study provides empirical evidence for the importance of money attitudes towards explaining students' money management and can be regarded as a contribution to a better understanding of students' financial behaviour.

Keywords: financial behaviour – financial literacy – money attitudes – money management

1 Problem statement and objective

Over the last decades, personal financial planning has often relied on a well-developed public social security system, a pension scheme and personal savings. Due to profound changes in the demographic and economic environment, publicly financed systems may not be able to guarantee the future financial security of the citizens. This results in the need for individuals to plan and organise their finances on their own. Therefore, it has become more important to be knowledgeable about financial concepts and products in order to make reasonable financial decisions (Anthes, 2004; Reifner, 2006).

The financial crisis of 2008 revealed a significant lack of understanding of financial concepts among people all over the world. Interest in substantial research on financial literacy has significantly increased and the development of educational programmes has been considerably expanded in order to enhance people's understanding of financial matters. The OECD has been very active in this field over the past decade, not only initiating a number of research programmes but also encouraging countries to develop and implement national strategies for enhancing financial literacy (OECD, 2013, 2017). In addition, the OECD has developed a questionnaire module for measuring financial literacy within its PISA programme. Within this module, the OECD has chosen a comprehensive definition of financial literacy as the "knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life" (OECD, 2013, p. 144). This definition is often referred to in other research studies. However, these studies frequently focus on measuring financial knowledge while other components of financial literacy play only a minor role (Lusardi & Mitchell, 2011; OECD, 2017). Therefore, little is known about other dimensions of financial literacy like money attitudes and financial behaviours, in particular saving and spending money (money management).

It is the aim of the study presented in this paper to examine students' money attitudes and selected aspects of financial behaviour. The study focuses on saving and spending money (consumption patterns) and potential relationships between these two components of financial literacy. The target group of this study consists of students in their eighth grade of schooling, aged 13 to 15, and is comparable to the target group of the OECD PISA programme (OECD, 2017). At this age, many students already have some experience in financial matters like earning their first pocket money or autonomous decisions regarding consumption and savings. Existing research on financial attitudes and behaviours has targeted respondents at the age of 18 to 29 years (Barry, 2014; Lange, 2004; Lange & Fries, 2006). However, attitudes as well as behavioural patterns are usually shaped at an earlier stage in life. So it seems essential to learn more about money attitudes and financial behaviours of younger students. The following section of the paper explains the terms "attitudes" and "behaviours" as well as approaches towards measuring these concepts. The third section describes the research design of our study and is followed by the presentation and discussion of selected results in the fourth and fifth section.

2 Money attitudes and financial behaviours

The term "attitude" can be described as "a tendency to act in a favorable or unfavorable way towards an object" (Eagly & Chaiken, 1993). Many attitudes are originally developed during childhood but may change in the course of life due to new experiences and learning processes. These may be induced by changing circumstances, new acquaintances or new challenges and tasks (Bornewasser, 1979) like – in the context of financial literacy – earning money, opening a bank account and saving money (Barry, 2014). Attitudes can be based either on emotions (e. g. "it feels good to have enough money") or on factual knowledge (e. g. "money enables you to buy what you want"). Therefore, some attitudes might shift because of emotions (like feelings of well-being, fear or safety), while others need to be based on facts and figures (Werth & Mayer, 2008).

Regardless of the importance of measuring attitudes in social science (Fischer & Wiswede, 2009; Frey, 1994), there has been no substantial research on attitudes towards money until the 1980s. To begin with, Yamauchi & Templer (1982) developed the Money Attitude Scale (MAS), which characterises attitudes towards money using five factors: "power and prestige", "retention of time", "distrust", "quality" and "anxiety". The factors "power and prestige", "distrust" and "anxiety" refer to an emotional concept of attitudes. "Retention of time", which describes a person's long-term financial planning, and "quality", focusing on the importance of buying the best goods available, mainly represent the concept of factual knowledge. Adaptions of this instrument concentrate on monetary beliefs and behaviour (Furnham, 1984) or organisational behaviour (Tang, 1992). However, Lim and Teo (1997) conclude that there were many similarities between these instruments and they, therefore, merge existing instruments into one consistent questionnaire. Barry (2014) revises this methodical approach and creates an instrument for German-speaking countries, comprising 28 items and the factors: "reputation and power", "financial planning", "quality achieved for money", "importance of money" and "parsimony". These factors account for 56.23 % of the variance of items reflecting various attitudes towards money and show a considerable internal consistency (Cronbach's $\alpha = .83$). The factor "reputation and power" covers items expressing that money can be used to influence people or to solve problems. "Financial planning" pertains to actively planning and keeping track of expenses and financial resources for the future. "Quality achieved for money" comprises items that indicate the respondent's assumption that you get higher quality for a higher price. The factor "importance of money" covers items expressing that it is desirable to have enough money (regardless of what you actually do with it). Finally, the factor "parsimony" pertains to keeping money and saving it very cautiously (Barry, 2014). There are significant differences in all five factors of attitudes between indebted young adults

in Germany and people of the same age group who are not indebted. This implies that all attitudes towards money that have been researched may be relevant for making financial decisions and, therefore, influence the effectiveness of personal financial decision-making and money management (Barry, Schiebe & Breuer, 2013). This observation has been discussed in several research studies, pointing to the conclusion that there is a relationship between people's attitudes towards money and the extent to which they face financial problems (Hayhoe & Wilhelm, 1998; Lim, Teo & Loo, 2003; Tokunaga, 1993).

According to Lange (2004), financial behaviour is described as the actions that people take in the fields of consumption, saving and borrowing money. However, in his more detailed description of financial behaviour, Lange (2004) focuses on consumption and differentiates between three types of consumption that he calls rational, demonstrative and compensatory consumption. Rational consumption can be characterised as planning buying decisions in the long term based on information, while demonstrative consumption aims towards buying special brands as a sign of belonging to a certain group of people. Compensatory consumption refers to buying goods and services in order to compensate for something you cannot get but would like to have. This is often a sign for deep-seated problems and is considered to be a reason for developing a shopping addiction (Scherhorn, Reisch & Raab, 1992).

According to Lange's research (2004), the majority of respondents shows tendencies towards rational behaviour. However, about one out of four is (also) prone to demonstrative consumption and 14 % show higher levels of compensatory consumption. About 7 % of the respondents were in debt, indicating that personal money spending was the main reason for their problematic financial situation. As pointed out by Lange and Fries (2006), a majority (84 %) of the students that they interviewed save money on a regular basis. Compared to their income, the saving ratio is about 14 %. Asked about the reasons for saving money, three main reasons can be identified as relevant: saving for a specific goal, saving for an unknown future and to generate income from interest. The most prominent purpose is working towards a specific goal, with an approval rate of 67 % (Lange, 2004). Borrowing money gains a higher importance for students' life at the ages between 12 to 14. Borrowed money mainly serves for satisfying immediate needs (buying sweets and beverages). Here, the peer group is the most relevant partner for borrowing money from in this age group (Gabanyi, Hemedinger & Lehner, 2007).

3 Method

This section describes the methodical approach of the study and explains the reasoning for the chosen methods. Qualitative as well as quantitative research

methods were applied in order to thoroughly study the students' financial attitudes and behaviour.

3.1 Qualitative pre-study and pre-test of the questionnaire

A qualitative preliminary study was conducted based on 32 semi-structured problem-centred interviews (Witzel & Reiter, 2012) with students in the eighth grade of schooling who attend a New Secondary School (Neue Mittelschule) or the lower cycle of an Academic Secondary School (Allgemeinbildende Höhere Schule). The main objective of this study was to get a deeper insight into the students' financial experiences and their conceptions of money matters. Data analysis was based on the principles of qualitative content analysis and the cyclical approach of inductive category development (Mayring, 2010). The findings of this preliminary study were used to adapt and refine factors of Barry's attitude scale towards money (2014) as well as the questionnaire of Lange's consumption study (2004).

Asked about their money attitudes, many students referred to anxiety and problems when dealing with money, which lead to negative feelings when thinking about their financial affairs. On the other hand, they often associate money with being happy and being able to purchase goods and services for pleasure and a good life. Both factors were included in the standardised questionnaire and tested within the pre-study. In addition to the consumption of goods and services, saving financial resources (instead of spending them) is an important topic within the target group. In terms of savings behaviour, two groups of savers were identified: those who save for an unknown future and those who need a specific goal to be able to save financial resources. Items to measure these two motives for saving were developed and tested.

There is an ongoing discussion about the nature and the measurement of financial behaviour. Rosenberg and Hovland (1960) for example conceptualize a three-component attitudinal model that distinguishes between cognitive, affective and behavioural components that are interdependent. However, other researchers argue that discrepancies between these attitudinal components towards an object are possible and plausible. Therefore, they would rather consider them as different factors that should not be combined (Ajzen & Fishbein, 1980; Katz, 1960).

The results of our qualitative interview-based pilot study with students support the assumption that the students' money attitudes may differ from their self-assessed behaviour. Therefore, our study chooses the approach that financial behaviour is defined as a separate component that is reflected in the actions people take.

As it was impossible to observe the actual behaviour of more than 1 000 students, we chose to measure students' self-assessed behaviour by administering a standardised questionnaire. As students in this age group are legally not permitted to

take out loans, the behavioural component of borrowing money is not taken into account. In the course of the pre-test, the reliability and internal consistency of the latent factors measuring money attitudes and financial behaviours were tested by calculating Cronbach's α and running an exploratory factor analysis. The resulting factors representing money attitudes and financial behaviours in the main test are illustrated in table 1, the original items with item means and standard deviations are described in table 2.

Table 1: Factors representing the dimensions of attitude and behaviour

Dimension	Factor	Items	Cronbach	Mean*	SD
Attitude	Happiness and power	5	.785	2.83	.871
	Financial planning (Barry, 2014)	5	.746	4.19	.646
	Quality achieved for money (Barry, 2014)	4	.813	3.58	.767
	Anxiety	4	.673	2.22	.747
	Rational consumption (Lange, 2004)	5	.716	3.43	.827
Behaviour	Demonstrative consumption (Lange, 2004)	4	.770	3.02	.887
	Compensatory consumption (Lange, 2004)	4	.677	2.57	.874
	General savings	1	-	3.36	1.099
	To save for an unknown future	4	.852	3.24	1.063
	To save for a specific aim	4	.722	3.44	.902

Annotations: *The students were asked to rate the items from 1 to 5 - 1 represents no relevance, 5 represents a very high importance.

Table 2: Factors representing the dimensions of attitude and behaviour
(5 point Likert scale: 5 stands for the highest agreement)

Dimension	Factor	Item (short)	Mean	SD
Attitude	Happiness and power	Money helps to fulfil wishes	3.35	1.203
		Money as a sign of success	2.88	1.187
		Having more money than others can bring happiness	2.87	1.223
		Rich people are happier	2.53	1.177
		With money you have less worries	2.51	1.135
		Important to plan expenses	4.63	.669
	Financial planning	careful money management is important	4.33	.879
		Important to know how much money is left	4.27	.889
		important to know the amount of money in my wallet	4.18	.966
		Being proud of saving money	3.59	1.133
	Quality achieved for money	a higher price stands for quality	3.83	.971
		paying a higher price allows to get more quality	3.19	1.105
		It takes much money to get the best	3.12	1.150
		branded products have a higher quality	2.94	1.242
		Being afraid to earn less money in the future	2.96	1.223
		Thinking about money makes me anxious	2.12	1.107
Behaviour	Anxiety	Money usage overstrains me	1.90	.931
		Money means problems	1.88	.946
		a balanced relation between price and quality is important to me	3.82	1.061
		I gather information before buying a product	3.60	1.236

Dimension	Factor	Item (short)	Mean	SD
Behaviour	Rational consumption	I always plan my buying decisions in the long term	3.52	1.161
		I search for information on the internet or in journals before buying a product	3.31	1.374
		I wait for price reductions before buying a product	2.88	1.183
		I regularly gather information about my favourite brands	3.17	1.303
	Demonstrative consumption	Brands are important to me	3.17	1.162
		I talk to my friends about my buying decisions	3.14	1.206
		It is important to me to buy the latest model	3.14	1.216
		When a new model of my favourite product is on the market, I need to buy it.	2.44	1.258
	Compensatory consumption	I regularly buy things that I do not need	2.87	1.209
		When I am at a shopping mall, I often have a spontaneous desire to buy things	2.66	1.199
		When I am not able to buy what I want, I get impatient.	2.46	1.244
		I regularly buy things because I just want to go shopping.	2.28	1.229
	General savings	portion of disposable money that the respondent saves	3.36	1.099
		I save money to feel secure	3.30	1.267
	To save for an unknown future	I save money for the future	3.29	1.318
		I save money in order to have no financial problems in the future	3.26	1.250
		I save money because the future is doubtful	3.10	1.271
		When saving money, I have an exact aim	3.61	1.250
Behaviour	To save for a specific aim	I save money for a big wish	3.55	1.212
		I save money for contributing a substantial amount when buying an expensive good.	3.44	1.175
	To save for a specific aim	I save money to buy an expensive product in the future.	3.21	1.235

The findings of the exploratory factor analysis of the attitudinal items reveal four distinct factors of money attitudes: "happiness and power", "financial planning", "quality for money" and "anxiety" (see figure 1). This result mainly reflects the factor structure that Barry (2014) found in her study with German adolescents. The exploratory analysis of the behavioural items results in six factors of financial behaviour: rational, demonstrative and compensatory consumption as well as saving for an unknown future, saving towards a specific goal and saving in general (see figure 2). Regarding internal consistency of the latent factors, a cut-off score of at least .60 for Cronbach's α , as recommended by Eckstein (2006), was applied. All factors show a sufficient level of reliability. "Saving in general" is measured with a single item that indicates the portion of the students' disposable money that they are willing to save and represents the students' savings ratio (e. g. "I save 50 % of my income"). As the saving ratio represents no latent construct, a measurement with a single item seems acceptable.

3.2 Sample and data collection

The sample of the main study consists of 1 343 students aged 13 to 15 in all federal provinces of Austria, with a gender ratio of 50.3 % female to 49.7 % male respondents. The survey was conducted in schools during lessons of Geography & Economics (Geographie & Wirtschaftskunde) as the research topic is covered in the curriculum of this subject (Jagsch, 2015). 53.2 % of the respondents attended the fourth grade of a New Secondary School (Neue Mittelschule) and 46.8 % the fourth grade of an Academic Secondary School (Allgemeinbildende Höhere Schule). This ratio represents the distribution of students in the eighth grade among school types in Austria. Participation in the survey was completely voluntary but the sampling might slightly be influenced by the motivational techniques of school authorities and teachers. The authors of this paper conducted the survey between April and July 2017. Prior to administering the standardised questionnaire, the objectives of the study were explained and privacy was assured to all students. The students were granted an adequate amount of time to answer the questions, in most cases the duration of an entire lesson of 50 minutes.

3.3 Data analysis

At the beginning, a confirmatory factor analysis for the 4-factor attitudinal and 6-factor behavioural model was conducted to examine if the empirical data fit the expected hypothesised structure and to get deeper insight into significant correlations within the dimensions. In addition, a structural equation model examined the relationship between certain attitudes and behaviours. Confirmatory factor analyses as well as the structural equation model were estimated with maximum likelihood using the AMOS software tool. Whether the hypothesised model fitted the empirical

data can be assessed with global goodness-of-fit measures. Therefore, four different model indices were calculated for every model: χ^2 test, Hoelter (1983) (for a significance level of .05 of the χ^2 test), CFI and RMSEA.

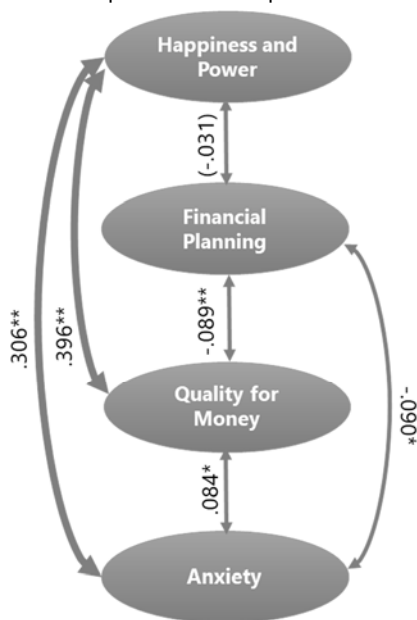
4 Selected results

Table 1 gives an overview of the measured attitudinal and behavioural factors, the number of items they comprise, the mean and standard deviation (SD) as well as Cronbach's α . "Financial planning" with a mean score of 4.19 is the most important attitudinal factor. At the same time, the standard deviation is relatively low, i. e. students' attitude that money is a scarce resource that needs planning is very strong and homogeneous. However, as spending money is often regarded as desirable behaviour, a certain amount of social desirability cannot be disregarded. The factor "anxiety" has the lowest mean (2.22), suggesting that most students are not confronted with financial worries in their everyday life. However, 19 % of the respondents show a higher mean score (> 3), revealing a greater level of stress regarding their personal money management.

As expected, rational consumption is predominant with a mean of 3.43. However, the importance of demonstrative and compensatory consumption for students' buying behaviour cannot be fully neglected. 28 % of the respondents indicate that demonstrative aspects influence their purchase decisions, another 18 % even buy things impulsively (mean > 3.5). With a mean score of 3.44, most of students save money regularly. Only 6 % of the respondents state that they spend the full amount of their disposable money on goods and services.

In order to identify relationships within and between attitudinal and behavioural factors, a confirmatory factor analysis was conducted and a structural equation model was tested. The confirmatory factor model representing attitudes towards money shows a sufficient fit with the underlying data. The χ^2 value is often regarded as a traditional measure for evaluating the overall model (Hu & Bentler, 1999), characterised by a well-fitting model with an insignificant result (value above .05). However, as this test is highly sensitive to sample size (Bentler & Bonnet, 1980), a significant result for 1 343 respondents did not come unexpected. Consequently further indices were used to evaluate the empirical fit of the model. The Hoelter test determines the sample size below which the χ^2 test would be insignificant. A value of over 200 is regarded as a good fit (Hoelter, 1983). With a value of 244 the model surpasses this recommended threshold easily. The CFI compares the χ^2 value of the hypothesised model with the χ^2 value of the independence model (Newsom, 2017). According to Bentler and Bonnet (1980), a value above .90 indicates a good model fit. The RMSEA shows how well the chosen assumption fits the population covariance matrix (Byrne, 1998), with, according to Steiger (2007), an upper limit of

.07. All fit indices were close to the recommended values. Therefore, the model is suitable to represent the empirical data.



Estimation: AMOS: Maximum likelihood

Model fit: χ^2 : .000; Hoelter .05: 244. CFI: .890; RMSEA: .065

p value: $^{*} < .05$; $^{**} < .001$

Figure 1: Attitudes towards money: results of the confirmatory factor analyses

As depicted in figure 1, students considering money as a source of happiness and power show higher approval towards the attitudes “quality achieved for money” ($r = .396$) and “anxiety” ($r = .306$). As the factor “anxiety” is characterised by statements about problems in dealing with money and recurring worries about the future, feelings of helplessness and powerlessness might prompt students to conclude that having more money would improve their lives. This result is consistent with previous research that indicates a positive relationship between the perceived power of money and the anxiety experienced (Lim & Teo, 1997) as well as the importance of quality achieved for money (Barry, 2014).

Interestingly, no statistically relevant relation between the notion of “quality achieved for money” and the experienced financial anxiety could be found ($r = .084$). This may be attributed to the assumption that students feeling financial anxiety are very likely short of financial resources. As purchasing branded products normally means paying higher prices, the available funds are surely insufficient.

Financial planning seems to be rather independent from the other remaining attitudinal factors as no remarkable correlations could be found within this dimension.

The confirmatory factor analysis reflecting the behaviour towards money has satisfactory fit index values. In addition to a significant χ^2 value, all index values fit the recommended limits mentioned above. All correlations between the assumed forms of consumption and savings are illustrated in the model described in figure 2.

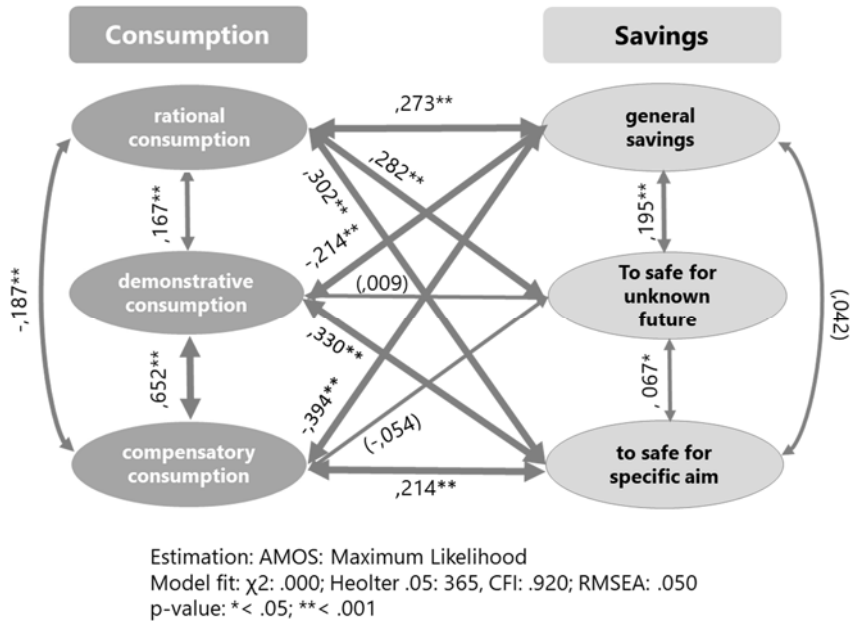


Figure 2: Behaviour towards money: results of the confirmatory factor analyses

Rational consumption shows low but highly significant correlations with other forms of consumption. While a higher level of rational behaviour leads to a minor positive effect on demonstrative buying decisions, it also has a negative effect on compensatory behaviour. This correlation might be the result of rational and therefore well-considered behaviour being a counterweight to impulsive buying

decisions. It seems rather unlikely that students are indifferent towards these forms of consumption as relative stable character attributes are represented. The general amount of savings (in % of the disposable amount of money) as well as routinely saving for an unknown future or for a specific goal show moderate positive correlations with the factor "rational consumption". Therefore, controlled and forward-looking consumption behaviour is positively related to saving money and having financial savings, the latter either providing security for an indefinite future or a dedicated saving goal.

