

# Experiential Financial Literacy: A Field Study of My Classroom Economy<sup>☆</sup>

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## Abstract

The teaching of financial capability in schools has shifted in the last decade to earlier grades, including elementary school. This randomized field study assesses the impact of a simulated classroom economy on students' financial knowledge and behavior. Students show evidence of gains in financial knowledge, even though the program was entirely 'learn by doing' rather than formal instruction. Students also self report improved financial behaviors, and school administrative data show gains in learning in social studies and to a lesser extent, mathematics. Simulated experiential learning about personal finance shows promise as a relatively efficient mechanism to build financial capability among elementary-school students and could serve as an important component of a comprehensive effort to promote financial well-being in schools.

*Keywords:* financial literacy; financial behavior; education evaluation

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## 1. Introduction

The development of financial capability—defined as understanding basic financial management and engaging in positive financial behaviors—remains an elusive goal (Lusardi et al., 2010a). About 35 states have some form of K-12 personal finance education required in schools (Council for Economic Education, 2014). Over the past decade, the focus of financial education policies has shifted from high school programs to financial education in earlier grades. For example, the National Association of State Boards of Education's Commission on Financial and Investor Literacy issued a

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report recommending that states ‘consider infusing financial and investor education *throughout* the K–12 curriculum’ (p. 20). The Federal Financial Literacy and Education Commission’s ‘Starting Early for Financial Success’ initiative promotes the potential benefits of reaching students at young ages for financial capability later in life.

An important question is if learning about finances is appropriate at younger ages. Reviews of the literature on children’s cognitive development and economic understanding (see, for example, Schug (1987), Webley and Nyhus (2006), or Scheinholtz et al. (2012)) indicate not only that children can understand financial concepts at younger ages than high school, but also that their understanding is well developed by age 12. Moreover, many children control some financial resources by this age (see Doss et al. (1995)) and may need training and guidance in how to manage their finances. While other studies have examined the effects of financial programs for older students (see Peng et al. (2007) and Totenhagen et al. (2015)), elementary school age students are less frequently studied (for a discussion, see Batty et al. (2015a)).

Relatedly, Drever et al. (2015) argue that financial knowledge is only one piece of the puzzle; the formation of financial attitudes and habits—which commonly occurs during childhood—is another potentially important driver of adult financial outcomes. The process through which young people acquire these values, norms, and behaviors is typically referred to as financial or economic socialization (Danes, 1994).

Naturally, much of this socialization occurs in families, as parents or other influential adults model financial behaviors or discuss family finances (see Gudmunson and Danes (2011) for a review). Research suggests that financial behaviors and self-confidence are associated with higher levels of parental guidance and oversight (see Pliner et al. (1994); Grinstein-Weiss et al. (2011) and Kim and Chatterjee (2013) ). Otto (2013) even observes a relationship between financial socialization and savings behavior in adolescence, although the impact on saving behavior in adulthood is less clear (Ashby et al., 2011).

Providing financial education in elementary school may help to counteract student’s lack of financial socialization outside of school (Suiter and Meszaros, 2005), ideally before negative habits can take hold (Schug and Walstad, 1991). How parental socialization and the role of non-school

based experiences influence young people are an important area of study in general (for a discussion, see Grusec and Davidov (2007)). The role of socialization with younger children related to financial capability is an important, further application of this work (see Van Campenhout (2015); Shim et al. (2010); Jorgensen and Savla (2010)).

While there are strong arguments in favor of introducing financial education in elementary schools, the curriculum in most schools is focused largely on math and language skills (Suiter and Meszaros, 2005). This leaves only minimal time for other topics. Moreover, many teachers feel unprepared to deliver personal finance instruction (Way and Holden, 2009); therefore, alternative educational approaches that focus more on financial socialization and rely less on dedicated lesson plans or teacher expertise can fill an important need.

One example of such an approach is bank-at-school programs. Some school districts offer in-school banking programs, facilitated through national organizations such as Save for America, via state-sponsored programs like the Delaware and Illinois Bank at School programs, or through independent partnerships between schools and local financial institutions. These initiatives offer children the chance to practice managing money with their own accounts (Johnson and Sherraden, 2007) and may enhance student learning by providing young people opportunities to apply what they learn in financial management programs, thereby increasing the relevance of the material and improving student engagement (Collins and Odders-White, 2015). While bank-at-school programs show promise, they require partnerships between school districts and financial institutions and ongoing oversight. These challenges limit the widespread use of these programs. In general there is support of the idea that experiences are powerful for learning in the context of non-education based experiential learning on subsequent behaviors (see Cai and Song (2017)) as well as in school settings (see Kourilsky (1977) and Rupp (2014)).