Quite the opposite is true for students who identify more strongly with demonstrative and compensatory consumption. Both factors have rather strong and highly significant negative correlations with the general amount of savings, namely $r = -.394$ for impulsive behaviour. Different forms of consumption behaviour relate to different routines of saving. Students preferring to save for an unknown future tend to make rational buying decisions. In contrast, respondents who are prone to demonstrative or compensatory consumption show no significant correlation with saving to increase financial security. These students are only motivated to save money if they wish to purchase a desired good or service.

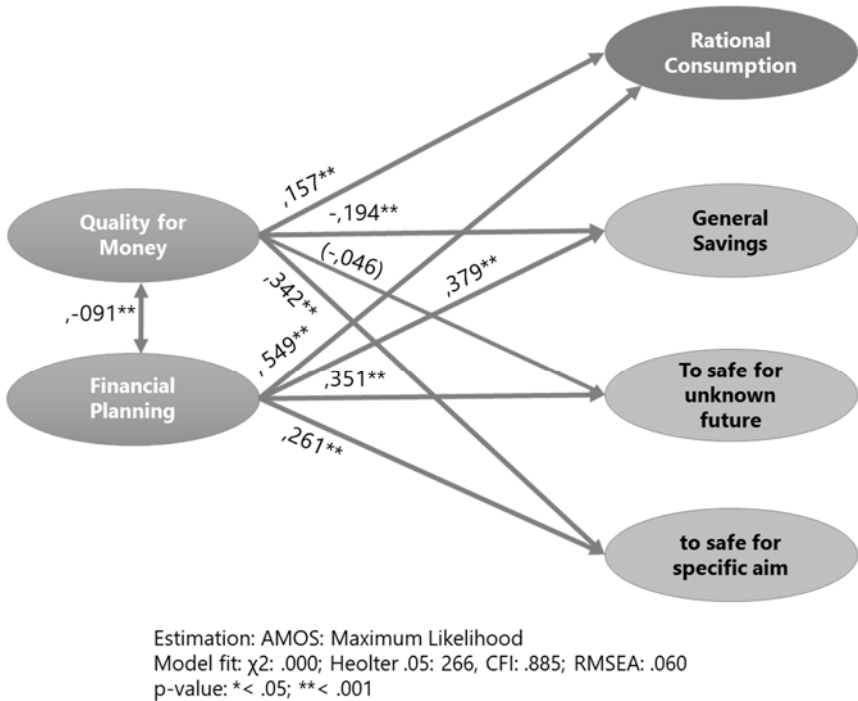


Figure 3: Structural equation model: attitudes and behaviour

The model in figure 3 integrates the two most important money attitudes of the respondents. The indices suggest a sufficient fit of the hypothetical structure with the empirical data. While the χ^2 value estimates a significant result, the outcome of the Hoelter index, showing a value of 266, is more than adequate. The CFI result slightly falls short of the recommended lower end, which seems acceptable in conjunction with the well-fitting RMSEA index.

The results indicate that there is a strong link between the attitude of “financial planning” and rational consumption as well as the importance of savings. As a result, “financial planning” shows highly significant positive effects on all behavioural factors of the model mentioned above. Therefore, students who favour financial planning save more money and tend to make their buying decisions based on long-term considerations compared to the other students. With a value of $\beta = .549$, financial planning is a remarkable predictor for rational consumption. Although the negative correlations between both attitudinal factors are highly significant, the

effect ($r = .091$) remains rather small and negligible. The factor "quality achieved for money" has significant effects on all behavioural factors. However, in comparison to "financial planning" the factor contributes less to explaining the variance within this model. Interestingly, the attitude that money is a sign of quality has two contrasting effects on consumption and savings. On the one hand, there is a positive relationship with rational behaviour and on the other hand, there is a negative effect on the general amount of savings. This suggests that students associating more money with higher quality are more likely to buy for the long term but save less than students with a lower approval of the attitude "quality achieved for money".

Overall, the results show that both attitudinal factors in figure 3 can explain the variance of 31.1 % of rational consumption, 19.5 % of the general amount of savings, 12.8 % of the importance to save for an unknown future and 17.2 % of the relevance to save for a specific purpose.

5 Summary and conclusions

Based on existing instruments measuring money attitudes and different forms of consumption (Barry, 2014; Lange, 2004) and on a qualitative preliminary study, the authors developed a questionnaire that is suitable for students in their eighth grade of schooling and their money attitudes as well as their saving and consumption behaviours. Confirmatory factor analyses as well as structural equation modelling were used to estimate the relationship of the factors within and between these dimensions.

Within the attitudinal dimensions, the results indicate that there is a significant positive relationship between the factors "happiness and power", "quality achieved for money" and "anxiety". On the other hand, financial planning is rather independent of all other money attitudes. Within the behavioural dimensions, rational consumption has significant correlations with all saving factors. Students whose buying is primarily rational and well considered are more likely to save higher amounts of money for an unknown future or towards a specific goal.

The study provides empirical evidence for the importance of the attitude "financial planning", which is closely linked to rational consumption as well as to all dimensions of saving money that were covered in this study.

While the factors "quality achieved for money", "anxiety" and "happiness and power" are mostly based on emotions, the factor "financial planning" is oriented towards using information and making rational decisions. Therefore, teaching why and how to budget and manage one's resources might reduce and help manage the emotions towards money and enhance financial literacy. The results of the qualitative pilot study suggest that there is an enormous potential for financial

education at schools that is not used yet. Curricula would allow teachers to deliver financial education, students are interested and acknowledge the importance of financial education, but very little is actually done at schools to foster the students' abilities to improve their financial skills. Moreover, as many students describe the importance of discussing money issues at home, parents should be encouraged to be a role model and involve their children in their own financial planning and explain their financial decision-making.

Financial planning is very likely influenced by observed behaviour of role models (family members or peers) as well as by information on the importance of budgeting and how to budget.

The results of this study also emphasise the observation that even at an early age with limited funds available, students can already be prone to demonstrative and even compensatory consumption that has a detrimental effect on their savings.

The standardised measurement of self-assessed attitudes and behaviour also has its limitations. The actual behaviour might differ from the respondents' self-assessment. The factor "financial planning" might be slightly influenced by social desirability as the item approval rate seems rather high. For future work, the items could be revised in order to reduce the effect of social desirability. The importance of financial experiences, like talking about money issues with family members or peers, and their influence on attitudes and behaviour could be studied in more detail. A deeper insight in important financial experiences could help identify relevant learning situations and improve financial education measures.

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¹ This study was financed with funds from the "Jubiläumsfond (Nr. 16251)" by the Austrian Central Bank (Österreichische Nationalbank).

The relation between financial knowledge, attitudes towards money, financial self-efficacy, and financial behavior among high school students in the Netherlands

Aisa Amagir, Arie Wilschut and Wim Groot

We provide evidence on the relationship between four different aspects of financial literacy: Financial knowledge, attitudes towards money, self-efficacy, and financial behavior. Ninth-grade high school students ($N = 2\,025$) in 22 schools and in four different educational tracks in the western part of the Netherlands took part in the survey. A multilevel analysis at school and individual level was applied. Findings show that financial behavior is highly associated with attitudes towards money as well as financial knowledge. Attitudes towards money, in turn, are associated with financial behavior and financial knowledge. Furthermore, financial knowledge is related to attitudes towards money and financial behavior. In order to improve financial behavior among high-school students, financial education programs should have a holistic approach and address all aspects of financial literacy.

Keywords: attitudes towards money – Dutch students – financial behavior – financial knowledge

1 Introduction

According to the OECD (2014), financial literacy is widely seen as an essential skill to function in an increasingly complex society and therefore an essential part of education that prepares for such a society. In the transition from adolescence to young adulthood, individuals must acquire the knowledge, skills, values, and attitudes needed to become self-sufficient (Shim, Barber, Card, Xiao & Serido, 2010). According to Dam (2014), self-sufficiency, initiative and responsibility are key competences in fostering citizenship among young people who live in societies organized upon individual responsibility. Although financial literacy primarily concerns the personal finances of individuals, the degree of financial literacy also affects public life. This has led to the recognition that better knowledge and understanding of financial concepts and risks could help improve financial decision making among adults and young people (OECD, 2014; 2017). The question arises if financial knowledge alone is sufficient to ensure responsible financial behavior. In order to design effective financial education programs, it is important to know the aspects of financial literacy that most influence financial decision making among adoles-

cents. Therefore, this study examines how four aspects of financial literacy are associated to each other: Financial knowledge, attitudes towards money, financial self-efficacy, and financial behavior.

2 Literature review and hypothesis

The OECD (2014, p. 33) defines financial literacy as “knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts”. Financial literacy defined in this way refers to ways in which individuals understand, manage, and plan their personal finances. Financial literacy aims at achieving personal finances that can support financial well-being, which is defined as a situation in which personal finances are a means to achieve and maintain a desired standard of living (Amagir, Groot, Maassen van den Brink & Wilschut, 2018). Financial literacy is defined as a combination of on the one hand financial knowledge, and on the other hand attitudes towards money, financial self-efficacy, and financial behavior that support the implementation of financial knowledge in daily financial decision-making (Amagir et al., 2018). Existing evidence about ways in which financial knowledge, attitudes towards money, financial self-efficacy, and financial behavior influence each other is mixed. Some studies report relatively limited effects of knowledge on changing behavior (Hilgert, Hogarth & Beverly, 2003; Perry & Morris, 2005). However, an interesting finding that contributes to the debate to which extent knowledge influences adolescents behavior is a study of Shim et al. (2010). They found that financial knowledge plays an important role in predicting attitudes toward money and is also directly linked to financial behavior. Attitudes towards money, in turn, predicted financial behavior. Financial knowledge was also statistically significantly related to financial self-efficacy, which in turn played a critical role in predicting financial behavior. Previous work of Shim, Xiao, Barber and Lyons (2009) also indicates that financial knowledge can translate into behavior directly as well as indirectly through attitude. Previous studies have reported that both objective (assessed) and subjective (self-assessed) financial knowledge influence financial behavior, with subjective knowledge having a relatively larger impact (Robb & Woodyard, 2011). Sohn, Joo, Grable, Lee and Kim (2012) found that among the significant variables related to Korean high school students’ financial knowledge, the most important one was attitudes towards money. Perceiving money as good or as a reward for efforts was positively associated with financial knowledge. Mitchell and Mickel (1999) note that money plays a symbolic role, while also influencing feelings and behavior. As regards feelings, some people perceive money as something good, valuable, important, and attractive, whereas others see it as evil, shameful, useless, and dishonest. In the

symbolic domain, we find that humans strive for achievement and recognition, status and respect, freedom and control, and power. The behavioral aspect concentrates on actions such as saving or investing money. Madern and Van der Schors (2012) showed that having a positive attitude – being willing to save, not being a short-term thinker and not being easily tempted - does more to prevent financial problems than having financial skills. In a study among college students, attitudes towards using credit cards influenced college students' credit purchasing behavior (Hayhoe, Leach, Turner, Bruin & Lawrence, 2000). Yang, James and Lester (2005) found attitude scores to be a strong predictor of the number of credit cards owned. Interestingly, more positive attitudes toward credit cards in general were associated with greater obsession with money and seeing money as a tactic for gaining power. Based on the reviewed literature, we hypothesize the following:

- H1: High financial knowledge levels among high school students are associated with positive attitudes towards money, higher levels of responsible financial behavior, and higher levels of self-efficacy in managing personal finances.
- H2: Responsible financial behavior levels among high school students are associated with positive attitudes towards money, higher financial knowledge levels, and higher levels of self-efficacy in managing personal finances.

3 Method

3.1 Sample

For this study, which is part of a larger study (Amagir, Groot, Maassen van den Brink & Wilschut, 2017), we surveyed ninth-grade high school students with an average age of 14.62 years ($SD = .685$, age range: 12-18) in the western part of the Netherlands in four different educational tracks (EP-Nuffic, 2015), in March 2017. Secondary education in the Netherlands is divided into three main tracks: a four-year pre-vocational track (VMBO), a five-year general secondary track (HAVO), and a six-year pre-university track (VWO); the lowest four-year track is subdivided into a basic (VMBO-BK) and a more advanced level (VMBO-GT). Students completed a survey designed to assess financial knowledge, attitudes towards money, self-efficacy, and financial behavior. We administered 2 952 questionnaires; in 22 schools. Of these 2 025 students (68.6 %) completed the whole questionnaire. These were used in the final analysis. The distribution of students in schools, is with the exception of a few schools rather equal. On average there are 92 students per school in the sample. As shown in appendix 1, gender (50.5 % male) and educational level were distributed almost equally in the sample, with 33.6 % of the sample in the lowest track (VMBO), 34.1 % of the sample in the general secondary track (HAVO) and 32.3 % of the sample in the pre-university track (VWO). The socio-economic

status (SES) of the area was equally distributed across our full sample, with approximately one-third (33.6 %) of the students having a low SES, one-third (32.7 %) a moderate SES and one third (33.6 %) a high SES.

3.2 Measurements

To measure high school students' knowledge of personal finance we used an adapted version of The Council for Economic Education (CEE) Test of Financial Knowledge (TFK) (Walstad & Rebeck, 2017). The adaptation consisted of several steps. Firstly, the test was translated and adjusted to the Dutch context, in accordance with the non-mandatory Dutch standards for financial education (NIBUD, 2015). Furthermore, based on the feedback received from teachers of economics in high school education and a pilot study involving 249 students from different high school tracks several items were refined because of differences between Dutch and American financial institutions, and businesses. Finally, an item-and-test analysis to confirm the reliability and discriminating power of the financial knowledge test was performed (Amagir et al., 2017).

The TFK, that consists of 40 multiple-choice items, has been developed to assess the financial knowledge of eighth and ninth-grade students in the USA in the following areas: (1) earning an income; (2) buying goods and services; (3) saving; (4) using credit; (5) financial investing; and (6) protecting and insuring (Walstad & Rebeck, 2016; 2017). These areas are based on the US National Standards for financial literacy (CEE, 2013). The items in the test are classified into two levels of intellectual skills; there are 15 items at a lower level (knowledge or comprehension) and 25 items at a higher level (application that might include analysis and evaluation).

We used the attitudes towards money scale of Amagir et al. (2017), that is built up of different items of the Money Attitude Scale by Yamauchi and Templer (1982), the Attitudes Towards Money scale by Barry (2016), and the CAED Autonomy (reflexive) scale by Micarello, Palacios & Burgos (2012) to measure high-school students attitudes towards money. The attitudes towards money scale captures the psychological aspects of money (power, success, status, and superiority), a money management aspect (e. g. budgeting), and attitudes towards money in situations of consumption. As shown in appendix 2, the scale measures four aspects of attitudes towards money: (1) power/prestige, (2) financial planning, (3) think before acting, and (4) quality for money. Characteristic for power/prestige is the idea that money enables people to influence and impress others. Financial planning refers to budgeting and careful spending. Attitude towards financial planning is about how important one finds it to budget money and to use money carefully. Think before acting concerns the amount of knowledge based reflection preceding the decision to buy something. Quality for money relates to the inclination to buy the best products available,

even if this implies having to pay more. The reliability scores were found to be good to acceptable, with a Cronbach α of .82 for power/prestige, .75 for financial planning, .62 for think before acting, and .61 for quality for money.

Self-efficacy was measured by asking the students to indicate on an 11-point scale: "How much confidence do you have in your own ability to manage money?" (Amagir et al., 2017). The scale varied from (0) cannot do, to (5) moderately certainly can do, to (10) highly certainly can do (Bandura, 2006).

As shown in appendix 2, responsible financial behavior was measured using eight items by asking the participants how frequently they had engaged in different activities, such as saving for a particular purchase, budgeting their money, and making ends meet. These items are based on activities high-school students might engage in, regarding budgeting, saving and borrowing. Responses to all items were based on a 4-point Likert scale, ranging from "never" to "very often." The Cronbach α of .61 was acceptable (Amagir et al., 2017).

The attitudes towards money, self-efficacy, and financial behavior measurements are validated by Amagir et al. (2017) by asking experts from Money Wise, a platform in which partners from the financial sector, science, government, education, and information and consumer organizations pool their strengths to advance responsible financial behavior in the Netherlands, and Nibud, a non-profit independent organization in the Netherlands that gives information and advice on financial matters to private households, for feedback regarding the clarity of individual items. Based on this feedback, some items were either combined or eliminated. Furthermore, the instruments were tested in a pilot study involving 156 students from different high school tracks, which resulted in a few extra changes.

4 Results

Table 1 presents the correlations, means and standard deviations of the included variables. We find a statistically significant correlation between financial knowledge, the subscales of attitudes towards money, and financial behavior. However, financial self-efficacy did not statistically significantly correlate with financial knowledge, the subscales of attitudes towards money, and financial behavior. Further, we find no statistically significant correlation between the attitudes towards money subscales: quality for money and think before acting, and between the attitudes towards money subscale quality for money and financial behavior. The highest correlation is found between the attitudes towards money subscale financial planning and financial behavior ($r = .488$). The pattern and strength of the correlations among the included variables provide a good basis for further analysis.

As shown in table 1, on average, students answered 56.1 % of the financial knowledge questions correctly. Compared to American high school students, on average, Dutch high school student's scores were higher on a similar test (TFK) (Walstad & Rebeck, 2016). With regard to attitudes towards money, students scored relatively high, with the exception of the subscales power/prestige and quality for money. The average scores for financial behavior and financial self-efficacy are also relatively high; an explanation for these scores might be that students overestimate their own abilities.

Table 1: Financial knowledge, attitudes towards money, financial self-efficacy, and financial behavior: Pearson's r correlations and descriptive statistics (N = 2 025)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Financial knowledge ^a	-						
(2) Attitudes: Power/prestige ^b	-.134**	-					
(3) Attitudes: Financial planning ^b	.123**	-.064**	-				
(4) Attitudes: Think before acting ^b	.162**	-.077**	.405**	-			
(5) Attitudes: Quality for money ^b	-.065**	.317**	.028 n. s.	-.030 n. s.	-		
(6) Financial self-efficacy ^c	-.010 n. s.	.010 n. s.	.002 n. s.	.028 n. s.	.014 n. s.	-	
(7) Financial behavior ^d	.227**	-.109**	.488**	.331**	.023 n. s.	-.011	-
Mean	56.10	2.18	3.01	2.99	2.39	7.30	2.94
SD	15.24	.57	.44	.54	.44	1.67	.44

Annotations: ^aIn percentages. ^bThe scale: 1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree. ^cThe scale: cannot do (0); moderately certainly can do (5); highly certainly can do (10). ^dThe scale: 1 = never; 2 = almost never; 3 = regularly; 4 = very often. **Correlation is significant at the 0.01 level (2-tailed), n. s. = not significant.

Because of the nested structure of the data, which is commonly found in educational settings, we conducted a multilevel analysis in MLwiN (Rasbash, Steele, Browne & Goldstein, 2009) at school and individual level in order to determine the relationship between financial knowledge, the four subscales of attitudes towards money, and financial behavior. In table 2 and 3, linear models are presented for the relationship

between financial knowledge, the four subscales of attitudes towards money, and financial behavior. Gender and SES were added as covariates in the models.

With regard to the financial knowledge model, we find a statistically significant positive relationship between financial knowledge and financial behavior ($p < .001$). The level of financial knowledge is 4.0 % higher for every unit of increase in financial behavior. Further, we find a statistically significant negative association between financial knowledge and power/prestige ($p = .018$) and a positive relationship between financial knowledge and think before acting ($p = .001$).

The attitudes towards money subscale "power/prestige" statistically significantly relates with think before money ($p = .020$) and quality for money ($p < .001$). One unit of increase in power/prestige is associated with a 0.3 point increase in quality for money. Furthermore, we find a negative statistically significant relationship between power/prestige and financial behavior ($p < .001$) and between power/prestige and financial knowledge ($p = .046$).

Financial behavior seems to have the strongest relation with the attitudes towards money subscale "financial planning" ($p < .001$). Also we find a statistically significant positive relationship between the subscale financial planning and think before acting ($p < .001$), and quality for money ($p = .051$).

The attitudes towards money subscale "think before acting" is positively statistically significantly related with financial planning ($p < .001$), quality for money ($p = .004$), financial behavior ($p < .001$), and financial knowledge ($p < .001$). Further, we find a statistically significant negative association between the attitudes towards money subscale "think before acting" and power/prestige ($p = .016$).