In this study, we consider an alternative approach that, like in-school banking, is experiential in nature, but is simpler to administer. In My Classroom Economy, students practice making financial decisions in a classroom-based economy that teachers implement as a classroom management system. This stands in contrast to more traditional financial education programs that follow specific lesson plans. To date, no rigorous studies have examined the impact of a simulated

economy on elementary school students' financial knowledge, attitudes, or behavior.

Historically, the focus of education policy has been on the high school financial literacy curriculum, not programs offered at younger ages. Studies document knowledge gains from high school financial education (e.g., Harter and Harter (2009); Walstad et al. (2010); Bruhn et al. (2016) document significant improvements in behavior following a high school financial education intervention, as do Brown and colleagues (2015). A meta-analysis conducted by Fernandes et al. (2014) suggests that these interventions have very small, or no impacts on financial behaviors, however.

Formal evaluations of economic or financial education programs targeted to elementary school students show positive effects on gaining measured financial knowledge (see Harter and Harter (2009), Sherraden et al. (2011), Batty et al. (2015b). citeKalmi). These studies also find some evidence of positive changes in student knowledge, attitudes and behaviors. We build on this work by conducting a randomized field trial in upper-elementary classrooms to evaluate an experiential financial learning program.

We find statistically significant improvements in students' financial knowledge and behaviors, including the frequency with which students report engaging in budgeting, as well as student reports of discussing financial management outside of school. Students also report taking part in more economic experiences. Surveys and interviews with teachers show that the program enjoys strong support, suggesting that MCE may be a relatively efficient mechanism for building financial capability among elementary-school students.

This paper begins with a review of the program studied, as well as the study setting and design. Next, we provide an overview of the measures and data collection, followed by findings and discussion of the relative merits of this approach compared to other modes of financial education.

## **2. Study Design**

### *2.1. My Classroom Economy*

My Classroom Economy (MCE) is a K-12 a classroom economic system. Students apply for classroom jobs and practice budgeting and saving through several core activities including: (1) earning salaries (in the form of classroom currency) for performing assigned tasks; (2) managing

expenses, including paying rent for or purchasing their desks; (3) earning bonuses or incurring fines for particular behaviors; and (4) making spending decisions at classroom auctions and stores. MCE's learning objectives align with Common Core standards as well as state and national standards for financial literacy, and materials are available to teachers free of charge online.

Figure 1 shows displays example jobs that student could have in the classroom, including a banker and custodian. Figure 2 shows a schedule of fines for problem behaviors, and Figure 3 shows bonuses for positive behaviors or achievements. Figure 4 shows copies of in-classroom currency. The MCE teacher's guides provide many other materials, including paychecks, loan applications and job descriptions.

## *2.2. Setting: School District of Palm Beach County*

The School District of Palm Beach County (SDPBC) implemented MCE during the first trimester of the 2015-2016 school year. With a total enrollment of more than 175,000 students, the SDPBC is the twelfth largest district in the U.S. (Snyder et al., 2016). Among the District's 85,000 elementary-school students (grades K-5 ), 33 percent are white, 28 percent black, and 33 percent Hispanic, with the remainder from Asian, American Indian, or other backgrounds. Overall, 61 percent of students qualified for free or reduced lunch in 2015, and 18 percent were English Language Learners (Palm Beach County School District, 2016).

SDPBC's K-12 Financial Literacy Coordinator identified 19 schools at the end of the 2014-2015 school year both willing to implement MCE and able to participate in a research study with in-class student assessments. Of these 19, 10 schools were randomly assigned by the research team into either a group that implemented MCE in the first trimester, and 9 were assigned to the control group that did not implement the program until after the first of three trimesters in the 2015-2016 school year. Teachers had hands-on opportunities to learn about MCE and to prepare MCE materials for their classrooms as part of a 3-hour training provided before the school year began.