We find a statistically significant positive relationship between the attitudes towards money subscale "quality for money", power/prestige ($p < .001$) and financial planning ($p = .046$). We also find a statistically significant negative relationship with think before acting ($p < .001$).

We find a statistically significant positive relationship between the financial behavior scale and financial knowledge ($p < .001$), and think before acting ($p < .001$). Financial planning is also statistically significantly related with the scale financial behavior ($p < .001$) and seems to be strongly related to financial behavior. Further, a statistically significant negative relationship between financial behavior and power/prestige is found ($p < .001$). These results indicate that H1 and H2 were partially supported.

Table 2: The relationship between financial knowledge, attitudes towards money, and financial behavior (multilevel analysis)

Dependent variable:	Financial knowledge
Independent variable	b (SE)
Intercept	54.262 (2.031)***
gender1	-0.860 (0.639)
Lowest SES2	-1.344 (0.850)
Middle SES2	-0.243 (0.730)
Financial knowledge	-
Attitudes: Power/prestige	-1.314 (0.556)**
Attitudes: Financial planning	-0.694 (0.813)
Attitudes: Think before acting	2.294 (0.603)***
Attitudes: Quality for money	-0.863 (0.699)
Financial behavior	4.384 (0.793)***
Variance Explained:	
- School level (between)	6 %
- Individual level (within)	7 %
ICC	32 %
Model fit: $-2 \cdot \log$ likelihood	16.158.923

Annotations: ¹reference category: female. ²reference category: high SES. *p < .10; **p < .05; ***p < .001. Schools (N = 22), (N = 2 025).

Table 3: The relationship between financial knowledge, attitudes towards money, and financial behavior (multilevel analysis)

Dependent variable	Attitudes: Power/ prestige	Attitudes: Financial planning	Attitudes: Think before acting
Independent variable	b (SE)	B (SE)	b (SE)
Intercept	2.045 (0.028)***	3.086 (0.022)***	2.901 (0.027)***
gender ¹	0.285 (0.025)***	-0.157 (0.017)***	0.217 (0.023)***
Lowest SES ²	-0.005 (0.031)	0.036 (0.022)	-0.048 (0.029)
Middle SES ²	-0.013 (0.029)	0.026 (0.020)	-0.025 (0.027)
Financial knowledge	-0.002 (0.001)**	-0.001 (0.001)	0.003 (0.001)***
Attitudes: Power/prestige	-	0.015 (0.015)	-0.048 (0.020)**
Attitudes: Financial planning	0.036 (0.032)	-	0.411 (0.028)***
Attitudes: Think before acting	-0.056 (0.024)**	0.229 (0.016)***	-
Attitudes: Quality for money	0.341 (0.027)***	0.037 (0.019)*	-0.070 (0.026)**
Financial behavior	-0.162 (0.032)***	0.430 (0.020)***	0.151 (0.029)***
Variance explained:			
-School level (between)	2 %	2 %	1 %
-Individual level (within)	17 %	35 %	23 %
ICC	1 %	2 %	1 %
Model fit:	3.068.961	1.547.277	2.732.129
-2*log likelihood			

Dependent variable	Attitudes: Quality for money	Financial behavior
Independent variable	b (SE)	b (SE)
Intercept	2.348 (0.021)***	2.868 (0.020)***
gender ¹	0.096 (0.020)***	0.143 (0.017)***
Lowest SES ²	-0.017 (0.024)	-0.045 (0.022)**
Middle SES ²	-0.006 (0.023)	-0.002 (0.020)
Financial knowledge	-0.001 (0.001)	0.004 (0.001)***
Attitudes: Power/prestige	0.217 (0.017)***	-0.079 (0.015)***
Attitudes: Financial planning	0.052 (0.026)**	0.442 (0.020)***
Attitudes: Think before acting	-0.053 (0.019)***	0.087 (0.017)***
Attitudes: Quality for money	-	0.027 (0.019)
Financial behavior	0.035 (0.025)	-
Variance explained:		
-School level (between)	1 %	5 %
-Individual level (within)	13 %	29 %
ICC	1 %	1 %
Model fit:		
-2*log likelihood	2.143.523	1.607.377

Annotations: ¹reference category: female. ²reference category: high SES. *p < .10; **p < .05; ***p < .001. Schools (N = 22), (N = 2 025).

5 Discussion

This study shows that students' financial knowledge levels are related to the subscales power/prestige and think before acting of attitudes towards money, and financial behavior. Responsible financial behavior appears to be most strongly related with the attitudes towards money subscale "financial planning" followed by the attitudes towards money subscales "think before acting" and "power/prestige", and "financial knowledge". This finding is consistent with studies by Shim et al. (2009; 2010), who found that attitudes towards money predict responsible financial behavior. In line with Hilgert et al. (2003) and Perry and Morris (2005), our findings suggest that focusing on knowledge alone in financial education programs may be ineffective in ensuring positive financial behavior. However, the direction of causality of the relationships remains unknown, because of the endogeneity of the variables. If the direction of causality is that changing financial behavior would improve financial

knowledge and attitudes towards money then the core of any financial education program in school should attempt to promote responsible financial behavior, and should start early in school. On the other hand, higher financial knowledge levels may lead to more responsible financial behavior, but at the same time people who exhibit more responsible financial behavior may be more interested or able to seek financial knowledge. With the exception of financial self-efficacy and the subscale quality for money of attitudes towards money, all components of financial literacy assessed in the survey are related to financial behavior. Thus to ensure healthy financial behavior, financial education programs should have a holistic approach and attempt to address all of these factors.

This study is performed in a Dutch context, therefore a limitation of this study may be the generalizability to different contexts. On the other hand, the Netherlands is representative of a western (Western European) country with a high degree of prosperity. Students in these countries to a large extent, live in similar circumstances when it comes to financial literacy.

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¹ Acknowledgements: This study was supported in part by Money Wise Platform (In dutch: Wijzer in geldzaken).

Appendix

Appendix 1: Study sample description (N = 2 025)

		All levels (%)	Preparatory secondary vocational education (VMBO-BKGT) (%)	Senior general education (HAVO) (%)	Pre-university education (VWO and gymnasium) (%)
N		100	33.6	34.1	32.3
Gender	Male	50.5	55.4	47.2	49.0
SES	Low	33.6	46.1	29.5	25.0
	Moderate	32.7	29.4	36.0	32.8
	High	33.6	24.5	34.4	42.3

Appendix 2: Attitudes towards money and financial behavior scale

Attitudes towards money scale

Power/prestige

I believe money is a symbol of success.

Money can help you express how successful you are.

Money is the most important goal in my life.

I feel that money is the only thing that I can really count on.

I believe you can influence other people to do things for you with money.

I firmly believe that money can solve all my problems.

I believe you can impress others by owning expensive things.

Financial planning

I find it important to keep track of my expenses.

I find it important to keep track of my income.

I find it important to do financial planning for the future.

I find it important to make ends meet.

I find it important to use my money very carefully.

I find it important to save money for the future.

I find it important to save money for unexpected expenses.

Think before acting

I find it important to research prices whenever I have the money to buy something.

I find it important to know if there are any discounts or deals currently available for the purchases I want to make.

Whenever I buy more expensive items, I always try to obtain more information on the product's quality.

I like to think thoroughly before deciding to buy something.

Quality for money

I pay more to get the very best, because I know that is important.

I don't mind spending more to get the very best.

I buy the most expensive items available.

I only buy name-brand products.

I only buy top-of-the-line products.

Financial behavior scale

I save money for the future.

I save money for unexpected expenses.

I save money for a particular purchase.

I budget my money.

I'm never short of money

I make ends meet.

I don't borrow money from friends or from my family if I want to buy something and don't have enough money.

I never ask my parents for money, if I want to buy something and don't have enough money.

Annotations: Based on Amagir et al. (2017)

One small spoonful at a time: Long-form vs. short-form financial education online learning modules

Diego Méndez-Carbajo and Scott A. Wolla

This paper studies the differences in student learning outcomes associated with changes in the format of online learning resources. We compare completion rates and degrees of student achievement across several financial education learning modules produced by the Federal Reserve Bank of St. Louis. Initially designed as a long-form online learning module focused on financial education the module "The time value of money" was later "chunked" into five separate short-form learning modules. Working on a sample of 68,972 students, we adopt a two-group pre- and post-test quasi-experimental design. We find across-the-board evidence of increased completion rates among registered students and statistically significant increases in average differences between pre-test and post-test scores. Additionally, we study how the increases in scores are distributed across students by comparing pre-test grade quartiles. Finally, we document changes in information absorption at the test-item level across module lengths.

Keywords: financial education – instructional design – online instruction

1 Introduction

The encouraging findings of Lusardi, Mitchell and Curto (2009) supporting the financial education of students and young adults highlight the importance of "improving the effectiveness of financial literacy programs currently offered in high school" (Lusardi et al., 2009, p. 23). Yet, as Brown, Collins, Schmeiser and Urban (2014) point out, "Given the scarcity of educational time and resources, the expansion of financial education in the K-12 curriculum could come at the expense of other valuable education topics" (Brown et al., 2014, p. 3). Thus, methods for delivering financial literacy resources to high school students that do not encroach on class time are particularly valuable to instructors. For example, the Council for Economic Education includes in its list of resources for K-12 educators and students an online personal finance game (for students) and an online Assessment Center (for instructors) (CEE, n. d.). The Federal Reserve Bank of St. Louis, through the Econ Lowdown program, produces free classroom resources for K-16 educators to teach about personal finance and economics. The educational value of these resources has been reported by Bosshardt and Grimes (2010), Suiter and Yetter (2015), and Wolla (2017). Several econlowdown.org online courses have received curriculum awards from the National Association of Economic Educators (NAEE).

The free lesson plans, activities, and readings offered by the Federal Reserve Bank of St. Louis support a personal financial literacy model "geared toward deepening

students' understanding of personal finance through an economic perspective", a model where "a basic understanding of economics provides a critical framework for making informed decisions about budgeting, saving, and investing" (CEE, 2013). The integration between personal financial literacy and economics is explicitly articulated in the summary description of the online module "The time value of money" (Econ Lowdown, n. d.) as follows: "The financial security that comes with wealth accumulation requires an understanding of the time value of money. Students begin this course with a lesson on opportunity cost, the most fundamental consideration in any personal financial decision. Students move on to a lesson on interest where they will recognize the importance of interest in sheltering them from the higher cost of living they are certain to experience in later years. The increase in their future costs will be due to inflation, the third subject they will encounter in this program. Students will use their knowledge of opportunity cost, interest and inflation to determine the future value of investments they may make as young adults and the present value of a sum of money they hope to have at a later date".

2 Issue and theoretical background

The work of Clark and Mayer (2016) compiles the evidence-based guidelines for designing and developing effective asynchronous and synchronous e-learning resources. Their work is grounded on the educational research reviewed by Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw and Liu (2006), which shows that learning in an online environment can be as effective as learning in a traditional classroom. Clark's and Mayer's (2016, p. 24) advice on best practices designing blended learning and online materials is organized around four features:

- ▶ Learners can control their pacing through a lesson;
- ▶ Engagement methods promote appropriate psychological processing;
- ▶ Lessons include appropriate use of graphics and words to present content;
- ▶ Realistic scenarios are used as a context for learning.

Of particular interest to us is the emphasis placed by Garrison and Vaughan (2008), Howard, Schenk and Discenza (2004), Johnson and Aragon (2003) and Smith (2008) on the amount of teaching and learning content that well-designed materials should display. Plainly put: "Electronic content should not be delivered in hour-long lectures [...] learners must be given smaller chunks of content" (Richards, Dooley & Lindner, 2004, p. 104). This emphasis on subdividing course materials is aimed both at "optimizing the cognitive load" (Clark, Nguyen & Sweller, 2006) and at "helping students learn in small increments" (Kelly, 2009, p. 6). In the absence of adequate segmenting/chunking of teaching material, learners are likely to experience "essential cognitive processing overload" (Clark & Mayer, 2016, p. 206). Informed by the work of Mayer and Moreno (2003), this essential overload represents the

inability to engage in the intellectual processing required to understand new material - particularly when there is a series of interrelated concepts or the learner is unfamiliar with a complex topic.

For the benefit of those readers familiar with Miller's (1956) seminal work on cognitive psychology we would like to disambiguate the term "chunking". Originally defined as the grouping of small pieces of information into sets in order to increase the capacity of short term memory, in the context of online learning "chunking" is recognized as the breaking of course content into smaller components that help students absorb information, avoiding information overload and exhaustion (Clark & Mayer, 2016; Garrison, Schardt & Kochi, 2000; Smith, 2008).

In that light, Smith and Brame (n. d.) advocate for "course content present in chunks that are easily digestible". Along those lines, the small-scale (N = 18) experimental laboratory work of Pomales-García and Liu (2006) found that users perceived shorter modules to be less difficult than longer modules as well as more likely to be viewed in their entirety. In order to test the robustness of their work they explicitly call for exploring how user persistence changes with modules of different length – while controlling for content and attractiveness. Similarly, in a larger-scale (N = 305) survey study of factors influencing non-completion of online courses among community college students Aragon and Johnson (2008) emphasize the importance of course design that "avoids information overload" in order to improve retention rates in online programs (Aragon & Johnson, 2008, p. 155).

This paper addresses the underdeveloped research identified by Clark and Mayer (2016) on how "the [learning] effects [of segmenting] replicate with different materials, learners, and learning contexts" (Clark & Mayer, 2016, p. 214). It also follows the "recommendations for future study" by Aragon and Johnson (2008), who call for the study of "factors influencing the persistence and retention of community college students in online courses" (Aragon & Johnson, 2008, p. 156) and by Pomales-García and Liu (2006), who ask for studies to explore "changes in persistence responses with modules longer than twenty minutes" (Pomales-García & Liu, 2006, p. 177).

The purpose of our research is to study the pedagogical benefits of delivering chunked online financial educational materials to K-12 students. We document the extent to which chunking content (i) increases student completion rates, (ii) promotes learning among low-performing students, and (iii) increases information absorption.

3 Method

3.1 Participants

Data were collected from 68 972 students between September 2011 and July 2017. The vast majority (96 %) were enrolled in 205 secondary and higher education institutions across 38 of the United States of America. Due to the strict privacy protection rules governing the collection of user data by the Federal Reserve Bank of St. Louis this dataset contains no demographic information about individual students. Moreover, the only school-level demographic dimensions reported are: gender distribution (co-ed: 99.08 %; all-girls: 0.79 %; all-boys: 0.13 %) and “majority (over 50 %) of school’s student population consisting of racial or ethnic minorities” (no: 84 %; yes: 16 %). Thus, although the nature of the data set prevents us from controlling for individual learner characteristics the available descriptive statistics strongly suggest a very broad spectrum of student types distributed across States and educational institutions. Table 1 shows the number of students enrolled and active in each online module under study.

Table 1: Student enrollments by module

Module	Active Students
“Time value of money”	15 401
“Opportunity cost”	20 259
“Inflation”	12 608
“Paying & receiving interest”	9 494
“Present value”	5 679
“Predicting the future”	5 531
Total	68 972

3.2 Materials

The data examined in this study was collected from econlowdown.org. This is the repository for free online economic and personal finance education resources from the Federal Reserve Bank of St. Louis (FRBSTL). Created in 2010, it currently contains (as of November 27, 2018) 334 different teaching and learning resources, including online modules, audio Q&As, and video Q&As. During 2016 Econ Lowdown online modules and videos had 1.1 million student enrollments (FRBSTL, 2017, p. 15). Covering a wide variety of topics key to the personal finance and economic education mission of the Federal Reserve Bank, the goal of the Econ Lowdown resources is to increase economic and financial literacy among high school and

college students: 136 of those resources are focused on the topic of personal finance.

Created in 2011, "The Time Value of Money" is an online module aligned with several of the K-12 Voluntary National Content Standards in Economics (CEE, 2010). Financial education and economic education are explicitly linked by the module authors, who state in the welcome page of the online module that "The financial security that comes with wealth accumulation requires an understanding of the time value of money". The module is organized in five different content sections - or lessons, blending text, audio, animations, concept checks, and short quizzes. This module contains 13 pre-test multiple-choice questions administered to determine the student's baseline of knowledge - thus serving as a proxy for pre-existing knowledge. At the end of the module the student answers the same 13 multiple-choice questions in a post-test administered to determine the magnitude of the added learning. The first column in table 2 shows the statements of the pre- and post-test multiple-choice questions. A complete preview of "The Time Value of Money" online module is accessible at econlowdown.org to any instructor who registers, at no cost, on the site. According to the Econ Lowdown website this module is expected to require 3 hours to complete. This estimate should be evaluated with some skepticism as it is not an average of user experiences per se. Moreover, all of the online modules available through econlowdown.org can be paused at any point after starting. The online platform records the last point of progress so the students can pick up where they left. Thus, any empirical measurement of the average time-on-task needed to complete a module is not currently possible.

In 2016 the content of "The Time Value of Money" online module was chunked into five smaller online modules precisely matching the individual sections in the original, or long-form, module: "Opportunity Cost", "Inflation", "Paying & Receiving Interest", "Present Value", and "Predicting the Future." Each of the short-form modules replicated the organization of the long-form module: pre-test, lesson, and post-test. Moreover, several of the pre-test and post-test multiple-choice questions from the long-form module were embedded in the corresponding short-form modules. Table 2 shows the chunking of the long-form module in terms of the pre-test and post-test multiple-choice questions. Complete previews of the "Opportunity Cost", "Inflation", "Paying & Receiving Interest", "Present Value", and "Predicting the Future" online modules are accessible at econlowdown.org to any instructor who registers, at no cost, on the site. According to the Econ Lowdown website each of the short modules are expected to require 15 minutes to complete. These estimates should be evaluated with some skepticism as the chunking of "The Time Value of Money" online module resulted in no reduction in actual instructional material.

3.3 Procedure

Unable to randomly assign student participants to different modules we adopted a two-group pre- and post-test quasi-experimental design. While all different modules are simultaneously available to instructors through econlowdown.org we eliminate from our sample those students who have completed the long-form module, “The Time Value of Money”, and any of the short-form modules (“Opportunity Cost”, “Inflation”, “Paying & Receiving Interest”, “Present Value”, and “Predicting the Future”) based on it. Thus, there is no overlap in student populations across the modules under study.

Table 2: Module chunking by pre/post-test question

Long-form “The Story of Unemployment” module questions	Short-form module
Other than the price I pay, goods and services I purchase today cost me nothing. All decisions involve costs. Opportunity cost is If you lend \$500.00 to your brother, what is your opportunity cost?	“Opportunity Cost”
Which of the following is an example of inflation?	“Inflation”
Interest is (payment) Interest is (income)	“Paying & Receiving Interest”
Present value is Having an understanding of present value:	“Present Value”
An annuity is:	“Predicting the Future”
I plan to increase the amount of money I save each month Having an understanding of future value: Saving is	N. A.

Moreover, the large number of students enrolled and active in the short-form modules, relative to the number of students enrolled and active in the long-form module, implies very small statistical margins of error in our findings. Those margins of error, predicated on the assumption that students enrolled in Econ Lowdown online modules – regardless of format/length – belong to the same general population, range between 0.37 % and 1.05 %. In other words, comparisons between

student groups enrolled in the aforementioned Econ Lowdown online modules are reliable, in the context of a quasi-experimental study design, due to two factors: (i) the target audience of the online module is the K-12 student population and more than 95 % of enrolled users are middle/high school students; and (ii) the number of students completing each module is no less than 5 000 - thus side-stepping potential small sample biases.

Finally, as in any study design lacking a strict random assignment of participants to specific groups, the possibility of positive selection sampling bias should also be highlighted. In other words, it is possible that instructors keenly attuned to the cognitive load capacity/ability of their students may choose to assign low-ability students a sequence of short-form modules – rather than a single long-form module – in order to boost their completion rates, learning gains, and information absorption. Unfortunately, due to the strict privacy protection rules governing the collection of user data by the Federal Reserve Bank of St. Louis, this dataset contains no demographic information about individual students. Thus, we cannot control for individual learner characteristics and ascertain with confidence the absence of positive selection sampling bias.

3.4 Data analyses

We document the pedagogical benefits of chunking online learning materials by reporting three sets of test-level descriptive statistics and one set of item-level descriptive statistics. Specifically, we quantify:

- ▶ Completion rates, by computing the percentage of students completing both the pre- and post-tests as a fraction of the total number of students who started work on the module;
- ▶ Gains in test scores, by comparing (i) mean differences in pre- and post-test scores among all students in each course and (ii) mean differences in pre- and post-test scores among students within the same quartile of pre-test scores. Our decision to employ the second metric of student learning is informed by the work of Asarta and Schmidt (2017), who note that “broad comparisons of student performance between instructional modes using class-wide means may obscure performance differences that could be occurring within subgroups of students” (Asarta & Schmidt, 2017, p. 30);
- ▶ Changes in information absorption, by comparing the percentage of item-level correct answers to each of the post-test questions included both in the long-form module and in any given short-form module.

4 Findings

4.1 Increased completion rates

Table 3 shows the completion rates for each of the online modules, indicating increases in student persistence in short-form modules ranging between 10 % and 14 %, relative to the long-form module.

Table 3: Completion rates by module

Module	Completion Rate
"Time Value of Money"	84 %
"Opportunity Cost"	96 %
"Inflation"	95 %
"Paying & Receiving Interest"	94 %
"Present Value"	98 %
"Predicting the Future"	97 %

These findings should naturally be interpreted with caution. Since the long-form and short-form modules present students with vastly different time demands and intellectual burdens, a fully articulated comparison of completion rates must consider those differences. For example, the fact that some students might have engaged with more than one section of the long-form module before dropping out would put them ahead, in terms of learning effort, of those students simply completing one of the short-form modules. Unfortunately, the data set we work with does not contain information about individual time-on-task for each section of a module so we cannot evaluate completion rates with that degree of granularity.

4.2 Gains in student learning

As table 4 shows, although statistically significant gains in mean scores are documented in three short-form modules – relative to the long-form module – in the other two short-form modules the mean scores are either unchanged or lower. Also, the variances in post-test and pre-test score differences are higher in all the short-form modules, suggesting a wider dispersion of pre-existing knowledge and intellectual ability.

Table 4: Differences in post/pre-test scores by module (all students)

Module	Difference in post/pre-test scores	
	Mean	Std. Dev.
"Time Value of Money"	18	21
"Opportunity Cost"	15***	28***
"Inflation"	20***	34***
"Paying & Receiving Interest"	26***	32***
"Present Value"	25***	31***
"Predicting the Future"	18	30***

Annotations: Asterisks denote significance level (***p < .01, **p < .05, *p < .1)

In order to analyze gains in student learning associated with the length of the online module – while taking into consideration pre-existing knowledge – we first create 4 groups of students according to their pre-test scores (i. e. 0-25 %, 26-50 %, 51-75 %, and 75-100 %) and then quantify their learning gains in terms of differences between post-test and pre-test scores. Note that in order to evaluate gains in student learning across identical amounts of educational content we are comparing the post-test scores of students who only completed the long-form online module "The Time Value of Money" (N = 7 456) to those of students who only completed all 5 of the short-form online modules based on it (N = 1 849). We have summarized key patterns in student learning in table 5 and table 6.

Although the proportion of students in the first and third pre-test score quartiles is almost identical across module(s) – 4 % and 45 %, respectively - a relatively larger number of students register positive changes in terms of post-test scores when completing the 5 individual short-form modules rather than when completing the single long-form module – 99 % vs. 97 % and 90 % vs. 80 % – respectively. Similarly widespread are the pre- to post-test score gains among students in the second and fourth pre-test quartiles: 93 % and 89 %, respectively, of students who complete the 5 individual short-form modules register score gains, whereas as many as 88 % and 63 %, respectively, manage to do so when completing the single long-form module.

Table 5: Frequency and magnitude of difference in pre- and post-test scores by quartile: "Time Value of Money" long module

Pre-test scores (%)	0 to 25	26 to 50	51 to 75	76 to 100
# of Students	278	1 474	3 414	2 290
(% of total)	4 %	20 %	46 %	31 %
Difference in Post and Pre-Test Scores				
Negative Change	1 %	6 %	11 %	13 %
-100				
-80				
-60				
-40		1 %	3 %	2 %
-20	1 %	6 %	8 %	11 %
No Change	2 %	6 %	9 %	23 %
20	10 %	19 %	31 %	51 %
40	21 %	31 %	45 %	12 %
60	19 %	25 %	4 %	
80	33 %	13 %		
100	13 %			
Positive Change	97 %	88 %	80 %	63 %

Table 6: Frequency and Magnitude of Difference in Pre and Post-Test Scores by Quartile: All 5 Short Money Modules Combined

Pre-test scores (%)	0 to 25	26 to 50	51 to 75	76 to 100
# of Students	76	784	826	163
(% of total)	4 %	42 %	45 %	9 %
Difference in Post and Pre-Test Scores				
Negative Change	1 %	7 %	10 %	10 %
-100				
-80				
-60				
-40		1 %	1 %	0 %
-20	1 %	6 %	8 %	10 %
No Change	0 %	1 %	1 %	1 %
20	11 %	19 %	43 %	84 %
40	22 %	30 %	41 %	5 %
60	21 %	31 %	7 %	
80	39 %	14 %		
100	5 %			
Positive Change	99 %	93 %	90 %	89 %

These findings should be interpreted with caution informed by the possibility, discussed above, of positive selection sampling bias. Nonetheless, the fact that the long-form online module “The Time Value of Money” was created in 2011 and the five short-form modules based on it were created in 2016 undoubtedly weighs on the difference in sample sizes reported in table 5 and table 6. Simply put, “The Time Value of Money” module has been available to assign by instructors much longer than the five short-form modules based on it.

4.3 Increased information absorption

Table 7 reports the percentages of correct answers to those post-test questions common to both long-form and short-form modules. The stars denote statistically significant differences in the percentages. Our findings are mixed here, as the changes in the level of information absorption at the test-item level are inconsistent – in terms of sign and magnitude – across module lengths. For example, although it appears that personal finance instruction related to the concept of present value and inflation is more effectively delivered through short-form modules, the opposite

seems to be the case regarding instruction related to paying and receiving interest and to defining and applying the concept of opportunity cost. As for instruction related to the concept of future value the length of the module does not seem to have any impact in the level of information absorption.

These findings might be influenced by either the presence or the absence of transfer among personal finance education topics. Since we cannot establish the sequence in which the short-form modules were completed, we cannot speak of specific sequences of instruction impacting the level of information absorption at the item level. In other words, it might be that some particular ways of sequencing the topics of the short modules are inferior or superior, in terms of educational value, to the topic sequencing adopted in the long module. For example, a solid understanding of price inflation facilitates a more robust understanding of present value, yet we cannot ascertain whether or not – nor how many – students completed the Inflation module before completing the Present Value module.

Table 7: Item-level analysis of post-test questions

Question	Percent of correct answers in post-test	
	Long-form module	Short-form module
Other than the price I pay, goods and services I purchase today cost me nothing.	87 %	78 %***
All decisions involve costs.	89 %	81 %***
Opportunity cost is	76 %	77 %***
If you lend \$500.00 to your brother, what is your opportunity cost?	71 %	68 %***
Which of the following is an example of inflation?	77 %	82 %***
Interest is (payment)	79 %	76 %***
Interest is (income)	81 %	72 %***
Present value is	70 %	72 %***
Having an understanding of present value:	73 %	87 %***
An annuity is:	89 %	90 %

Annotations: Asterisks denote significance level (***p < .01, **p < .05, *p < .1)

5 Discussion and conclusions

This study has documented increases in student persistence associated with shorter formats of online modules, thus endorsing a design strategy where chunking learning content “avoids information overload” and increases completion rates (Aragon & Johnson, 2008, p. 155). We have also found evidence of larger gains in student learning, computed as the difference between post-test and pre-test scores, particularly among students with low pre-test scores. These findings are aligned with the work of Clark and Mayer (2016) and Mayer and Moreno (2003). Finally, we have documented statistically significant increases in information absorption at the item level in several short-form modules, relative to the long-form module, although our findings in this regard lack consistency and are sometimes contradictory. Overall, the findings from this study endorse the adoption of pedagogical strategies where financial education is delivered in curricular units of relatively small size, rather than as a single long-format lesson.

Additional work is needed to cement our findings. Stemming from the quasi-experimental design of our study, we have qualified our findings in terms of being potentially influenced by positive selection sampling bias. In that regard, an experimental design with fully fledged random assignment of participants to treatments and controls would help assert the robustness of our findings. Moreover, in such a setting researchers could explore the potential impact of content sequencing on overall learning gains. That is, whether it helps or hinders personal financial education to sequence instructional topics in any particular way.

Our work can be extended by pursuing several avenues of research. A study of personal finance misconceptions might shed light into the uneven degrees of information absorption recorded at the test-item level. A parallel analysis of the effectiveness of distractors in personal finance multiple-choice questions should complement this line of work. Along these lines, we suggest decomposing the difference in scores between pre-test and post-test according to the method proposed by Walstad and Wagner (2016) and already employed by Happ, Zlatkin-Troitschanskaia and Schmidt (2016). This method allows researchers to identify the different types of added-learning (i. e. retained, positive, negative, and zero) associated with the different length formats of the online modules. Evidence of differences in the type of added-value learning associated with the length or the topic of the learning module would help instructors select the format and pedagogy fitting the student learning goals best.

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A survey of personal finance understanding: Does it matter when high school students take the course?

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The United States has experienced an expansion of high school personal finance course mandates over the past two decades (CEE, 2016). Those mandates raise challenges for local school entities as they seek to offer students a personal finance education with scarce resources. Even in states without course mandates, many local school entities require personal finance courses for graduation or, at the very least, offer personal finance electives for their high school students. In the implementation of these efforts, whether required or voluntary, the question arises as to when in a high school student's secondary education is optimal for the student to take a capstone personal finance course. In this survey paper, we use pre- and posttest data from the Keys to Financial Success program to show that while younger students begin their Keys courses with a relatively lower level of personal finance knowledge than their older high school peers, by the end of the course those two groups of students exhibit, on average, the same personal finance knowledge. This result supports the offering of a personal finance capstone course at any time in the students' high school schedule with no measurable effect on their end-of-course personal finance knowledge.

Keywords: Financial literacy – K-12 schools – Keys to financial success – personal finance education

1 Introduction

Financial literacy has been defined as the knowledge of financial concepts and products contributing to effective financial decision-making and planning that affect income and wealth (Gale & Levine, 2011; Hastings, Madrian & Skimmyhorn, 2013). The potential positive influence that financial knowledge can have on financial behaviors has been well documented in the literature (Hastings et al., 2013; Hilgert, Hogarth, Vitt & Anderson, 2003; Lusardi & Mitchell, 2014; Robb & Woodyard, 2011; Urban, Schmeiser, Collins & Brown, 2015). However, while many have argued that the benefits associated with educating citizens on personal finance matters outweigh the costs, the average world citizen has been found to be financially illiterate. For example, Lusardi, Mitchell, and Curto (2010) examined data from the 1997 National Longitudinal Survey of Youth (NLSY) and found that young people in the United States have low levels of financial literacy. Atkinson and Messy (2012) examined Organization for Economic Co-operation and Development (OECD) data and found a significant lack of personal finance knowledge among adults in the 14 countries studied. Butters, Asarta and McCoy (2012) found that high school students that competed in the 2011 National Personal Finance Challenge performed poorly

overall and on the four standards in the Financial Fitness for Life High School Test (FFFL-HS Test).

In recent years, increased emphasis has been placed on providing personal finance education programs in the K-12 system, and on studying their effectiveness. In fact, a number of research studies have shown that well designed, administered, and evaluated financial education programs can have positive effects on the personal finance knowledge of young people (Asarta, Hill & Meszaros, 2014; Harter & Harter, 2009; Hill & Asarta, 2016; Walstad, Rebeck & MacDonald, 2010). In their overview of the financial literacy programs offered in the United States, Fox, Bartholomae and Lee (2005) advocate for programs to be grounded in the five-tiered Jacob's (1988) application and evaluation approach in order to be effective. Based on Jacobs' approach, a well-designed and evaluated program should focus on properly training teachers to deliver well-defined content, coupled with a rigorous evaluation process using valid and reliable instruments in pre- and posttest settings.

This paper follows a simple survey approach, similar to that used by Butters and Asarta (2011), Förster, Happ and Molerov (2017), and Walstad and Rebeck (2001), to examine the age question in financial education. We begin our work with a literature review and the presentation of our research questions, followed by a description of the Keys to Financial Success high school program, and the data used in the study. Our survey results are presented and discussed in section four, followed by our concluding discussion and comments in section five.

2 Literature and research questions

A recent comprehensive review of the personal finance landscape, issues, and key studies (Walstad et al., 2017) devoted an entire section to presenting and discussing youth findings (for individuals between 11 and 18 years of age). This review highlighted the importance of integrating good curricula, useful resources, effective teacher-training opportunities, and appropriate evaluation tools for demonstrating the effectiveness of financial education on the knowledge and behaviors of young students.

Several studies have examined the effectiveness of the Financial Fitness for Life (FFFL) curriculum on students' personal finance knowledge. The FFFL is one of five youth curricula highlighted in Walstad et al. (2017), and the source of the assessment instrument used in this survey. Swinton, DeBerry, Scafidi, and Woodard (2007) found that students whose teachers attended professional development training on the FFFL curriculum scored significantly higher on Georgia's required end-of-course economics test than students whose teachers did not attend the training. Similarly, Walstad and Rebeck (2005) found that students taught using the FFFL curriculum by

trained teachers had higher personal finance achievement scores on the Financial Fitness for Life High School Test (FFFL-HS Test) than their counterparts in a comparison group. Harter and Harter (2009) studied the effectiveness of the FFFL curriculum in elementary, middle, and high school classrooms in eastern Kentucky, finding that high school students taught eight or more of the FFFL lessons by trained teachers increased their personal finance knowledge, as measured by the FFFL-HS Test, by a larger degree than their counterparts in a control group. Asarta et al. (2014) found that high school students taught the 52-lesson Keys to Financial Success high school program increased their personal finance knowledge by over 25 percentage points. Hill and Asarta (2016) found that female students in the Keys to Financial Success courses slightly outperformed their male counterparts overall on the FFFL-HS Test. It is important to note that the amount of instruction time varied across the studies presented above. In Swinton et al. (2007), the amount of instruction time using the FFFL lessons is unknown and likely varies significantly across their sample. For the other studies, the maximum amount of instruction time in personal finance is a U.S. semester, or approximately 90 days in Asarta et al. (2014). In all of these studies, end-of-course or end-of-curriculum knowledge gain was the success measure. Unfortunately, measurement of long-term knowledge retention and changes in individual financial behaviors were beyond the reach of these studies.

A number of popular high school personal finance curricula beyond the FFFL have also been studied in carefully crafted research efforts. Walstad et al. (2010) studied the effect of the Financing Your Future (FYF) curriculum on personal finance knowledge using 17 items from the FFFL-HS Test and 13 items they wrote to assess achievement on FYF-specific content. They found that students taught the FYF lessons during approximately six hours of instruction outscored their counterparts in a control group by nearly 19 percentage points on the hybrid FFFL-FYF test instrument. Danes, Rodriguez, and Brewton (2013) studied the effectiveness of the High School Financial Planning Program (HSFPP) on a sample of 4 794 high school students in 130 U.S. high schools. They found that students' financial knowledge and behaviors, as measured by a post-then-pre self-evaluation method, improved after completion of the HSFPP curriculum. The amount of instruction time in the Danes et al. study varied considerably, with 50 percent of the teachers in the study reporting that they spent 10 or more weeks teaching their students using the HSFPP curriculum.

While we have not been able to successfully identify any survey studies that directly examine the influence of a student's age on her personal finance knowledge improvements following instruction, the test manual for the FFFL-HS Test (Walstad & Rebeck, 2005) and the manual for the Test of Financial Literacy (TFL) (Walstad & Rebeck, 2016) both offer overall grade level test results for students having received

such instruction. For the FFFL-HS Test, the overall average test performance of Grade 11 students participating in the norming of the test was found to be approximately 7 percentage points higher than that of participating Grade 12 students after instruction. That finding is consistent with the descriptive statistics provided in the TFL manual, although the difference in performance was reduced to approximately 1.5 percentage points. The TFL manual, however, also reports overall posttest results for students in Grade 10 and shows that those students performed lower, by approximately 10 to 11 percentage points, than students in grades 11 and 12 after instruction. Prior to instruction, the descriptive statistics provided in the manuals for the FFFL-HS Test and the TFL both point to students in lower high school levels having less personal finance knowledge than students in higher high school levels. It is important to note that neither test manual provides overall test results for students in Grade 9, the first of four grades in the U.S. high school system.

To our knowledge, there have been no survey studies examining the degree to which a young student's age impacts her uptake of personal finance knowledge. To that end, our first research question examines whether or not there are differences in personal finance knowledge between younger and older high school students prior to personal finance instruction. Then, we progress to examining whether or not a personal finance course can close any potential gaps in knowledge between high school students of different ages. Finally, based on the two previous questions, our concluding research question revolves around the title of this manuscript: does it matter when high school students take a personal finance course?

3 Method

3.1 The Keys to Financial Success course

In this survey paper, we use a rich dataset of pre- and posttest scores obtained from students participating in one-semester Keys to Financial Success courses offered in Delaware, New Jersey, and Pennsylvania. The Keys curriculum was developed thanks to a partnership between the Federal Reserve Bank of Philadelphia and the University of Delaware Center for Economic Education and Entrepreneurship¹. As described extensively in Asarta et al. (2014), and Hill and Asarta (2016), Keys is a 52-lesson model for a capstone, high school personal finance course. Keys was assembled using lessons from the high school versions of Financial Fitness for Life (FFFL) (Gellman

¹ The authors of this paper lead the economic education programs at the Reserve Bank and the Center, respectively. The first author has, in partnership with two other economic educators, team-taught the annual Keys teacher-training program since 2005 and has led the team that updates the Keys curriculum since 2010. The second author has led the Center since 2013 and supports the continuation of the Keys program in Delaware.

& Laux, 2011), Learning, Earning, and Investing (LEI) (Caldwell et al., 2004), Practical Money Skills for Life (VISA, 2000), and additional activities and curriculum materials developed by the two partners. All of the lessons in the Keys model approach the teaching of personal finance from the perspective of economics principles and cost-benefit analysis. The lessons make use of active- and collaborative-learning teaching methods and are flexible enough to be taught by teachers in family and consumer sciences, business education, social studies, and mathematics departments.

The Keys program requires participating schools to offer the course at least once each academic year. Keys teachers are trained extensively during a 30-hour professional development program in the summer before they first teach the course. The professional development program includes presentations of personal finance content by Federal Reserve staff, lesson demonstrations, hands on activities, and training on online resources. Follow-up training and support is offered to participating teachers throughout the academic year and via an invitation to return to the Federal Reserve or the University of Delaware for supplemental professional development training. Figure 1 provides the typical structure, by theme, of a 16-week Keys course. A typical course is divided into nine themes—goals and decision-making, careers and planning, budgeting, saving and investing, credit, banking services, transportation issues, housing issues, and risk protection. While teachers are free to present their own personal finance course based on the recommended curriculum, they are strongly urged to follow the plan as laid out in the pacing guide provided in figure 1. According to the plan, students spend the most amount of time in the saving and investing, and the credit themes. The least amount of time is spent on banking services, transportation issues, and housing issues.

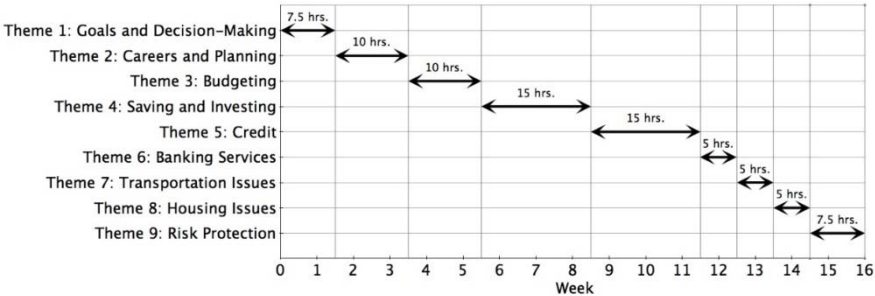


Figure 1: Structure of a typical 16-week keys course

Table 1 provides a snapshot of themes, lessons, and curricula sources utilized in the Keys course. Each of the nine themes includes a number of key lessons. For example, “Budgeting” includes lessons on why students should have a budget, how to plan in order to fund the student’s goals, why the government taxes income, how to

manage money, and how to prepare a budget. As can be seen in Table 1, the combination of the nine themes and the many lessons offered in Keys makes the program a robust and comprehensive resource for teaching personal finance at the high school level.