## *2.3. Students*

Upper-elementary students are appropriate for this study for several reasons. Cognitive development theory suggests that the elementary years may be a window of opportunity when education

can influence behavior later in life. Skills related to saving money (ownership, conservation, planning, deferred consumption) are influenced in childhood (Webley (2005)). From a developmental perspective, the period between ages 5 and 7 (commonly referred to as the “5 to 7 shift”) is associated with marked growth in self-control, planning, and formal decision-making abilities (Melton, 2013). Students by age 8 to 10 are likely to be able to participate actively in MCE. Finally, from a practical perspective, elementary school students tend to spend most of the day with their primary teacher, making elementary school a more natural environment to implement a classroom economy than later grades, where students move from room to room more often.

### **3. Data**

#### *3.1. Sample*

As shown in table 1, there are 19 schools in the MCE study, and an additional 118 non-MCE schools for which we observe student’s administrative data. Math performance was similar between the two main MCE schools; both MCE schools are higher than students in schools with no MCE offered. On average, MCE 1st schools are 59 percent minority, with a lower percentage (54 percent) in the ‘MCE later’ group, and 73 percent in the non MCE schools. Between 43 percent to 63 percent of students qualify for free- and reduced-priced school lunches. The schools are similar on English language learner status—about 18 percent of students are learning English in MCE 1st schools, and about 17 to 19 percent in other schools. While schools were assigned to MCE, there are strong differences across schools based on what areas from which they draw students. These differences across schools suggest the need to control for student’s observable characteristics in the analysis, including baseline measures to estimate changes rather than simply levels of outcomes.

#### *3.2. Data Collection and Measures*

We have three sources of data. One source is data collected from students at two points in time using in-class surveys about 10 weeks apart. Survey questions included in the pre- and post-assessments were developed based on validated measures presented in prior studies and were pretested with similarly aged children (Batty et al., 2015b). The University of Wisconsin Survey Center (UWSC) distributed and collected the in-class assessments at schools in August 2015 and

again in early November 2015. No survey data was collected at the no MCE schools. In-class assessments included: (1) Financial Knowledge (a 13-item quiz); (2) Budgeting Behaviors (a 5-item scale); (3) Propensity to Plan (a 4-item scale); (4) Financial Socialization (a 2-item scale) and (6) Economic Experiences (a 5-item scale). Each is discussed in more detail below.

### **Financial Knowledge**

Although MCE does not employ direct lessons on financial topics, the exposure to financial situations that it provides could improve students' financial knowledge or motivate students to pursue that knowledge on their own. The financial knowledge scale that participating students completed for the MCE evaluation is composed of 13 quiz items that were pretested with similarly aged students. The quiz (see Appendix) includes questions related to owning and renting, budgeting, and opportunity costs, as well as basic financial numeracy, compound interest, profit and loss, account balances, and the costs of common items. The quiz items test objective financial knowledge rather than subjective self-assessments of knowledge.

When calculating students' financial knowledge score we employ item response theory (IRT), a technique used to generate a knowledge scale that accounts for differences in the difficulty of each question (DeVellis, 2016). We use a three-parameter logistic IRT model, where the three factors account for how difficult each item is, how well each item contributes to the overall scale, and how often students show a pattern of guessing. The scores are transformed to produce a mean of 50, where a high score shows higher financial knowledge. The standardized score is based on parameters estimated from the initial quiz. The changes in scores from the baseline to follow-up provide a consistent knowledge test score within subjects. The model and parameters, as well as a principal components factor table, are provided in the Appendix.

### **Budgeting**

In classrooms using MCE, students earn money and must manage expenses. Students manage their cash flow in order to purchase items from the auction or classroom store, cover fines, and pay rent for or purchase their desks. This practice could translate into changes in how students understand budgeting. To test this possibility, we estimate a scale that assesses five items, each with five categorical responses (ordered so higher scores correspond to greater budgeting behavior).

Since these are subjective and not objective quiz items of varying difficulty, the scale is simply the mean response across the five items. The items include:

- How important is it to keep track of how much money you earn and spend using a budget?
- How often do you have a plan for how you will spend money?
- How good are you at making decisions about how to spend your money?
- How confident are you about making decisions that deal with money?
- How good are you at keeping track of what you spend your money on?