Table 1: Keys themes and lessons with correlations to other curriculum materials

Keys lesson number	Keys lesson title	FFFL2001	FFFL2011	Other
Theme 1: Goals & decision making				
1.1	How to really be a millionaire	1	1	
1.2	The economic way of thinking	2	2	
1.3	Making decisions	3	3	
1.4	How can we decide?	3	3	PMS, K
1.5	How to set goals			K
Theme 2: Careers & planning				
2.1	What do you mean I have to earn an income?			K
2.2	Making a job	5	5	
2.3	Invest in yourself			L(3)
2.4	Why some jobs pay more than others	6	6	
2.5	What else is out there and how would I find it?			K
2.6	Dreams and plans			K
Theme 3: Budgeting				
3.1	Why should I have a budget?			K
3.2	Funding my goals by planning			K
3.3	Uncle Sam takes a bite: Forms, forms, forms	7	7	
3.4	Managing your money	20	8	
3.5	Preparing my own budget			K

Keys lesson number	Keys lesson title	FFFL2001	FFFL2011	Other
Theme 4: Saving & investing				
4.1	Pay yourself first, early, and often	8	20	
4.2	Why should I have a savings plan?			K
4.3	How do I decide whether to save, invest, or both?			L(12)
4.4	There is no free lunch in investing	9	21	
4.5	Financial institutions in the U.S. economy			L(11)
4.6	Reading the financial pages: In print and online			L(5)
4.7	Research companies			L(13)
4.8	How to buy and sell stocks and bonds			L(8)
Theme 5: Credit				
5.1	Extra "credit": Cash or credit			K
5.2	What is credit?	11	11	
5.3	Cash or credit? Which should I use and when?			FFFL-MS(15)
5.4	Making credit choices	12	12	K
5.5	Finding your way through the credit maze			C(18)
5.6	Applying for credit	13	13	
5.7	All about interest	14	14	
5.8	Shopping for a credit card	15	15	
5.9	Consumer credit protection	18	18	K
Theme 6: Banking Services				
6.1	What financial institutions can do for me			K
6.2	Checking accounts: Not all are created equal	21	9	K
6.3	Practice, practice: How to record deposits, Keep a running balance, and reconcile a checking account	21	9	

Keys lesson number	Keys lesson title	FFFL2001	FFFL2011	Other
Theme 7: Transportation issues				
7.1	How do you get wheels and what are the costs?			PMS, K
7.2	What do I want and what can I afford?	3	3	PMS, K
7.3	What are warranties and service contracts and why do I need them? Or do I?			K
7.4	Have I got a deal for you! Loan or lease?	17	17	
7.5	How costly will my car insurance be?	22	10	PMS
Theme 8: Housing issues				
8.1	Moving into my own place	3	3	PMS
8.2	How comfortable will my place be?			K
8.3	Tired of renting: Should I buy my own house?			K
8.4	Can I really afford that house?			PMS, K
8.5	Obtaining financing: Shop for your mortgage	16	16	PMS, K
Theme 9: Risk protection				
9.1	Let the buyer beware			K
9.2	Credit scams, schemes, identity theft, and privacy issues	19	19	K
9.3	Why insurance and how does it work?			VE(1)
9.4	The basics of life insurance			VE(2)
9.5	Everything you ever wanted to know about automobile insurance			VE(3)
9.6	Why renter's insurance?			VE(4)

Annotations: C denotes Capstone-High School. FFFL-MS denotes Financial Fitness for Life, Grades 6-8. K denotes original content developed for Keys. L denotes Learning, Earning, and Investing, Grades 9-12 (2004 Edition). PMS denotes Practical Money Skills. VE denotes Virtual Economics 4.5. Lesson numbers, where applicable, appear in parentheses.

3.2 Test instrument

Test scores reported in this paper were obtained using the Financial Fitness for Life High School Test (FFFL-HS Test), a valid and reliable measure of personal finance knowledge developed by the Council for Economic Education (Walstad & Rebeck, 2005). The Council for Economic Education has recently made the FFFL-HS Test items available to educators via econedlink.org. Walstad and Rebeck (2005) showed, using the norming sample, that the test exhibits good internal consistency ($\alpha = .86$) and accurately measures financial literacy. As described in Asarta et al. (2014), four questions from the 50-question FFFL-HS Test (questions 12, 13, 16, and 49) were eliminated from the test instrument and replaced with four “in-house” items to better represent the full coverage of the Keys course². These four items were not normed and are not included in the results presented in this paper. The alpha coefficient resulting from the administration of the remaining 46 questions to the sample examined in this study is 0.90, which, as with the norming sample, shows strong internal consistency. The first edition of the National Standards in K-12 Personal Finance Education (Jump\$tart Coalition, 2002) was used by the FFFL-HS Test authors to establish the standards and concept benchmarks measured by the test instrument. Walstad and Rebeck (2005) delineate which questions pertain to each of the four standards (Income, Money Management, Spending and Credit, and Saving and Investing) and each of the 26 concept benchmarks.

3.3 Descriptive statistics

In table 2, we present the descriptive statistics for our sample of 458 students who took one-semester Keys courses during the 2012 academic year. Together, these students were in 18 class sections taught by 12 different teachers. Female students represented 57 percent of the sample. Nearly half of the students in the sample were 15 years of age or younger at the time they took the pretest at the beginning of their Keys course. Approximately 55 percent of the students in the sample completed the course during the fall semester, with the other 45 percent taking the class in the spring.

² The four “in-house” questions were written by the Keys to Financial Success curriculum authors to assess credit scores, identity theft, the purpose of budgeting, and check cashing services. These questions were added since these topics were not assessed by the original 50-question FFFL-HS Test. Reliability of these four questions is unknown. To ensure comparison with other studies that employ the FFFL-HS Test and maintain strong reliability, results from these four author-created questions are not included in the metrics reported in this paper.

Table 2: Descriptive statistics (students N = 458; sections N = 18; teachers N = 12)

Variable	Percent	n
Student gender		
Female	.57	259
Male	.43	199
Student age at pretest		
≤ 15 years	.47	217
16 years	.16	74
17 years	.29	134
18 years	.06	28
≥ 19 years	.01	5
Participating students		
2011 – Fall	.55	254
2012 – Spring	.45	204
Participating sections		
2011 – Fall	.55	10
2012 – Spring	.45	8

For the purposes of the survey results presented below, the sample was divided into two groups: Younger students includes all students who were 15 years of age or younger at the time they took the pretest. Older students includes all students who were 16 years of age or older at the time they took the pretest.

4 Results

4.1 Pretest scores

Table 3 presents the overall, standard, and concept specific pretest and posttest average performance for younger versus older students. The overall average pretest score was 38.91 percent correct for younger students and 46.42 percent correct for older students. The knowledge advantage exhibited by older students at the pretest level is consistent with prior results reported by Walstad and Rebeck (2005; 2016). In each of the four standards of the FFFL-HS Test, younger students exhibited significantly less personal finance knowledge at the pretest level than their older counterparts. In the majority of the more disaggregated FFFL-HS Test concepts, the

younger students also exhibited less personal finance knowledge at the pretest level than the older students. Taken together, these results show that younger Keys students come to their high school personal finance capstone course with significantly less personal finance knowledge than their older counterparts, a finding that was expected based on consumer socialization theory (Denhardt & Jeffress, 1971; Ward, 1974) and the descriptive results presented in several personal finance test manuals.

Table 3: Pre- and posttest scores for younger versus older students³

	Items (FFFL)	Younger students		Older Students	
		Pre	Post	Pre	Post
A. Income		45.67 ^a	74.76	53.20 ^a	74.73
1. Sources of income	1, 11, 12, 13	56.68	84.10	57.68	85.27
2. Determinants of income	9, 14, 15, 16, 17	44.47 ^a	78.34 ^d	54.56 ^a	73.44 ^d
3 Taxes and transfer payments	18, 19, 20	39.94 ^a	63.75 ^d	48.41 ^a	69.43 ^d
B. Money Management		41.14 ^a	66.79	50.01 ^a	67.28
1. Limited resources and choice	5, 8	41.47 ^a	64.52	50.62 ^a	58.92
2. Opportunity cost	7	17.97 ^a	56.22	33.20 ^a	57.26
3. Personal financial responsibility	6	82.95	88.48	81.74	85.48
4. Financial decision making	10	32.72	74.19	38.59	78.01
5. Inflation and investing	28	20.28	45.16	25.31	45.64
6. Insurance, risk management	46, 47, 48, 49, 50	48.62 ^a	67.97	56.85 ^a	69.29
7. Budgeting	41, 42, 43	31.49 ^a	65.13	40.66 ^a	65.01
8. Use of money management tools	44, 45	45.62 ^a	70.74	60.37 ^a	76.35

³ Values for the independent samples t-tests and tests of proportions used to test the differences in mean percentage correct shown in this table are available from the authors upon request.

		Younger students		Older Students	
	Items (FFFL)	Pre	Post	Pre	Post
C. Spending and credit		30.08 ^a	62.84	35.91 ^a	60.73
1. Benefits and costs of spending	3, 4	37.56 ^b	64.52 ^d	43.57 ^b	58.09 ^d
2. Information on products					
3. Costs and benefits of payment methods	31, 32	42.17 ^a	71.43	51.87 ^a	71.16
4. Risk and credit	35, 36	39.17 ^a	67.28	56.43 ^a	68.26
5. Sources of credit	37, 40	20.97	54.15	22.20	51.04
6. Credit history and records	33, 34	18.89	56.68	18.26	59.54
7. Managing financial difficulties					
8. Rights and responsibilities of buyers, sellers, and creditors	38	13.36	63.13 ^c	10.37	51.87 ^c
D. Saving and investing		39.17 ^a	64.60	46.47 ^a	66.96
1. Saving and investing	21, 23	19.82 ^a	41.47 ^c	29.67 ^a	54.98 ^c
2. Reasons for saving and investing	2	82.49 ^a	96.77	92.95 ^a	98.34
3. Risk, return, and liquidity investment	25, 26, 27	40.40 ^a	65.75	50.62 ^a	67.50
4. Buy and sell investments	29, 30	43.78 ^b	76.96	51.24 ^b	79.25
5. Rate of return on investments	22, 24	29.03	51.38	26.14	46.06
6. Sources of investment information	39	41.94 ^b	76.96	52.28 ^b	75.10
7. Government and saving and investment					
Total		38.91 ^a	66.88	46.42 ^a	67.09

Annotations: ^aDifference in pretest means is statistically significant at the 1 % level. ^bDifference in pretest means is statistically significant at the 5 % level. ^cDifference in posttest means is statistically significant at the 1 % level. ^dDifference in posttest means is statistically significant at the 5 % level.

Table 4: Gains in FFFL-HS Test scores for younger versus older students⁴

	Younger students gain	Older students gain	Difference in gain
A. Income	29.08	21.53	-7.55**
1. Sources of income	27.42	27.59	0.17
2. Determinants of income	33.87	18.88	-14.99**
3 Taxes and transfer payments	23.81	21.02	-2.79
B. Money and management	25.65	17.26	-8.39**
1. Limited resources and choice	23.04	8.30	-14.74**
2. Opportunity cost	38.25	24.07	-14.18**
3. Personal financial responsibility	5.53	3.73	-1.80
4. Financial decision making	41.47	39.42	-2.06
5. Inflation and investing	24.88	20.33	-4.55
6. Insurance, risk management	19.35	12.45	-6.91*
7. Budgeting	33.64	24.34	-9.30**
8. Use of money management tools	25.12	15.98	-9.14*
C. Spending and credit	32.76	24.82	-7.94**
1. Benefits and costs of spending	26.96	14.52	-12.44**
2. Information on products			
3. Costs and benefits of payment methods	29.26	19.29	-9.97*
4. Risk and credit	28.11	11.83	-16.28**
5. Sources of credit	33.18	28.84	-4.34
6. Credit history and records	37.79	41.29	3.50
7. Managing financial difficulties			
8. Rights and responsibilities of buyers, sellers, and creditors	49.77	41.49	-8.28

⁴ Values for the independent samples t-tests and tests of proportions used to test the differences in mean gain scores shown in this table are available from the authors upon request.

	Younger students gain	Older students gain	Difference in gain
D. Saving and investing	25.43	20.48	-4.95*
1. Saving and investing	21.66	25.31	3.65
2. Reasons for saving and investing	14.29	5.39	-8.89**
3. Risk, return, and liquidity investment	25.35	16.87	-8.47*
4. Buy and sell investments	33.18	28.01	-5.17
5. Rate of return on investments	22.35	19.92	-2.43
6. Sources of investment information	35.02	22.82	-12.20*
7. Government and saving and investment			
Total	27.97	20.67	-7.30**

Annotations: *Difference in mean gain scores is statistically significant at the 5 % level. **Difference in mean gain scores is statistically significant at the 1 % level.

4.2 Posttest scores

At the posttest level, younger students in one-semester keys courses perform as well as their older counterparts on nearly every part of the FFFL-HS Test. The overall average posttest score was 66.88 percent correct for younger students and 67.99 percent correct for older students, with the difference in these means not being statistically significant. Furthermore, the average posttest scores of younger and older students were statistically equivalent on the four standards of the test. At the concept level, older students significantly outperformed younger students on taxes and transfer payments (by 5.68 percentage points) and saving and investing (by 13.51 percentage points). Younger students outperformed their older counterparts, however, on three of the FFFL-HS Test concepts: determinants of income (by 4.90 percentage points), benefits and costs of spending (by 6.43 percentage points), and rights and responsibilities of buyers, sellers, and creditors (by 11.26 percentage points).

4.3 Gain scores

Table 4 presents the pretest to posttest gains in FFFL-HS test scores for younger and older students enrolled in one-semester keys courses. Younger students exhibit knowledge gains that are significantly larger than those of their older counterparts in the overall FFFL-HS Test and in each of the four standards of the test. At the overall test level, younger students gained 27.97 percentage points from pretest to posttest, while older students only gained 20.67 percentage points. At the standard level, the largest gain difference was found in the money management standard,

with younger students improving their personal finance knowledge by 8.39 percentage points more than older students. Finally, at the concept level, the younger students exhibited statistically greater pretest to posttest gains in 13 of the 26 concepts covered in the FFFL-HS Test. The largest gain differential was found in the risk and credit concept at 16.28 percentage points, while knowledge gains between the two groups of students were remarkably similar in the sources of income concept.

5 Discussion

We find that younger students exhibit lower levels of personal finance knowledge than their older counterparts prior to instruction, but also find that a capstone course such as *Keys to Financial Success* can close that gap in just one semester. This result provides evidence that student age may not matter in determining student knowledge outcomes in personal finance at the high school level. Some practitioners have contended that personal finance capstone courses should be targeted to older high school students only since the content presented in those courses may be more immediately relevant to juniors and seniors in high school. However, our results suggest that younger high school students are just as capable of learning about personal finance as older students, and that nothing is likely lost by offering personal finance courses to high school freshmen.

There are a number of limitations to our study. The potential decay of student knowledge after the completion of a course is well documented in many academic disciplines (Bacon & Stuart, 2006; Custers, 2010; Dills, Hernández-Julián & Rotthoff, 2016). While our study is able to measure the gains in student personal finance knowledge from the start to the end of the *Keys* course, we do not know the degree to which that knowledge decays over time. Of particular interest to educational researchers examining the K-12 space has been the knowledge loss that occurs during the typically inactive summer months of vacation (Alexander, Entwisle & Olson, 2007). This knowledge degradation could result in students who take their capstone course, early in their high school career, entering adulthood with less personal finance knowledge than their counterparts who wait to take the course nearer to high school graduation. Additionally, while we know that every teacher whose students' test scores are captured in the study was trained and provided with the same teaching materials, there are unobserved teacher characteristics that are likely correlated with student performance. As Hanushek (1971, p. 288) explains, "There is a considerable part of teaching that cannot be explained by a set of fairly standard variables measuring teachers and classrooms." These unobserved characteristics may include the teacher's teaching style, ability to teach personal finance, and knowledge of the content area. For this reason, multivariate studies generally control for these unobserved characteristics using teacher fixed effects (Butters, Asarta & Fischer, 2011;

Butters, Asarta & Thompson, 2013; Harris & Sass, 2011; Swinton et al., 2007). Additionally, while we document significant increases in personal finance knowledge from pretest to posttest, we do not have the ability to measure the effect that this increased knowledge has on individuals' personal finance behaviors in adulthood. It is worth noting, however, that several recent studies have found that exposure to personal finance instruction can improve youth's financial behaviors (Bruhn, de Souza Leao, Legovini, Marchetti & Zia, 2016; Urban et al., 2015). Finally, the data used in this study is nested in nature. While the nested structure of the data would justify the use of multi-level analysis, the reduced number of level 2 units presents challenges in terms of the reliability of the estimates (Chambers, 2016). Ultimately, even though this study has a number of limitations, it is the first to provide detailed survey results of the stock of personal finance knowledge, and subsequent gains in that knowledge for all high school ages. Our hope is that this survey study will serve as a first step for others to investigate the age question in personal finance education at the high school level.

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Contribution of bank webpages to the development of young adults' financial competence about mortgages

Bärbel Fürstenau and Mandy Hommel

Financial competence has become increasingly important for citizens, especially in decisions about complex financial products, such as mortgages. Mortgages have long-term consequences for individuals' financial situations and potentially for the economy. To prepare for significant decisions, potential first-time homebuyers often consult the internet. Therefore, we analysed whether the information provided online by banks supports the development of financial competence about mortgages. We included webpages of two German banks differing in quality and quantity of information. The study comprised 101 students. They were randomly assigned to one of two experimental groups or a control group. All students answered self-assessment questions about financial knowledge and behaviour and took a knowledge post-test. Students in the experimental groups surveyed the webpages of the respective bank. They were requested to use the information to work on an authentic case that required a decision about taking a loan to buy a single-family house. The decision was to be justified. While doing so, some randomly selected students thought aloud. Results of the post-test did not show significant differences in knowledge between the groups. Further, the experimental groups did not differ in quality of arguments for or against a decision. The think-aloud data show that webpages stimulate statements differently. Also, the data reveal common misconceptions of students. Overall, webpages do not contribute to the development of satisfactory financial competence. The students' arguments and think-aloud data reveal starting points for improvement of webpages or instructional support.

Keywords: bank webpages – financial competence – financial decisions – mortgage

1 Introduction

Recently, many countries have become increasingly concerned about their citizens' level of financial literacy. Citizens need to be financially literate to secure individual and societal financial well-being. The Organisation for Economic Co-operation and Development describes financial literacy as "knowledge and understanding of financial concepts and risks, and the skills, motivation, and confidence to apply such knowledge and understanding to make effective decisions across a range of financial contexts" (OECD, 2013, p. 144).

Since technological developments and deregulation of markets allow direct access to various kinds of financial products and transactions, and since financial institutions have reduced personal counselling, consumers are given more responsibility for financial decisions (Apréa et al., 2016). Those decisions refer to borrowing options, retirement savings or health care, just to name a few (Fernandes, Lynch &

Netemeyer, 2014). Thus, people face situations that are difficult to comprehend. Accordingly, it is necessary that people have a minimum level of financial competence and understand concepts, procedures, effects and risks related to the financial product in question. Especially decisions about complex financial products, such as mortgages, should be based on financial competence.

Before a decision is made, potential borrowers often obtain information by exploring the internet, e. g. bank websites. This approach can be interpreted as “just-in-time” acquisition of knowledge (Fernandes et al., 2014), meaning that necessary knowledge is acquired when it is needed for a specific situation but not beforehand. Just-in-time acquisition of knowledge is compatible with learning approaches in which knowledge should be acquired in authentic environments so that its application and relevance is already obvious in the process of acquisition (e. g. Reinmann, & Mandl, 2006). Thereby, the problem that knowledge acquired in educational settings decays over time or remains inert (Whitehead, 1929) might be reduced.

However, the learning potential of webpages is influenced by the comprehensibility (e. g. quantity, quality and design) of information given (e. g. Groeben, 1982). It may not aim primarily to support user learning but instead to fulfil marketing purposes. As shown by Fürstenau, Hommel, Leopold, Ponce and López (2015, 2016), webpages of banks differ in some respects – among them, the quality and quantity of information provided – and thus may support comprehension of users differently.

Against this backdrop, our exploratory study examines whether just-in-time learning via using webpages supports the acquisition of knowledge about mortgages and the financially literate decision-making of potential borrowers. For that purpose, we selected webpages of two banks in Germany that differ in comprehensibility of the information provided to determine whether webpages support potential consumers in financial competence development or cause misconceptions. The potential of just-in-time learning is discussed, and suggestions for the setup of webpages, as well as starting points for targeted qualification in guided instructional processes, are provided.

2 Developing financial competence about mortgages by using bank webpages

2.1 Financial competence about mortgages

Mortgage loans allow people to purchase a home. Mortgages are offered by banks or other lenders and are often secured against the individual property (EU, 2017, para. 1; GSA, 2017, p. 27). If a person fails to fulfil his or her repayment obligations

and the mortgage has been secured against the property, lenders can seize and resell the home to pay off the loan. Therefore, decisions about mortgages must be considered carefully and should be based on substantial knowledge. For that purpose, consumers need to have clear information about loan conditions and the granting process (EU, 2014/17¹, chapter 2, article 6, para. 1).

Regarding mortgages, the European Parliament's directives (EU, 2014/17) stress, on the one hand, the importance of responsible consumer financial behaviour to avoid possible negative consequences for the financial system, as the global subprime and financial crises has shown. On the other hand, also providers of financial products, e. g. banks and financial intermediaries, are required to act "honestly, fairly, transparently, and professionally" based on information about specific consumer circumstances and reasonable assumptions about the risks for the consumer over the term of the loan (EU, 2014/17, chapter 3, article 7, para. 1).

Before offering a mortgage, banks (or other lenders) value the property and rate the creditworthiness of potential borrowers. This rating usually includes the evaluation of collateral (Bienert & Brunauer, 2007, p. 544). That is, banks aim i. a. to prevent mortgage delinquencies and foreclosures, and to assure debt service during the term of a loan (Keller, 2013).

When offering mortgages and educating potential customers, banks use different channels, including counsellors in regional branches, financial intermediaries, mobile sales or webpages. Online information has become increasingly important because it is available to potential customers regardless of time and space. Banks usually provide information on their webpages in the form of calculators that invite potential borrowers to calculate income and expenses, the affordable purchase price for a property, the annuity and costs for renting or buying. From the perspective of the banks, the information provided may be part of a marketing strategy to attract people to arrange a counselling interview. Despite this aim, information should support comprehension of users about the product in question.

Potential borrowers can leave the decision about a loan completely to the bank and trust its advice. However, responsible and financially literate decision-making requires the customer to make a decision on his or her own and to validate the bank's advice, due to the long-term consequences for the personal financial situation. The simple rule – "only sign contracts [...] you really comprehend" (transl., Keller, 2013, p. 25) – holds true for all financial decisions. In the case of mortgages, knowledge and skills regarding four core elements are required (Fürstenau et al., 2016, p. 64f.): (1) calculation of the free disposable monthly income, (2) calculation

¹ Directive EU, 2014/17, of the European Parliament and of the Council on credit agreements for consumers relating to residential immovable property

and comparison of the options renting and buying, (3) calculation of the affordable financial frame, and (4) calculation of the loan.

2.2 Comprehensibility and content quality of information on webpages

Webpages (and written material in general) might not always provide information that suitably supports comprehension. In general, text comprehension is an interactive process between the reader and the material. In the course of that process, learners build mental models of the content (e. g. Johnson-Laird, 1983; Van Dijk & Kintsch, 1983). Both learner and text characteristics play a role in this process. On the one hand, the text or material activates prior knowledge. On the other hand, prior knowledge is retrieved to perceive and select information provided in the text. Therefore, the learner's prior knowledge, as well as motivation, is of major interest. On the side of the texts, the following dimensions – in order of importance – support comprehension (Groeben, 1982; Langer, Schulz von Thun & Tausch, 1999):

- (1) Structure: The content should be very structured and coherent.
- (2) Simplicity: The wording and structure of sentences should be very easy (familiar words, short sentences).
- (3) Conciseness: The text should be neither too concise nor too lengthy.
- (4) Stimulation: The text should comprise some, but not too many, novel supplements that stimulate cognitive activation (e. g. examples, new and surprising details).

Apart from the comprehensibility dimensions, the content quality of information on webpages can be assessed by comparing it to a reference, such as a learning objective or an expert model. As shown by Fürstenau et al. (2015, 2016), the quality of information on bank webpages only partly meets the requirements of experts in the field.

Against this background, we investigated whether information (on bank webpages) contributes to the development of financial competence and why this might be the case. Following Weinert (2001, p. 62), we interpret competence as successfully meeting the demands of an underlying complex task. In our case, we took into account knowledge about mortgages and also justified economically reasonable decisions in favour or against a loan, dependent on the case given.

3 Method

3.1 Material and sample

The study focused on loan calculation as one of the four core elements of decisions about home buying. Loan calculators of two German banks, i. e. Commerzbank

(CoBa) and NordLB² (NoLB), were included in the study. The calculators of the two banks are similar in that they both request the user to enter data in appropriate fields to provide calculation results. The CoBa calculator provides additional explanations linked to the fields by question marks (see figures 1.1, 1.2, 1.3, and 2). The calculators differ in comprehensibility, although both calculators are very structured. The NoLB calculator is simpler than that of CoBa because it requires less information and uses less unfamiliar words, such as heritage right or accommodation unit. The CoBa calculator consists of 30 concepts and 22 explanations; in contrast, the NoLB calculator consists of only seven concepts and does not offer any explanation (Fürstenau et al., 2016). The NoLB calculator is extremely concise whereas the CoBa calculator offers more information, some of which is not necessary in calculating an annuity (e. g. year of birth, postcode and kind of employment). Neither calculator offer stimulations but instead are factual.

The content quality of the calculators was determined by calculating the degree of correspondence with a reference calculator (Fürstenau et al., 2015), regarding both concepts and explanations necessary for comprehension and decision-making. This reference calculator was developed based on specialist literature and was validated through communication with mortgage specialists. The results indicate that the calculators of both banks differ widely from the reference calculator. The NoLB calculator is slightly closer to the reference calculator than the CoBa calculator. Both calculators provide information about the amount of annuity based upon principal, interest, initial annual repayment and the residual debt after the term of fixed interest.

² Braunschweigische Landessparkasse (BLSK) is part of NordLB (as a so-called "AidA", Anstalt in der Anstalt, which means "institution in the institution Norddeutsche Landesbank").

Übersicht
Finanzierungsrechner

Zinsrechner

Schritt 1 2 3

Sie haben bereits Angaben zu Ihrer Traum-Immobilie und wissen, wie viel Darlehen Sie benötigen? Dann können Sie mit unserem Zinsrechner einen ersten individuellen Zinssatz errechnen.

Pflichtangaben sind mit (*) gekennzeichnet

Details

Postleitzahl Ihres Wohnortes *
(current postcode)

Postleitzahl des Objektes *
(postcode for the house)

Kaufpreis des Objektes * EUR ?
(purchase price)

Kosten für Umbau / Modernisierung / Sondergewerke / Eigenleistung EUR ?
(modernizing costs)

Fälligkeit des Kaufpreises * ?
(due date of purchase price)

Wie hoch ist der gewünschte Darlehensbetrag? * EUR ?
(principal)

Sollzinsbindung * ?
(term of fixed interest)

Rückzahlung *
(kind of repayment)

Anfängliche Tilgung * % ?
(initial annual repayment)

Volltilgung ☐
(full repayment)

Baujahr (Jahr der Fertigstellung) *
(year of construction)

Bauweise ?
(kind of construction)

Besonderheiten der Bauart ?
(particularities of construction)

Wie groß ist die gesamte Wohnfläche? m² ?
(living space)

Wie viele Wohneinheiten besitzt das zu finanzierende Objekt? *
(units of living)

Besteht ein Erbbaurecht? * ☐ Ja ☒ Nein ?
(heritage right)

Zurück
Berechnen

Figure 1.1: CoBa loan calculator (1)

Übersicht | Finanzierungsrechner

Zinsrechner

Schritt 1 2 3

Sie haben bereits Angaben zu Ihrer Traum-Immobilie und wissen, wie viel Darlehen Sie benötigen? Dann können Sie mit unserem Zinsrechner einen ersten individuellen Zinssatz errechnen.

Pflichtangaben sind mit (*) gekennzeichnet

Details

Postleitzahl Ihres Wohnortes * 01067
(current postcode)

Postleitzahl des Objektes * 01169
(postcode for the house)

Kaufpreis des Objekts * 200.000,00 EUR
(purchase price)

Kosten für Umbau / Modernisierung / Sondergewerke / Eigenleistung
(modernizing costs) EUR ?

Fälligkeit des Kaufpreises * 01.02.2018
(due date of purchase price)

Wie hoch ist der gewünschte Darlehensbetrag? * 130.000,00 EUR
(principal)

Sollzinsbindung * 10 Jahre
(term of fixed interest)

Rückzahlung *
(kind of repayment)

Anfängliche Tilgung * 2 %
(initial annual repayment)

Baujah

Wählen Sie hier für die Rückzahlung die gewünschte Tilgung. Die anfängliche Tilgung ist der Tilgungssatz, der zusammen mit dem Sollzinssatz die Höhe der Rate bestimmt. Wenn Sie die Finanzierung während der Sollzinsbindung komplett zurückzahlen möchten, wählen sie bei Tilgung "Volltilgung" aus.
(Select the percentage of repayment. The percentage of initial annual repayment and the interest rate determines the annuity. If you want to repay the loan completely during the term of fixed interest you have to select "full repayment".)

Wie groß ist die gesamte Wohnfläche? 120,00 m²
(living space)

Wie viele Wohneinheiten besitzt das zu finanzierende Objekt? * 1
(units of living)

Besteht ein Erbbaurecht? * ☐ Ja ☒ Nein
(heritage right)

Zurück

Berechnen

Figure 1.2: CoBa loan calculator (2)

Übersicht
Finanzierungsrechner

Zinsrechner

Schritt 1 2 3

Details

Darlehensbetrag (principal)	130.000 €
Sollzinsbindung (term of fixed interest)	10 Jahre ?
Gebundener Sollzinssatz pro Jahr (Stand 08.01.2018 12:33) (interest per year)	1,30 %
Effektiver Jahreszins gemäß Preisangabenverordnung (annual percentage rate)	1,31 % ?
Anfängliche Tilgung in % pro Jahr (initial annual repayment)	2,00 %
Jährliche Gesamtleistung (Annuität) (percentage of annuity per year)	3,30 % ?
Monatliche Rate (annuity per month)	357,50 €
Zahlungsweise (way of payment)	monatlich, nachschüssig ?
Sondertilgung (unscheduled principal repayment)	einmal jährlich bis zu 6.500,00 EUR (5 %) möglich ?
Auszahlungsdatum (payment date)	28.02.2018

Tilgungsplan ▶ Details

Getilgter Betrag bis zum Ende der Sollzinsbindung (amount of repayment until the end of term of fixed interest)	27.749,64 €
Restschuld am Ende der Sollzinsbindung (residual debt after term of fixed interest)	102.250,36 € ?
Summe gezahlter Sollzinsleistungen (sum of interest payment)	15.150,36 €
Darlehensdauer bei gleichbleibendem Zins (term of the loan, constant interest assumed)	38 Jahren 7 Monaten
Rate bei Sollzinsanstieg von 2% am Ende der Sollzinsbindung (annuity after term of fixed interest, calculated with interest increase of 2%)	527,92 € ?

Gebühren

Bearbeitungskosten (closing costs)	keine ?
Schätzkosten (appraisal costs)	0 € ?
Bereitstellungszinsfreie Monate (ohne separaten Zinsaufschlag) (months without commitment interest)	2 ?
Danach Bereitstellungszins pro Monat (% vom Darlehensbetrag) (commitment interest)	0,25 %

Zurück
Wünschen Sie ein persönliches Angebot?
Angebot anfordern ▶

Figure 1.3: CoBa loan calculator (3)

Tilgungsrechner

Erstellen Sie Ihren persönlichen Tilgungsplan. Er zeigt Ihnen überschlägig, mit welchen Raten und in welchem Zeitraum Sie Ihr Darlehen zurückzahlen können.



Darlehensbetrag: (principal)	<input type="text" value="150.000,00"/>	Euro
Sollzinssatz: (interest)	<input type="text" value="2,75"/>	%
Anfängliche Tilgung: (initial annual repayment)	<input type="text" value="3,00"/>	%
Dauer der Zinsbindung: (term of fixed interest)	<input type="text" value="10,00"/>	Jahre
Monatliche Rate: (annuity)	<input type="text" value="718,75"/>	Euro
Restschuld nach Ende der Sollzinsbindung: (residual debt after term of fixed interest)	<input type="text" value="98.271,84"/>	Euro
Darlehensdauer: (term of the loan)	<input type="text" value="23,7"/>	Jahre
<input type="button" value="Berechnen!"/>		

Figure 2: NoLB loan calculator

Overall, the CoBa calculator is advantageous regarding the amount of semantic content provided and its moderate conciseness. In contrast, the NoLB calculator is slightly more advantageous concerning accuracy to the reference calculator and degree of simplicity. Due to this assessment, it seems inappropriate to generate specific hypotheses other than that the webpages differ in supporting learners in competence development.

Table 1: Sample

	n	%	Gender	Age M	Courses of studies	Apprenticeship
CG	36	35.6	9 m, 26 f, 1 n/a	26.3	a: 3, b: 25, c: 7, d: 0, e: 0	12
EG CoBa	31	30.7	10 m, 21 f	22.9	a: 13, b: 16, c: 0, d: 1, e: 0	7
EG NoLB	34	33.7	6 m, 28 f	21.8	a: 22, b: 11, c: 0, d: 0, e: 1	4
Total	101	100.0	25 m, 75 f	23.7	a: 38, b: 52, c: 7, d: 1, e: 1	23

Annotations: CG = Control Group, EG = Experimental Group; Course of studies (a: economics, b: economics education, c: pedagogy, d: industrial engineering, e: transport economics)

Students (N = 101, age M = 23.7) of different courses of the advanced university bachelor's programme in economics and business (at TU Dresden, Germany) took part in the study (see table 1). The students were randomly assigned to one of three conditions. Students in the control group were, on average, a little older than students in the experimental groups. Also, more students in the control group completed a commercial apprenticeship before studying at the university. The study was performed in June 2016.

3.2 Data gathering and course of the study

All students first completed a questionnaire on self-assessment of financial knowledge and previous experience with various forms of investments and financing. They rated items (e. g. "How would you rate your knowledge about money investments?") on a six-point Likert scale (very bad to very good). This self-assessment served as a control variable, which might explain differences in test results. We dispensed with a classical pre-test (regarding knowledge and decision tasks) to avoid the testing effect (Roediger & Karpicke, 2006), i. e. a learning effect through the test and not only through the study of the websites.

Subsequently, the subjects of the two experimental groups explored the loan calculator on the website of their respective bank. The first experimental group (EG CoBa) used CoBa's loan calculator (see figures 1.1, 1.2, 1.3) and the second experimental group (EG NoLB) used the NoLB calculator (see figure 2). The exploration was guided by an authentic case: The students were given concrete information on the personal and financial situation of a small family as well as the desired property (e. g. single-family house, purchase price and additional costs). The students' task was to make a decision for or against taking out a mortgage loan and to justify the decision from a financial point of view. The decision task was designed in such a way that the debt service could be adequately carried out and thus a decision for the loan was justifiable. Nevertheless, dependent on their individual

preference, the subjects could also decide against taking out a loan on a justified basis.

While exploring the calculators on the webpages and in the course of decision-making, we audio-recorded think-aloud data of six randomly selected students (three from each EG) to gain insight into their learning processes. At the beginning of the exploration phase, the test persons were asked to speak aloud everything that comes to their minds. Now and then, they were reminded by the investigator to speak their thoughts aloud.

At the end, all test subjects completed a knowledge test on the relevant concepts and interrelationships of mortgage financing, such as annuity, fixed interest or initial annual repayment rate. Also, the students had to evaluate the consequences of changes in situational variables, such as the effect of a change in interest rate, the term of fixed interest on the interest payable or the effects of inflation on home buying. The test consisted of 12 items (see table 2) in single choice format, meaning that only one of four alternatives could be marked as correct. The test was developed by the project team.

Table 2: Example items of the test

Which statement is correct?

- ☐ Proportion of interest and repayment remain constant
- ☐ The amount of repayment remains constant for every instalment
- ☐ During the term of the loan, the proportion of repayment increases
- ☐ The amount of monthly repayment decreases during the term of the loan

Which statement is correct?

- ☐ Accumulated interest payments are independent of the principal amount
 - ☐ Longer term of the loan leads to higher accumulated interest payments
 - ☐ Longer term of the loan leads to higher amount of repayment
 - ☐ Unscheduled repayments during the term of the loan lead to higher accumulated interest payments
-

3.3 Data analysis

The self-assessment questionnaires were subjected to an exploratory factor analysis ($N = 139^3$, Cronbach's $\alpha = 0.835$, KMO = 0.918; Varimax-Rotation), which explained 81.4 % of variance showing a three-factor structure: (1) Experience with investments and financing (eigenvalue 8.7; variance explained 54.5 %), (2) financial knowledge (eigenvalue 2.8; variance explained 17.4 %), and (3) subjective significance of home ownership (eigenvalue 1.5; variance explained 9.5 %).

The knowledge tests were scored using a sample solution. If the correct statement was chosen, the test subject received one point; otherwise, zero points were given. A total of 12 points could be achieved.

The decision task was analysed using content analysis (Mayring, 2015). The arguments of the test subjects were compared with each other as well as with reference arguments. The project team defined the reference arguments after consulting a mortgage expert. Student arguments that were identical in terms of semantics – but differently expressed in terms of language – were harmonised to enable this comparison. For example, if a test person argued “the term of fixed interest is too short” and another stated “the term of fixed interest is only ten years”, both statements were categorised as “the term of fixed interest is too short”. To determine how well the arguments of the test subjects agreed with the reference arguments, a distance measure was calculated for each test subject using the Galanter metric (Fürstenau & Trojahnner, 2005). This metric expresses the correspondence between each test subject's set of arguments and the reference set of arguments in relation to the total number of arguments (union set of reference arguments and test subject's arguments). The distance measure can be used as a quality indicator. The distance can take values between zero and one. Zero indicates there is no distance, and one indicates that there is a maximum distance, meaning that no similarities exist. The higher the distance value, the less the concordance between an individual subject and the reference argument.

The think-aloud data was transcribed and analysed using content analysis (Mayring, 2015). The coding scheme was adapted from Chi, Bassok, Lewis, Reimann and Glaser (1989). It consists of three types of idea statements: (1) explanation/elaboration, (2) monitoring, and (3) others. Explanation and elaboration refer to substantial statements (Chi et al., 1989, p. 161) about mortgages, indicating that students tried to make meaning of the information provided. The main category “explanation/elaboration” comprises four subcategories: (a) defining, refining or

³ The questionnaires were presented to a larger sample of students so that a sample of 139 completed questionnaires could be used for factor analysis.

expanding situational conditions influencing decisions; (b) explicating or inferring consequences; (c) evaluating facts, results, or information; and, finally, (d) giving meaning to expressions or terms. Monitoring statements refer to different states of comprehension and subsume the following: (a) statements about own comprehension; (b) statements about comprehension failures; and (c) statements about uncertainty about comprehension. Other types of statements refer to (a) perceiving or remembering information; (b) reading information; (c) selecting an option from a drop-down menu without explaining the selection; (d) paraphrasing given information; (e) questions about content; and (f) metastrategic statements. Metastrategic statements concern what individuals are doing, planning to do or already did (see table 3).

Table 3: Categories for coding think-aloud data

Category	Definition	Example statement
Explanation/elaboration		
Define conditions	Definition, refinement and/or expansion of (given) situational frame and conditions	I assume an increase in the interest level during the next 10 to 20 years.
Explicate consequences	Explication of causal relations, inferring consequences, reasoning about situations, comparisons, calculations, interpretations of results	In this case, I have to pay an annuity of 445 EUR.
Evaluate facts	Evaluation of facts, results or information provided; judgement about whether something is good or bad, too less or too much etc.	15 000 EUR interest is relatively low.
Give meaning to expressions	Explanation of concepts, expressions, terms, and interrelationships	Repayment means that you repay your debt.
Monitoring		
Comprehension	Statements about comprehension	Okay, I think I have understood now.
Comprehension failures	Statements about comprehension failures	Probably, I have calculated it totally wrong.
Uncertainty about comprehension	Questions/uncertainty about comprehension	What, what, what is this? I would have said, maybe the term of fixed interest. I am not sure.

Category	Definition	Example statement
Others		
Perceive/remember	Perceiving or remembering information	There is no explanation. One could do a calculation here.
Read	Reading information from given sources	Please insert here additional construction costs.
Select	Selecting data/information from a drop-down menu	Good, then – given the options here – I take 300 000 EUR.
Paraphrase	Paraphrasing given information	The term of the loan would last only 38 years and 2 months.
Question	Questions regarding content and procedures	What is unplanned repayment?
Metastrategic statement	Statements about what persons are doing or planning to do, or already did	I go back to step 1. Before, I take the complete data from the working sheet.

The analysis of the think-aloud protocols, specifically with regard to the categories “comprehension failures”, “uncertainty about comprehension”, and “question” reveal comprehension problems and misconceptions of the students. These problems and misconceptions can offer clues to improve information on webpages and for instructional support and deliberate instructional processes.

4 Results

4.1 Knowledge tests and self-assessment questionnaires

A total of 12 points could be achieved in the knowledge test. Test subjects in the EG CoBa ($M = 5.9$) scored best, while the subjects in the CG ($M = 5.1$) scored worst (see table 4). However, the results of the three groups did not differ significantly ($n = 101$; Kruskal-Wallis test, $df = 2$, $\chi^2 = 1.926$, $\alpha = 0.05$, $p = .382$). Given the fact that the CG students did not explore any websites, they achieved a comparatively high average score.

Table 4: Results of the knowledge test

Score	CG	EG CoBa	EG NoLB
M	5.1	5.9	5.5
Min	1	2.0	1
Max	9.0	11.0	10
SD	2.1	2.1	2.1

Concerning self-assessments, the CG students have significantly more financial experience (factor 1) than those in the two EGs ($n = 99$, Mann-Whitney U-Test, $Z = -3.426$, $p = .001$). In the other two factors, no significant differences could be found. A possible reason for the different financial experiences may be that one-third of the CG students, but only 12 % of the EG NoLB and 23 % of the EG CoBa students had completed a commercial vocational apprenticeship. Groups with and without a commercial apprenticeship differed significantly in their ratings of financial experience ($n = 98$; Kruskal-Wallis test, $df = 1$, $\chi^2 = 9.594$, $\alpha = .05$, $p = .002$) and financial knowledge ($\chi^2 = 9.387$, $\alpha = .05$, $p = .002$). Participants who had completed an apprenticeship rated their financial knowledge and experiences higher than those who did not. Further analyses showed that the self-assessed financial knowledge (factor 2; $n = 99$, Spearman's $\rho = .245$, $p = .015$, two-tailed) significantly and positively correlates with the knowledge as measured by the knowledge test (test score minus expected value)⁴ but not with financial experience (factor 1; $\rho = 0.181$, $p = .073$), and not with subjective significance of home ownership (factor 3, $\rho = 0.095$, $p = .348$).

4.2 Decision task – arguments

With regard to the complex decision task, the proportions of test subjects who opted against or for taking out a mortgage loan are comparable in both EGs. Nearly two-thirds of the test subjects voted against financing (see table 5).

⁴ The expected value was subtracted from the test scores so that they were adjusted for randomly correct answers.

Table 5: Decisions for and against taking out a loan

Decision	EG CoBa		EG NoLB	
	n	%	n	%
Against loan	19	61.3	21	61.8
For loan	12	38.7	13	38.2

In the next step, the arguments were analysed and compared with the reference argumentation, both quantitatively (number of arguments) and qualitatively (distance values) (see table 6). The qualitative comparison makes it possible to determine which arguments the test subjects took into account, either for or against financing. Students' arguments reveal hints for what information should be provided on webpages and what should be taught in educational settings.