### **Propensity to Plan**

Along with potential benefits around instilling the importance of budgeting, the experience of having to earn money and manage expenses within the MCE program may promote an inclination to plan ahead. The student in-class assessments included four items about how often the student engages in general planning behaviors. The outcome is a scale of responses from 1 to 5, again ordered so higher scores correspond to more positive behaviors. The items include:

- How often do you set goals for yourself?
- How often do you set goals for the next few days for what you want to achieve?
- How often do you have a plan for how your free time will be used in the next few days?
- How much better does it make you feel to have your free time planned out for the next few days?

### **Financial Socialization**

In many homes, money is not a topic of frequent discussion. MCE allows students to experience economic and financial issues (for instance, income and the impact of fines and bonuses) in a safe setting, potentially leading to discussions at home that parents would not otherwise initiate. We include two items related to financial socialization. These measures relate to whether a student self reports that their family talks about money at home. The outcome is a scale of responses from

1 to 5 across these two items: (1) How often does your family talk about how you spend money?, and (2) How often do you talk to your family about financial issues?

### **Economic Experience**

Finally, we attempt to measure students' financial experiences outside the MCE setting. It is plausible that students' experiences with MCE might motivate them to look for ways to earn real income, save, or take on more financial tasks independently. The student in-class assessments includes six yes or no items that form a summed scale of responses (ordered so higher scores correspond to more experiences). The items include:

- In the last month, have you received an allowance?
- In the last month, have you gotten money from your family for doing chores?
- Do you currently have a bank account in your own name?
- In the last month, have you received spending money or money as a gift?
- Do you make your own decisions about how to spend your money?
- In the last month, have you gotten money from a job?

Because students might interpret the last two questions in the context of MCE and not their economic behavior at home, we also use a shorter four-item version (labeled 'Experience B') as an alternative.

Table 2 provides summary reliability statistics for each measure at baseline across all students in the evaluation at baseline. The internal reliability, or Cronbach's alpha, is used to assess how well the questions describe a common characteristic. As noted above, all measures were pretested prior to the study with other students of a similar age to refine the items included and to test each scale's internal consistency, or how closely related items are as a group, and its validity, or how well the scale performs relative to other measures of similar outcomes. Details can be found in Batty et al. (2015b).

Table 3 shows the means and standard deviations for the key variables in the student assessments for the MCE and non-MCE groups, before and after the program was offered.

### 3.3. Administrative Data

The second source of data are grades by subject by trimester. These are administrative records submitted by teachers on each student at the 19 MCE study schools. These data are available for all students in the MCE schools, as well as 1,338 students at 27 non-MCE schools. We use data on teacher reported performance for social studies and math. SDPBC provided data at the end of the school year on student grades from each trimester.

Grades are recorded when students are assessed for each Florida state standard in the course of the normal academic year, shown in Table 4. If the student is assessed, and then meets or exceeds the state standards, that is recorded in the data. For social studies there are 8 state assessed standards. For math, there are 12 assessed standards. We estimate how MCE may effect student's learning based on the proportion of assessed standards the student has met or exceeded the threshold. The administrative data also record teacher provided assessments of concerns about each student making progress towards learning standards in each of the three trimesters.

Finally, the third source of data is annual test scores, attendance and standardized test scores for students. These data are available from the MCE schools, as well as 8,800 students who attended 118 non-MCE schools. The Florida standardized math test is scored on a 5 point scale, where 5 is the highest quartile. Attendance is measured in days absent from school out of a total of 180 required days of schooling.

SDPBC provided data on scores on the annual Florida State Assessment (FSA) standardized math exam. These data are all measured per student, in cross section, and do not represent changes from baseline to post-treatment.

In addition, we have the standardized test scores and attendance for the past three school years. We can also observe the student's school, race, English language status from administrative data.

These data permit several contrasts based on the administrative data:

- changes in test scores from the prior year for students in schools where MCE was offered in the first trimester compared to students in schools did not offer MCE in the first trimester, but were interested in offering MCE in the second and third trimester;
- changes in test scores from the prior year for students in schools where MCE was offered at

any time, compared to schools where MCE was never offered;

- differences in trends across trimesters for students in schools where MCE was offered in the first trimester compared to students in schools offering MCE after the first trimester and compared to students in schools never offering MCE.