Table 6: Number of arguments for and against taking out a loan

	Reference		EG CoBa (n = 31)		EG NoLB (n = 34)	
	against loan	for loan	against loan	for loan	against loan	for loan
M			2.4 ⁵	3.4	2.9	3
Min			0	0	0	0
Max			7	11	12.	10
SD			2.1	2.9	3.4	2.8
Total arg.	5	5	68	58	124	61
Total diff. arg.	5	5	45	41	60	39

Annotations: arg. = arguments, diff. arg. = different arguments

Both EGs expressed, in total and on average per person, more arguments against than for financing. The members of the EG NoLB expressed on average more arguments against financing than the EG CoBa. The average number of arguments in favour of taking out a loan is a little higher in the EG CoBa. Both EGs named, on average, fewer arguments than suggested by the reference argumentation. However, in total, many different arguments were named, although those arguments were not part of the reference argumentation. Concerning argumentation against taking out loans, the reasons provided by the EG NoLB were more productive, although possibly less effective from a qualitative point of view. The distance measures showed that the mean distance from the reference argumentation is 0.86 (SD = 0.1) for EG NoLB and 0.88 (SD = 0.1) for EG CoBa. Since

⁵ Means and SDs were calculated based on the number of students in the respective group, and on the number of different arguments.

the maximum distance is 1 (no agreement with the reference argumentation), the distance values must be considered high. Accordingly, there are hardly any similarities between the student and reference argumentations. The EGs' distance values do not differ significantly ($n = 65$, Kruskal-Wallis, $df = 3$, $\chi^2 = 1.725$, $p = .189$).

In the course of the qualitative analyses, the content of the student arguments was analysed and compared with the reference argumentation. Tables 7 and 8 provide an overview of the reference arguments as well as some common arguments used by the students against or for financing. Concerning the decision against a loan, only one of the five reference arguments (term of the loan is too long) was named by a considerable number of students (see table 7). Only a small or negligible proportion of students mentioned the other reference arguments. This was true for both EGs.

Table 7: Decision task reference arguments and student arguments against a loan

	No. of students			
	EG CoBa (n = 31)		EG NoLB (n = 34)	
	n	%	n	%
Reference arguments				
Term of the loan is too long.	10	32.3	17	50
Initial repayment rate is too low.	4	12.9	3	8.8
Interest rate after term of fixed interest is uncertain.	1	3.2	3	8.8
Maintenance expenses have to be considered.	0	0	2	5.9
Term of fixed interest is too short.	1	3.2	1	2.9
Some further student arguments				
Residual debt is too high.	1	3.2	10	29.4
Disposable monthly income is too low.	4	12.9	7	20.6
Expenses buffer has to be considered.	3	9.7	6	

In the case of arguments for financing (see table 8), only one reference argument (instalment is lower than disposable monthly income) was mentioned by a considerable number of students in both EGs. However, almost three-fourths of the students did not mention that argument. As can be inferred from the small number of students mentioning the arguments listed, and from the total number of different arguments (see table 6), the students' argumentations were very heterogeneous.

Table 8: Decision task reference arguments and student arguments in favour of a loan

	No. of Students			
	EG CoBa (n = 31)		EG NoLB (n = 34)	
	n	%	n	%
Reference arguments				
Instalment is lower than disposable monthly income.	7	22.5	10	29.4
Interest rate is low.	3	9.7	2	5.9
Repayment can be made until retirement age.	3	9.7	3	8.8
Term of the loan is adequate.	1	3.2	0	0
Expenses buffer has to be considered.	1	3.2	2	5.9
Some further student arguments				
Down payment is used for financing.	1	3.2	4	11.8
Disposable monthly income is left for savings.	0	0	3	8.8
Monthly income seems to be safe.	2	6.5	3	8.8

The analysis also revealed topics either misinterpreted or disregarded by the students. However, topics could be identified that were mentioned by the students, although not relevant for decision-making. Comprehension problems could be stated, for example, about the relationship between instalment and free disposable monthly income, interest rate and term of the loan, interest rate and annuity, estimation of total repayment, taking into account expenses, buffers, maintenance costs or increase of the interest rate after the term of fixed interest.

4.3 Think-aloud data

The codings of the think-aloud data showed that the EG CoBa mainly expressed statements categorised under “others”, followed by “explanatory and elaborative” statements, and finally, “monitoring” statements. In contrast, the EG NoLB predominantly expressed statements attributed to the category “explanation/elaboration”, followed by “others”, and finally, “monitoring” statements (see table 9). The EG CoBa was mainly concerned with reading information, selecting options from given drop-down menus, and planning the next step. The EG NoLB mainly explicated consequences or paraphrased information given. Compared to the EG CoBa, the EG NoLB used fewer metastrategic statements and did not read aloud as much information provided to them. It is particularly noticeable that the EG CoBa expressed more comprehension failures than the EG NoLB (see table 9).

Table 9: Think-aloud codings

Category	No. of Codings	
	EG CoBa (n = 3)	EG NoLB (n = 3)
Explanation/elaboration		
Define conditions	22	8
Explicate consequences	40	86
Evaluate facts	21	13
Give meaning to expressions	16	7
n	99	114
Monitoring		
Comprehension	6	1
Comprehension failures	35	7
Uncertainty about comprehension	2	1
n	43	9
Others		
Perceive/remember	18	7
Read	107	18
Select	60	5
Paraphrase	31	31
Question	32	13
Metastrategic statement	48	12
n	296	86

All think-aloud participants explicated comprehension failures, uncertainties about comprehension or questions regarding concepts and calculation procedures. Those utterances revealed that the students were aware of comprehension problems. However, in some cases, students expressed statements and were not aware that those statements were inadequate. To get insight into misconceptions, we coded the content of all statements and judged them as wrong or correct. In total, 40 coded wrong utterances revealed 27 problems concerning comprehension of concepts presented in the calculators. On average, 4.3 misconceptions were coded for the EG CoBa and 4.7 for the EG NoLB. Table 10 gives an overview of the most frequently coded misconceptions.

Table 10: Most frequent misconceptions

(Mis)Concept	Frequency total	No. of students	
		EG CoBa (n = 3)	EG NoLB (n = 3)
Initial annual repayment	10	2	2
Principal	3	1	2
Term of the loan	3	1	2
Term of fixed interest	3	2	0
Annuity	2	1	1
Full repayment within the term of fixed interest	2	1	0
Interest	2	1	0
Payment date	2	1	0

The most frequently coded misconception in both EGs was “initial annual repayment”. Some participants mistook the concept as the amount of repayment to be paid at the beginning of the year, in addition to the monthly annuity (EG NoLB). Others were of the opinion that the initial annual repayment is a constant percentage of repayment (EG NoLB), or some type of prepayment (EG CoBa). Other misconceptions coded for participants of both groups refer to “principal”, “term of the loan”, or “annuity”. Students mistook the interrelationships between the concepts “interest”, “repayment”, “annuity”, and “term of the loan”. In particular, the EG CoBa seemed to have difficulties comprehending “term of fixed interest”. The “term of fixed interest” was misunderstood as the end of the whole term of the loan.

5 Discussion

Students of both EGs who explored websites tended to perform better in the knowledge test than the CG students. However, the difference was not significant. Regarding the factors extracted from the self-assessments, financial knowledge and financial experience show a significant positive correlation with the knowledge test scores. It must be noted that CG students have significantly more financial experience, which could be attributed to the fact that a comparatively high number of CG test subjects completed a commercial vocational apprenticeship. Overall, it can be assumed that previous knowledge and experience decisively influence the acquisition of knowledge about mortgage loans.

With regard to the decisions, it can be stated that more students of both EGs decided against than for taking out a loan even though the latter would have been

possible from a financial point of view. Consequently, students seem to act cautiously (to be on the safe side), and might not be capable of understanding the information given as well as using it for decision-making.

Given the assumption that financial competence about mortgages is expressed specifically in the arguments for or against taking out a loan, the results are not satisfactory. Students' arguments only partially matched the reference argumentation, indicated by the high distance values. The EG NoLB achieved slightly better values than the EG CoBa on the decision task. This result is interesting, given the small amount of information and lack of explanations on the NoLB website. In comparison, the CoBa website offers many concepts and explanations.

If the results of the think-aloud codings are taken into account, it can be stated that CoBa students were more concerned with identifying, reading and selecting information, whereas NoLB students expressed more explications and elaborations. Therefore, the NoLB calculator might stimulate explanatory and elaborative thinking and thus better supports cognitive processes aimed at deep understanding. The more stimulating characteristic of the NoLB calculator might be attributed to its higher degree of simplicity and its closeness to the reference calculator. In contrast, the amount of information required by the CoBa calculator might be confusing. Dependent on prior knowledge and the cognitive resources of users, either calculator may be advantageous or disadvantageous. Looking at the knowledge test scores, we cannot yet attribute learning outcomes to the comprehensibility dimensions and semantic content of information given on the websites.

By exploring authentic websites, subjects neither acquired sufficient knowledge nor were able to apply this knowledge satisfactorily in decision-making situations. The level of financial competence achieved about decisions on taking mortgages can be regarded as low. Previous knowledge and experiences seem to be more important than comprehensibility and content of the websites. Therefore, we suggest improving websites regarding learner characteristics or embedding exploration of websites in instructional design settings, whether they are more formal or informal. The just-in-time idea can be regarded either way, in that knowledge and behaviour are closely related in authentic case-based decision-making situations.

Students' reasoning regarding the decision for or against a loan can provide clues for website design or instruction. In particular, central arguments for or against taking out a loan, which were not mentioned by the students, should be emphasised. Furthermore, arguments indicating that interrelationships have not been understood, e.g. those between the concepts of "interest", "repayment", "annuity", and "term of the loan", should be addressed. Further, the most important misconceptions, such as "initial annual repayment" can be clarified. Overall, our data

provide detailed hints for setting up comprehensible websites and for pedagogical interventions that accompany learning in ecologically valid settings.

Limitations of the study can be seen in the following factors:

Concerning the sample size, it can be questioned whether findings based on data from 101 participants are stable and robust. However, coping with qualitative data often limits sample size but reveals deep insights into student thinking as has become obvious by analysis of misconceptions and argumentation.

In addition, the group of participants can be regarded as highly selected because exclusively university students took part in the study. Therefore, generalisations with regard to knowledge gain and instructional objectives for a potential financial literacy course about loan taking for house buying might be restricted. However, in many empirical studies test persons are highly selected because it is not possible to recruit a representative cross section of the population. Aware of this difficulty, we controlled for prior knowledge and experiences (self-assessment) in order to interpret the results against the background of those possible influences. Based on our results and in line with many psychological studies we assume that prior knowledge influences learning outcomes and competence development.

Furthermore, the fact that, according to self-assessment, the CG has significantly more financial experience than the two EGs might be another limitation, although we controlled for it. However, a group comparison is at least questionable.

The self-assessment of financial knowledge and previous experience with various forms of investments and financing can be questioned because it might not provide as reliable information as an objective test. In contrast, using an objective test might have caused a testing effect (Roediger & Karpicke, 2006) which means a learning effect resulting from working on the test, not from the intervention (study of webpages). Therefore, we tried to balance the disadvantages respectively advantages of one or the other option. As can be seen from the results, the judgments (or self-assessments) of knowledge positively correlate with posttest scores and therefore seem at least not to be an unreliable predictor of posttest knowledge. Alternatively, we could have provided an objective test and postpone the intervention for a sufficient time span in order to ensure the students forget the test in the meantime. However, if there is a lot of time between test and intervention, it makes it harder to control for what happens in between. Nevertheless, we consider integrating objective testing in a follow-up study.

Another point is that the CG did not perform the decision task because the decision task was tied to the exploration of the websites. In real-life settings, people usually explore websites aiming to solve a specific problem or find helpful information for a decision to be made. The CG was not supposed to have access to the information

on the websites. Nevertheless, the CG could have made a justified decision about the case without exploring the websites. In a follow-up study recently carried out, the comparability of the groups was ensured. Also, students of all groups completed a decision task.

Concerning the ecological validity of the study, it might be implausible that young adults such as students using the internet to solve a problem restrict themselves to one and only one information source, that is to say the webpages of only one bank. Instead, they might explore several banks' webpages, and in addition the webpages of consumer protection agencies. However, in a research study, it is necessary to limit the use of websites in order to gain comparable data. If every student would have used different websites in a different order, data would have been not comparable anymore. We wanted to know how well the students understand the websites of one of two German banks. We selected the websites of the two banks because in a pre-study in which we compared websites of several German banks, it turned out that the two we used in this study differed the most in terms of quantity and quality of information (Fürstenau et al., 2016). Consequently, the different set-up of the webpage might have explained differences in competence development. In addition, given the assumption that students would study webpages of several banks they would presumably survey the information of one bank after the other. Therefore, it seems plausible to start with one bank for each group of students though the students did not have a free choice.

Finally, it can be questioned whether financing a home might be the first priority of students and whether results might be biased by lack of motivation or interest in the topic. This potential lack of motivation causes problems for interpreting the results if groups differ in that respect. However, in the self-assessment questionnaire, we included items addressing the subjective significance of home-ownership, and the groups did not differ in that respect. In addition, in the Eastern part of Germany, in which the study was run, people traditionally start very early with family planning and caring about home ownership. Furthermore, we were primarily interested in comprehensibility of webpages concerning financing, interest, debt servicing and not that much in home buying itself (as intended use). Nevertheless, higher motivation might have led to better learning results.

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⁶ The project was funded by the German Research Foundation to support the initiation of international collaboration. We thank the anonymous reviewers for their helpful comments on our article.

Students' fiscal literacy: An explorative study of their understanding of the tax system

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Fiscal literacy can be seen as an essential element that has been rarely researched as yet. Existing studies in the field of fiscal literacy focus primarily on tax knowledge and the ability to manage personal tax issues. This study not only examines the students' knowledge of taxes and how they are concerned as individuals (individual level), but it also explores the students' understanding of the fiscal system, its elements and the interdependencies between them (societal level). Therefore, problem-centred interviews were conducted with 22 students in the age bracket of 17–18 years in business colleges in Austria. The results of the content analysis show that students have an incomplete picture of the fiscal system. Furthermore, students recognise public goods that they benefit from every day, but they have little knowledge of intangible services. On an individual level, some students do not even perceive themselves as tax payers. On the other hand, there are students who do have experience with income tax, but many are not able to explain tax-related issues in detail. The results provide implications for instruction, curriculum development and further research.

Keywords: Financial literacy, fiscal literacy, students' understanding, tax literacy

1 Introduction

Financial literacy is vital for young people to successfully manage their financial issues (Breitbach & Walstad, 2016). Conceptualising financial literacy as personal money management (Atkinson & Messy, 2012) or critical consumption of financial goods and services (Rutledge, 2010), however, does not necessarily involve an understanding of economic issues on a societal level. The understanding of taxes and the fiscal system as an integrated whole is an essential but often neglected area of content in financial literacy. Taxes are only marginally represented in many content-frameworks of financial literacy and have received fairly little attention in instruments to measure financial literacy.

However, several empirical studies indicate the importance of tax knowledge for tax compliance (Eriksen & Fallan, 1996; Kirchler, Niemirowski & Wearing, 2006). A lack of knowledge and the resulting lack of understanding, therefore, can result in unfavourable attitudes towards tax systems. Consequently, fiscal literacy should be considered a vital part of financial literacy which influences both societies and individuals.

In addition to large-scale assessment of students' financial literacy, in-depth research on their understanding of financial topics is important. Getting to know the

students' understanding can "influence subsequent learning, reasoning and action" (Aprea, 2015, p. 12). Furthermore, Kaminski and Friebe (2012) identify the study of students' understanding of financial topics as one central field of research which serves as a starting point for economic instruction. Interview-based studies on young people's conceptions of economic and financial topics have focused on various phenomena, such as sustainability (Reid, Petocz & Taylor, 2009), the free provision of goods and services (Davies & Lundholm, 2012), the financial and economic crises (Aprea & Sappa, 2014), and price determination (Ignell, Davies & Lundholm, 2017). On the other hand, few researchers have addressed students' understanding of taxes and the fiscal system as it has been pointed out by Furnham (2005, p. 704), who states that "almost no research has concentrated specifically on the understanding of the topic of taxation".

Interviews offer the possibility to uncover students' cognitive structure that can then support instruction. While it is important that teachers are aware of the prior-understanding of their students and apply teaching methods accordingly (Weißeno, Detjen, Juchler, Massing & Richter, 2010, p. 52), the results of this study can also provide valuable input for curriculum development and contribute to closing the research gap on fiscal literacy. Therefore, the main aim of this study is to reveal young people's understanding of taxes and the fiscal system.

2 Fiscal literacy: related definitions and concepts

Few studies have been published in the field of fiscal literacy or tax literacy, but many of them emphasise on the empirical study of country-specific aspects of tax knowledge, important for managing personal tax-related issues (Bhushan & Medury, 2013; Chardon, Freudenberg & Brimble, 2016; Cvrlje, 2015; Latiff, Noordin, Omar & Harjito, 2005; Madi et al., 2010). Most of these studies have attempted to define tax literacy, but none has been identified as explicitly referring to fiscal literacy.

Cvrlje (2015, p. 156), who conducted a literature review on tax literacy, points out that the concept of tax literacy is a rather new one pertaining to financial literacy. Thus and since tax literacy influences the personal financial situation, tax literacy can be described as an important part of financial literacy (Cvrlje, 2015, p. 157). This conceptualisation is supported by Chardon et al. (2016), who carried out a study in Australia that focused on theoretical and practical knowledge of personal taxation, such as tax calculation and tax deductions (Chardon et al., 2016, p. 334). Another definition focusing on personal financial improvement was developed by Bhushan and Medury (2013, p. 76), who studied tax literacy among salaried taxpayers in India. They defined tax literacy as "knowledge which an individual should possess in order to manage the issues concerning personal taxation effectively" (Bhushan & Medury,

2013, p. 76). The level of tax literacy in the study was determined by items measuring the basic concepts of income tax, the calculation of the tax liability, rates, deductions, and some other factors (Bhushan & Medury, 2013, p. 78). Madi et al. (2010, p. 219), who studied the tax literacy of employees in Malaysia, described tax literacy as a part of functional literacy which was defined as the ability to write and calculate. Brackin (2007, p. 5), who analysed financial literacy surveys on taxation in Australia, suggested that a person who has a high level of tax literacy “would take an active and responsible role in the taxation arena”.

The definitions reveal that most studies on tax literacy only focus on the level of individuals. In this study, fiscal literacy not only comprises practical knowledge and the ability to manage personal tax-related problems but also an understanding of the larger economic context. Fiscal literacy is, therefore, understood as part of the understanding of financial literacy developed by Davies (2015). Davies (2015, p. 309) includes aspects of short-term and long-term financial planning, individual budgeting, financial services and government budgets as content areas of financial literacy (Davies, 2015, p. 312). According to Atkinson and Messy (2012, p. 3), financial literacy also comprises knowledge, attitude and behaviour. Within this study, however, the focus is on the cognitive part of fiscal literacy.

This approach combines several disciplines (e. g. public finance, personal taxation, and tax law) and also covers different economic life situations (e. g. consumer, earner, economic citizen, as proposed by Retzmann and Seeber (2016)). While public finance deals with tax-related issues from a governmental point of view (Graf, 2005), the goal of personal taxation is to provide a solution for tax-related problems of individuals. Tax law deals with the legal tax system as well as individual tax laws (Ehrke-Rabel, 2013).

Therefore, fiscal literacy, as conceptualised in this paper, on the one hand, consists of content areas from public finance, in particular basic knowledge (tax payers and recipients of tax money, taxes and the fiscal budget, the reasons for collecting taxes), macroeconomic stabilisation, allocation of resources and distribution of income. On the other hand, from a personal taxation perspective, the following content areas are part of the construct: basic knowledge of central concepts (definition of taxes, indirect and direct taxes, object of taxation, tax debtor and tax payer), income tax (basic principles of income tax, tax liability, wage tax rate, deductions, employee assessment, capital gains tax), corporate tax (corporate tax liability, corporate tax rate), value added tax (VAT) (VAT debtor and payer, VAT rates) and recent tax reforms.

It has to be pointed out, that this study is oriented towards the prevalent economic system in Austria, the social market economy, which is based on a neoliberal

paradigm. Since not all content areas can be covered in this paper, only selected results for public finance, personal taxation and tax law are presented. In order to be able to stimulate the students' narration, it was important to find connections to students' lives, which were used as a basis for framing the interview question as indicated in table 1. It has to be pointed out, however, that the cells should not be viewed as distinct units, since the topics and roles are interrelated.

Table 1: Knowledge components of tax literacy

	Earners	Consumer	Economic citizen
Public finance	How can the Austrian income tax be characterized? What are the underlying intentions?	What goods and services are financed through tax money?*	Who is paying taxes?* Who benefits from the taxes?* Why are public goods and services not financed privately?*
Personal taxation	Have you already paid taxes? Which ones?*		Why is it important to pay taxes?
Tax law	What is your experiences with income tax?*	What value added tax rates exist in Austria? Why are there different rates?	What recent tax reforms took place in Austria?

The results to the interview questions marked with asterisks are presented in this article. The other questions are provided as examples for the categories.

The following research questions guide this study:

1. What understanding do students have of tax-related issues on a societal level (taxpayers and tax beneficiaries, tax expenditures, public goods)?
2. What understanding do students have of tax-related issues on an individual level (general personal experience with paying taxes, income tax)?