#### **4. Teacher Fidelity to MCE Program**

Student survey assessments offer some evidence on how students in the first semester treatment group report using MCE. Figure 5 shows the number of times students recall buying something at the classroom store (or auction); the majority of students (60 percent) reported buying at least one item, meaning they were able to convert their income into some consumption during the study period. (Others may have been saving or used their income to pay fines or classroom expenses.)

In Figure 6, nearly three out of four students reported paying a fine, consistent with the classroom management aspects of MCE. Figure 7 shows that students, at the end of the first trimester, had an average MCE account balance of \$1,295 (median \$1,000) and only 10 percent had less than \$20. All these student-reported behaviors indicate that MCE was in fact implemented, and that students had experiences with the program.

In addition, teachers who implemented MCE during the study period completed a nine-question teacher survey at the end of the first trimester. A majority (52 percent) of teachers reported giving students opportunities to earn income more than once per day. Although some teachers (10 percent) reported giving students opportunities to buy items at a store or auction once a week, 40 percent reported doing so once every other week, in line with suggested guidelines from the training. Over 82 percent rated their overall experience with MCE as excellent or good. In line with this high level of satisfaction, 95 percent of teachers reported that they planned to use MCE again.

#### **5. Analysis**

The impact of MCE is estimated based on changes in student's assessed measures conditional on if they attended schools assigned to receive the program in the first trimester of the school year. This is an Intention-to-Treat (ITT) estimate for a student attending MCE school—we do

not observe if each student took part in the program. While this overcomes the selection effects of students who volunteer to take part in programs, there may be selection by school staff into the study. We therefore focus on estimating changes, controlling for baseline measures.

The main estimate the effects of MCE, is as follows:

$$Y_{followup} = \alpha_0 + \beta_1(1stTermMCE) + \beta_2(Y_{baseline}) + \beta_3X + \epsilon_{i,s} \quad (1)$$

where the estimate on the *1st Term MCE* indicator is the outcome of interest for a student at time 2 (where baseline is time 1 and follow-up is time 2), controlling for the baseline measure. *1st Term MCE* is an indicator for MCE participation by the student’s school in the first trimester.

In an iterative specification we then add in  $\mathbf{X}$ , a set of demographic characteristics including student race, student age, and student scores on a standardized math test in the prior school year. Gender and age were collected from the students in the survey since prior studies of gender indicate females have different financial knowledge than males (Edwards et al., 2007; Lusardi et al., 2010b) Math scores and race were available in administrative data. Because so many financial and economic decisions require quantitative reasoning, the relationship between math ability and financial knowledge is also important to consider (Agarwal and Mazumder, 2013).

The academic grades analysis is based on student level records. The grades and standards data form a 3 period panel, with one observation per student for each trimester, including students at no MCE schools. In the second trimester, the Post MCE ‘treatment’ group is only the MCE 1st group. In the third trimester, it is both MCE school groups. The comparison is no MCE schools in all periods, with the MCE later group an additional comparison in the first two trimesters. These estimates have clustered standard errors at the school level when using the administrative data (137 clusters).

Finally we have annual student level data on days absent and 2015-2016 school year Florida standardized math tests (FSA) taken in April and May 2016. These reflect cumulative measures for 2,619 students from MCE study schools who took both year’s exams, and are estimated relative to the prior year’s levels. In these estimates we show the MCE 1st group compared to the MCE

later group—we do not expect large effects since both groups were exposed to MCE, only one group had a longer exposure. We can also compare each group to more than 8,000 students at no MCE schools, where we might find a change in test score trajectories. These later estimates also have clustered standard errors at the school level (137 clusters). Only race and English learner status are available as controls (beyond prior year scores).

## 6. Results

Table 5 shows changes in the financial literacy or knowledge quiz, as scored using item response theory. The overall estimate is about 1.2 to 1.3 points. In terms of effect size relative to the standard deviation (a sigma unit), is just under 0.16 standard deviation units—a modest effect size. Relative to the baseline mean of 50, it is a about a 2 percent marginal increase.

Table 6 shows changes in the raw scales. Here the estimates (with no controls) show students in the MCE 1st group answered about 0.28 questions correctly, about one-tenth of a standard deviation. Table 6 also shows no significant changes in the budgeting or propensity-to-plan scales, indicating that MCE did not have measurable effects in this area. There are positive changes in the student-reported financial socialization and experiences scales. Here, the overall MCE effects are statistically significant and of relatively robust magnitudes.

Table 7 show changes in the student-reported scales all normalized to be 0 to 1, and including student level controls. Here the overall effect of MCE is statistically significant for all but the propensity to plan outcome. The effects are smallest for budgeting and financial knowledge, and larger for experiences and socialization. This finding is consistent with MCE encouraging students to engage in more economic activity in the real world, including at home. However, even though it was not the intent of the assessment survey, students may have been reflecting on MCE activities, rather than economic behaviors at home. Two of the items in the scale (report getting money from a job and making decisions about spending) could have been viewed in the context of MCE by some students. The 4-item version of the experience scale ('B') without these two items shows smaller but still significant effects of MCE.

Table 8 shows the MCE estimated effect on students achieving state standards for social studies

(excluding economics). The MCE estimated effect on students achieving social studies standards is 0.09, relative to a mean of 0.29 with student fixed effects. The results remain when adding in controls (race, absences, English learners, and grade level), as well. We also estimate reductions in the rate teachers evaluate students as being at concerning levels of performance.

Table 9 shows the MCE estimated effect on trimester math grades. Here we estimate a 0.11 increase in students' performance, compared to a mean of 0.67. Again we see a decline in teachers judging students performance as concerning. These results hold with student fixed effects or controls. In the terms after MCE is introduced into schools, students perform better in both math and social studies, including clustering errors for at the school level.

Finally, Table 10 shows the estimated MCE effects on students attendance and achieving math FSA test scores, measured at the end of the school year, relative to the prior year. In columns 1 and 2, we see no effects on attendance in either the MCE 1st schools vs. MCE later schools ('more' MCE vs less MCE), or any MCE schools vs no MCE schools.

In columns 3 and 4, we estimate MCE's effects on FSA math test scores. Here students who had more trimesters of MCE (MCE vs Comparison) show no significance, although the estimate is positive. Compared to no MCE, a student in a school assigned to MCE has an improvement in FSA math test scores from the prior year that is 0.10 to 0.13 points higher than students in other schools. The effect size relative to the standard deviation is small in magnitude, close to 0.09, but statistically significant.<sup>5</sup>

## 7. Discussion

Figure 9 shows the results of this study compared to a study of Financial Fitness for Life (FFFL), a traditional 3-5 hour formal instruction program on financial literacy, by Batty et al. (2015c). Both that study and this current study examined a similar age group and shared five financial knowledge test questions.<sup>6</sup>

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<sup>5</sup>Although now shown in the tables, the results are similar if we restrict the sample to the same schools and students as in Tables 9

<sup>6</sup>(1) 'Ming wanted to buy a fancy notebook for school and save her money to buy a computer. Ming decided to buy a plain notebook that is less expensive so she can save more money for the computer. Ming's decision is an example of ? ' (2) 'Jill had \$50 in her checking account. She made a withdrawal of \$10 and a deposit of \$20. What is Jill's balance in her checking account? (3) 'The Smiths have \$750 in income, and \$800 in expenses this month.

Using the same IRT scoring procedures for both test scales, we can then produce comparable pre–post estimates of effect sizes on knowledge based on treatment assignment. Figure 9 shows that the size of the gain from MCE and FFFL is similar. The FFFL program is a formalized course that taught specific content that appeared on the student knowledge quiz; MCE did not have the same focus on specific content or evaluation questions. Yet, these results indicate that MCE produces similar knowledge gains as FFFL, without a formal curriculum—that is students ‘learned by doing’. Both programs produce gains in knowledge on this scale of similar magnitudes, and both have statistically positive effects. MCE has the advantage of being widely supported by students and also serving as a classroom management strategy that teachers seemed eager to adopt.

## 8. Conclusions

This paper presents results of a formal evaluation of My Classroom Economy, an experiential approach to increasing financial education for elementary school students . Based on students ages 8 to 11, we find that MCE produces statistically significant changes in students’ financial knowledge after only ten weeks. These knowledge gains—which are modest in size—are notable given that MCE does not employ direct lessons on financial topics, but instead simply exposes students to financial situations. Differences in pre-post assessments also reveal improvements in students’ financial behaviors, including the frequency with which students are engaging in budgeting and money management as well as student reports of engaging in financial management at home and outside of school. Students in schools with MCE also report taking part in more economic experiences.