3 Method

3.1 Sample

The study involves 22 students of 17-18 years ($M = 17.86$) from three different federal provinces in Austria (Vienna, Lower Austria, and Burgenland). All the students attend business colleges in Austria, which are to be described as a five-year secondary school providing initial vocational training combined with general education that permits admission to universities and higher educational institutions in Austria (Bundesministerium für Bildung, 2015). This target group was chosen because these students have prior economic and business-related knowledge as well

as interest in economic topics. Around 60 per cent (in total 13) of the students were women and around 40 per cent (in total 9) men. This corresponds to the usual gender ratio in this type of school. The sample included six different schools and, therefore, a variation of students from different social strata, ethnicities and performance levels. One school offering a special program for talented students was included (accounts for 18 per cent of the sample). 86.36 per cent of the students indicated that they had work experience either through part-time jobs or internships, whereas 13.64 per cent specified that they have not had any work experience yet.

A look at the curriculum shows that students are taught a basic economic knowledge, but also given a more detailed education on the topics of business administration and accounting (Bundesministerium für Bildung, 2014). Furthermore, entrepreneurship education, which is designed to enable students to start a company, constitutes a vital part of the curriculum. In addition, most students should have personal experience with paying income tax because the curriculum includes a mandatory internship of 300 working hours. It has to be completed between the second and the fifth school year (Bundesministerium für Bildung, 2014). Thus, many students start earning money at the age of 15. Moreover, they have the right to vote in Austria, and are therefore confronted with tax-related issues in the political context as well. Finally, all students are regular payer of VAT.

A deductive sampling strategy combined with sampling through gatekeepers was the method used to gain access to students. The gatekeepers were teachers and school authorities who helped motivate the students to take part in the interviews and also helped in building trust between the participants and the researcher (Reinders, 2005, p. 119). This sampling strategy can, however, lead to a positive bias of the results, since the teachers might have asked the most intelligible and communicative students to take part in the interviews. Furthermore, students who agreed to do the interview could even have had a special interest in tax-related issues and have an extroverted personality. Also, the variation of the sample increases the width of the results while limiting the possibility of generalisability and comparability. Therefore, the results have to be read with caution.

3.2 Data collection

The study was approved by education and school authorities, but also by parents, if the students were yet to attain legal age. The author of this article conducted 22 semi-structured problem-centred interviews (Witzel & Reiter, 2012) between December 2016 and January 2017. The interviews lasted between 10 and 25 minutes and were held at the schools.

In order to design this study, relevant literature has been reviewed. Semi-structured problem-centred interviews have been identified as the most suitable method for gaining insight into students' understanding of the tax system. According to Schnell, Hill and Esser (2013, p. 378), this form of interviews provides enough flexibility and openness for obtaining an insight into the reference framework of the interviewees. On the other hand, the interview guideline ensures that relevant aspects are covered. Reinders (2005, pp. 106-107) points out that problem-centred interviews are especially suitable for adolescents, since there is a clearly defined area of focus. Furthermore, the questions by the interviewer support the process of narration. Sometimes, however, young people tend to answer questions briefly. For this purpose, the use communication techniques such as paraphrasing and ad-hoc questions have been taken into account (Witzel & Reiter, 2012).

After informing the interviewees about the study as well as assuring the students privacy, the interviews started with a rather open question concerning first associations with the term "taxes". Thereafter questions as indicated in table 1 were asked.

3.3 Data analysis

The interviews were recorded and transcribed. Since this study incorporates criteria from previous studies in the field, the analyses of the curriculum as well as that of textbooks from the disciplines of public finance, personal taxation and tax law, these criteria were used to filter the interviews. The main steps of the content analysis are depicted on figure 1. In a first step, information was systematically deduced from the interviews, therefore, the main categories were applied to the interview transcripts. Then, the content analytic method of summarising (Mayring, 2014) was used, therefore, the results were extracted, paraphrased, generalised and reduced and the subcategories, coding rules and the anchoring examples were developed in a cyclical approach. The coding scheme as well as the number of answers that fall in each category are illustrated in table 2, table 4, table 5, table 6 and table 7. The coding was done by a single researcher but ambiguous answers were discussed with other researchers. In order to improve the validity of the study, peer debriefing as suggested by Creswell and Miller (2000) was used at several stages of the study (for the interview guideline, the analytical process and the category development, the interpretation of the results).

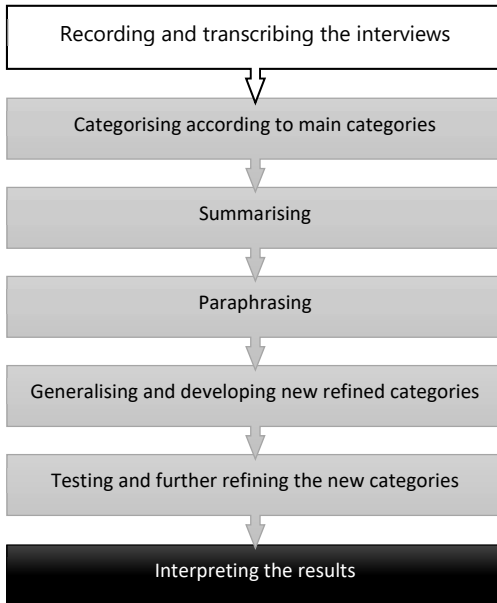


Figure 1: Content analysis adapted from Mayring (2014)

4 Results

4.1 Societal level: taxpayers and tax beneficiaries

The circular flow model depicts economic exchanges in a clear and structured way. Therefore, this model is often used in instructional settings to explain macroeconomic topics (Daraban, 2010). In most interviews, cards representing the actors in the circular flow model – households, firms, banks and the government – were used in order to stimulate a conversation on taxpayers and tax beneficiaries.

At first the answers to the question “Who is paying taxes?” are analysed and then the results of replies to “Who benefits from the taxes?” is presented. 10 students correctly answer that private households, banks and companies pay taxes to the government. Many students support their explanation by examples of taxes that are paid by the different actors, as the following excerpt ⁵¹ demonstrates “The firms pay VAT, that’s for sure. Sales tax actually [...]. The banks pay the capital gains tax to the tax authorities. [...] And, yes the private households pay the regular VAT for the products that it buys”.

¹ Since the interviews were held in German, the interview sections are translated into English.

6 students state that private households and companies pay taxes but do not mention banks as taxpayers. An example is shown in the following excerpt 9, "Firms and privates pay to the banks, the capital gains tax and so on. The government too, if it has a bank account". For this student, the banks are the major recipient of tax payments. Also, this student mentions the government as a taxpayer.

The second part of this analysis is concerned with the beneficiaries of tax money. 7 students initially respond that the government benefits from the taxes and one student even mentions tax authorities. This can be seen in the excerpt 10 below.

Interviewer: "Who would you say profits from taxes?"

Student: "The government, the most."

Interviewer: "How?"

Student: "Oh well, because of the deductions and so on (...), so actually the tax authorities too, and not only the government. They profit the most."

This dialogue suggests that the government is perceived as a private company whose income is taxes and that it wants to make a profit from earning taxes. This profit is then used, for example, for paying the salaries of politicians. Nearly all of these students then, however, clarify that the government also uses taxes to finance goods and services for other institutions. However, not all students mention all three institutions. 3 students name private households but do not comment on or are not sure about the role of banks and companies as excerpt 11 below demonstrates.

Interviewer: "Would you say the banks profit from taxes too?"

Student: "No, I do not think so."

Interviewer: "And companies?"

Student: "From the taxes? Profiting? (Laughs) I do not know."

4 students mention private households and companies but are not sure if banks benefit from tax revenues. 5 students state that all the actors in the circular flow model benefit from tax revenues and 2 students refer to all but the government as beneficiaries. The categories are depicted in table 2.

Table 2: Category system and results: circular flow model

Main categories	Subcategories	Description/Coding rules	Number of students
Circular flow model	Payers: private households, banks and companies	Private households, banks and companies are mentioned as tax payers.	10
	Payers: private households and companies	Private households and companies are mentioned as tax payers. Banks are not mentioned. Government might be mentioned.	6
	Beneficiaries: the government	Government as the first answer to the question "who benefits from tax payments?"	7
	Beneficiaries: private households	Only private households are mentioned as beneficiaries.	3
	Beneficiaries: private households and companies	Private households and companies are mentioned as beneficiaries.	4
	Beneficiaries: all institutions	All institutions are mentioned as beneficiaries.	5
	Beneficiaries: all except the government	All except the government are mentioned as beneficiaries.	2

4.2 Societal level: tax expenditures

In order to further explain the students' understanding of goods and services funded through tax money, their answers are compared to real expenditures in Austria by Statistik Austria (2016) as depicted in table 3.

Table 3: Tax expenditures (real expenses taken from Statistik Austria, 2016)

Categories	Expenditures in 2016 in million €
Social protection	76 227
Health	28 280
General public services	23 259
Economic affairs	20 032
Education	17 486
Public order and safety	4 788
Recreation, culture and religion	4 258
Defence	2 173
Environment protection	1 410
Housing and community amenities	1 221

Most of the students' answers, as depicted in table 4 below, fall into the categories of infrastructure and traffic, social protection and education. This seems quite self-explanatory since it is something they encounter on a daily basis. Very few students mention examples in the categories of recreation, general public services and grants. 2 students remember from media reports that in the course of the Eurovision Song Contest (held in Austria in 2015) "Ampelpärchen" (traffic light figures) were financed.

Surprisingly, none of the students mentions examples from the categories of public order and safety, defence and environmental protection. However, students are able to name some of the expenditures funded by taxes. At the same time, this analysis has to be read with caution, as categories are not always as clear-cut as they would seem, e. g. the category "hospitals" comprises different tax-funded areas such as the building, the salary of the workers etc.. Also, highways are mainly funded through direct fees whereas local streets are funded by municipalities. Therefore, the category of infrastructure and traffic somewhat overlaps with other categories (BMVIT, 2012). For the analysis the most suitable category was chosen. The incomplete picture of the range of public goods is in line with the findings of Furnham and Rawles (2004, p. 18), who interviewed students of a similar age in Great

Britain. Those students mostly named spending in the categories of education and health, followed by defence in third place.

Table 4: Category system and results: tax expenditures

Main categories	Subcategories	Number of students
Infrastructure and traffic (17)	Infrastructure	7
	Streets	6
	Buildings	2
	Subway	1
	Public transport	1
	Hospitals	4
	Health insurance	2
Social protection (16)	Unemployment benefit	3
	Pension	3
	Health system	1
	Refugee support	1
	Social insurance	1
	Accident insurance	1
	Social institutions	1
Education (13)	Child benefit	1
	Schools	9
	Books	1
	Vocational training	1
	Education	1
	University	1

Main categories	Subcategories	Number of students
Recreation (4)	Traffic light figures	2
	Parks	1
	Events	1
	Public income	1
General public services (3)	Public organizations	1
	Municipalities	1
Grants (2)	Grants	2

4.3 Societal level: public goods

When students were asked why public goods are not financed privately, four explanations were identified, whereas students who were unable to give any explanation were not included in the analysis. 9 students answer that goods would otherwise not be affordable for everyone. For example, one student draws the conclusion that financing public goods privately might be affordable for affluent people but could have dangerous effects on low-income families, as expressed in excerpt 2, "[...] I often think about lower-income families or lower middle-class families, and that they would lose their means of existence, and that is something I do not support at all". 3 students argue that it would be hard to coordinate the private provision of public goods because a lot of money would be required at once. 2 students add that individuals would rely more on the status quo, leading to stagnation in innovation. 1 student says that certain individuals would gain control over certain public goods, e. g. water. An overview of the categories and answers is provided in table 5.

Table 5: Category system and results: public goods

Main categories	Subcategories	Description/Coding rules	Number of students
Public goods	Not affordable for everyone	Reason for not privately financing public goods: lack of affordability	9
	Coordination problem	Reason: too much money would be needed at once, which is hard to coordinate	3
	No more innovation	Reason: Financing public goods privately would stop innovation	2
	Concentrated power	Reason: Single person or institutions would have more power	1

Public goods are characterised by the impossibility of excluding people from their usage, for technical reasons or from a societal point of view as well as the non-rivalry of the usage (Piekenbrock, 2013). Even though these two characteristics render efficient allocation through market mechanism impossible, they are only partly addressed by the students. The non-exclusivity argument can be linked to the main category of “not affordable for everyone” because from a societal point of view non-exclusivity can mean that everybody should have access to education. The argument that “individuals would gain control” can also be read as related to non-exclusivity, since it is not desirable in a society that individuals should be able to exclude others from having access to public goods such as education or water.

4.4 Individual level: experience with paying taxes

When it comes to the students’ personal experiences with paying taxes, 17 students spontaneously confirm that they have already paid taxes. 5 insist that they had not yet paid taxes. As the dialogue below (excerpt 10) illustrates, paying taxes is associated with working and earning money.

Interviewer: “Have you already paid taxes?”

Student: “No.”

Interviewer: “No?”

Student: “No, I don’t think so (laughs).”

Interviewer: “Why not?”

Student: “Because I am a student.”

Interviewer: "Who is paying taxes?"

Student: "People who work."

On further inquiry, 19 students indicate that they pay VAT when purchase something. They were finally able to relate VAT to personal shopping experiences, as seen in excerpt 16: "Yes, when going shopping, like everybody else and (...) everywhere, if you go to the hairdresser, if you are (...) yes when going to the book-shop, buying books for example, yes".

9 students mention that they had paid income tax while working. 7 students state that they have worked, but are yet to pay income tax. 3 students do not mention income tax but later in the interview indicate that they have work experience.

Most of the students with work experience say that they did not pay income tax because their income did not exceed the minimum threshold. Their explanations, however, are not always correct as the following excerpt 21 shows: "No, because as an employee, you only pay income tax if you earn more than €1 300? And as an intern I do not earn that much, at least I think so". The student is not aware of the fact that she or he pays tax but is eligible to tax return if the income is lower than €11 000 per year (help.gv.at, 2016). Table 6 provides an overview of the categories and results.

Table 6: Category system and results: experience with paying taxes

Main categories	Subcategories	Description/Coding rules	Number of students
Experience with paying taxes	Yes	First answers to the question did you already pay taxes: "yes".	17
	No	First answers to the question did you already pay taxes: "no".	5
	VAT	Student mentions experience with VAT or tax paid when buying goods.	19
	Income tax: yes	Student mentions that income tax was paid due to internship or part-time job.	9
	Income tax: no, but work experience	Student mentions that he or she already worked but did not pay income tax.	7

4.5 Individual level: income tax

In Austria, income tax is automatically deducted from gross salaries by the employer and paid to fiscal authorities before net salaries are paid to the employees. The employees can, however, file an “Arbeitnehmerveranlagung” (employee assessment) in order to get a tax return. This is often the case when employees do not work an entire year (e. g. students during internships) or have salaries that vary from month to month (help.gv.at, 2016).

Most students associate the term employee assessment with the fact that tax money is returned to employees, some students, however, were unable to relate to the term employee assessment at all, those students were excluded from the analysis. 13 students have yet to carry out an employee assessment themselves. The reasons could be that they did not have the opportunity since they were yet to work. Others say that parents handled the employee assessment formalities for them. 4 students plan to fill out their employee assessment forms in the coming months. One student specifies the process as evident in excerpt 3: “I have to write the tax authority and tell them how much I have earned and how much tax I have paid, and that I am entitled to get it back”. This can be seen as a misunderstanding because there is the possibility to file an employee assessment, either online or by filling out the paper form.

4 students try to explain why they could get money back when filing an employee assessment. However, no detailed explanations are given and they are rather unsure of their answers. 2 students specify that the reason was that they had only worked for one month and they have no other regular income. 1 student says the reason was that too much tax money had been paid. 1 student claims that she or he is eligible to a tax return because of her or his status as a student.

The understanding of the term “employee assessment” varies. The first and second answer can be classified as partly correct. The third answer is similar to the dialogue in section 4.4. There seems to be an incorrect understanding of whether students have to pay taxes or not. An overview of the replies is provided in table 7.

Table 7: Category system and results: income tax

Main categories	Subcategories	Description/Coding rules	Number of students
Income tax	Yes, already conducted themselves	Students mention that they conduct an employee assessment themselves.	5
	Not conducted	Students mention that they did not conduct an employee assessment themselves.	13
	Planned in future	Share of students that have not yet conducted an employee assessment but have specific plans of doing it in the near future.	4
	Explanation	Students offer an explanation why one gets money back when doing an employee assessment.	4

5 Summary and conclusion

The lack of understanding which has been identified in this study, is in line with the research findings of Furnham (2005, p. 710), who confirms that even the oldest and potentially the most experienced students have problems understanding tax-related issues. Students are seemingly often not aware of the economic interdependencies on a macroeconomic level. Similar results were reported by Aprea and Sappa (2014), who analysed students' conceptions of economic crises. The findings suggest several possible adjustments for fiscal education. The main results are summarised and suggestions on a didactical level are given:

The students' understandings of the tax-paying side include the answers that the government and banks do not pay taxes but receive tax money. This is, however, only partially correct, since the government does pay taxes when it acts, for example, as an employer. The second misunderstanding could be ascribed to a mix-up between taxes and banking fees. The underlying argument might, however, also be considered correct, as governments have to use tax money for paying interest on debts or tax money being used for bank bail-outs.

It is an interesting observation that the first answer to the question on who benefits from tax money is "the government". This might be a result of them thinking about the money's recipient. Also, some students could have perceived the government as an entity of corrupt politicians capable of embezzling tax money. This assumption

could easily have been drawn from scandals and their media coverage. According to Ausubel (1960, p. 271), advance organisers help to reactivate existing concepts and thereby support the cognitive integration of new topics. The circular flow model can be used as an advance organiser for teaching a variety of economic topics. The importance is emphasised by its prevalence in various competence models (Weber, 2001).

The category of tax expenditures offers details on students' perception of the goods financed by tax money. It is quite obvious that the students' views are very much focused on goods and services that they benefit from on a personal level or those discussed in the media. This bias should be reflected upon in a classroom setting. One teaching approach could be to ask students to list all the goods and services paid for through tax money they benefited from in their personal lives. This list can then be compared to the actual goods and services provided by the government.

The students present a variety of correct arguments for the provision of public goods. The main reasoning is the affordability for lower-income people. Building their arguments, the question why goods and services are provided by the government can then be answered in an instructional setting. In addition, the problems associated with public goods can be experienced through public good games as for example described by Martins, Fortmüller and Powell (2017). It is, however, of importance to then discuss the underlying principles of the game and the consequences for real life.

Taxes are payment transactions that are not easily recognised by all students. It is a fact that all of them, as consumers, have already paid VAT. Also, most young people have bank accounts of their own and consequently pay capital gains tax. Some of the students have already worked and paid income tax. Building on the students' experiences, instruction should explicitly relate to the fact that paying taxes is part of everyday life. This approach facilitates integrating new concepts into the existing cognitive structures. In addition, calculating income tax should be practiced and explained in class, in order to be able to understand the income tax system.

While there are students who have already filed for a tax return, some do not have any experience with an employee assessment. Several students appear to have no clarity about why and how they would get back money by applying for an employee assessment. Instruction on how to fill out the employee assessment forms offers the possibility for a competence-oriented approach. This practice relies on the real-life situation as initially proposed by Robinsohn (1972).

Fiscal education is a crucial but often neglected part of a comprehensive financial education that should be included in the school curricula. On a curricular level, programmes intending to foster fiscal literacy should include content about taxes

on the individual level as well as on the societal level. On an instructional level, the results indicate that especially tax-related issues on the individual level do not only require memorising content but also applying the content and, therefore, the facilitation of developing competence in dealing with tax-related problems.

Some of the results of this study are specific to the Austrian tax system, which can be viewed as a limitation. As already mentioned there are various limitations when it comes to the sample of this study (see 3.1), e. g. sampling strategy through gatekeepers, the variation of the sample and the small sample size. These limitations do not allow drawing general conclusions. In this study, the data was coded by a single researcher, which can be seen as another limitation. However, peer debriefing (Creswell & Miller, 2000) was employed and the categories are provided in order to increase transparency. To be able to validate the findings, a larger sample and an even more structured approach based on this study is needed. In combination with existing test instruments, the present results provide the basis for a test instrument to systematically measure tax knowledge, interest in tax-related issues as well as attitudes and behavioural intentions towards tax compliance.

A final limitation of this study is the focus on cognitive aspects. Therefore, future studies are recommended exploring the reasons behind cognitive processes as well as other non-cognitive factors. In addition, more in-depth questions (needing more interview time) might be able to contribute to gaining a deeper insight into the students' reasoning and process of drawing conclusions.

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² Special thanks to the school authorities, teachers and students who made this study possible.

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Impressum

Empirische Pädagogik

Zeitschrift zu Theorie und Praxis erziehungswissenschaftlicher Forschung

ISSN 0931-5020

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Gabriele E. Dlugosch, Julia Fluck, Ingmar Hosenfeld, Urban Lissmann, Michael Zimmer-Müller.

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Erscheinungsweise/Preis

Die Zeitschrift erscheint viermal jährlich. Der Bezugspreis beträgt € 45,00/Jahr (Studierende: € 25,00/Jahr) zzgl. Porto. Kündigung bis spätestens 8 Wochen vor Jahresende.