Figure 8 shows a summary of the normalized estimated effects based on pre-post surveys of students. Overall, the results of this study highlight the promise of experiential learning programs like MCE for elementary school-age students. Student assessments document gains in financial knowledge, budgeting, socialization, and financial experiences after just 10 weeks of participation,

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Are they saving money this month?’ (4) ‘A plan for spending your money is called?’ (5) ‘Suppose you have \$100 in a bank account that pays an interest rate of 10 percent per year. How much would you have in this bank account at the end of 2 years?’

and teachers' feedback on the program was very positive. Moreover, school administrative data suggest gains in learning in social studies and math. Collectively, these results show the potential of experiential programs like MCE to teach financial content to children age 8 to 12.

MCE is designed to run the length of a school year, giving students more opportunities to make financial decisions and receive feedback, and allowing teachers to incorporate more sophisticated elements of personal finance. The full, year-long version of MCE would likely show more substantial effects. Based on school district testing data and grades, compared to students in non MCE schools, these effects may become larger over time.

The effects of MCE are not isolated to financial knowledge. The program also appears to spillover into learning about social studies and math. This finding supports the use of MCE to achieve broader learning objectives. This is one of the first studies to show how financial education programs might support other non-financial learning objectives.

It should be noted that the positive impact associated with participation in MCE does not differ across subgroups—that is, student and parents from a variety of backgrounds see similar effects in response to MCE. School-based assignment to MCE is not ideal to test for subgroup effects, however, and how experiential learning affects more economically vulnerable students is an issue that may benefit from further exploration.

Indeed, the natural advantage of a simulated economy is that it can operate as a classroom management system without requiring the development of additional curricula. Experiential simulations like MCE could be operated concurrently with a traditional financial education curriculum. The combination of experiential learning and classroom work from elementary grades into middle school and high school may have promise as a flexible strategy that can continue to engage students as they develop and practice financial capability. A student who experiences MCE at age 9 and 10, in-school banking and coursework through age 14, and a combination of experiential and classroom learning at ages 15 to 18 might be most likely to develop stronger financial capability in adulthood. Engaging parents more directly could enhance the development of financial capability even further.

MCE also has the added advantage of serving as a classroom management system, ideally

integrating with teachers' day-to-day efforts to promote positive behaviors. The approach imposes fewer requirements than more traditional financial education programs and requires less effort overall from teachers in terms of training and support. Interviews with teachers show the program enjoys strong support among teachers who participated in the pilot and the evaluation; in fact, 95 percent of teachers reported that they plan to continue using the program. Thus, MCE and similar approaches show promise as a relatively efficient mechanism to promote financial capability among K-12 students and could serve as an important component of a comprehensive effort to promote financial well-being.

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## 10. Tables and Figures

Figure 1: MCE Teacher Materials: Jobs

<b>JOB</b>	<b>JOB DESCRIPTION</b>	<b>MONTHLY SALARY</b>
<b>Banker</b> <i>1 for every 5 students</i>	Keep banking records for 4 to 6 students. Accept money for deposits. Pay out money for withdrawals. Keep some cash ready to meet requests. Deposit remaining cash in the Central Classroom Bank. <b>Requires a recommendation.</b>	\$700
<b>Police Officer</b> <i>1 for every 5 students</i>	Check for violations of class rules. Hand out tickets to fine students who break the rules. Keep a record of fines and payments. Deposit money from fines in the Fine Folder. <b>Requires a recommendation.</b>	\$650
<b>Loan Officer</b> <i>1-2 per class</i>	Allow students to acquire loans for a set amount. Hand out loan slips and calculate interest. Keep a record of all loans. Work with the Banker to deposit money from the students' accounts.	\$650
<b>Clerk</b> <i>2-3 per class</i>	Hand out papers to students. Hand out materials such as art supplies. Collect papers or homework from students when asked. Organize the class supply shelves and keep them neat.	\$600
<b>Messenger</b> <i>1-2 per class</i>	Deliver written or spoken messages to people throughout the building. Answer the class phone.	\$550
<b>Custodian</b> <i>3-5 per class</i>	Keep the writing boards and countertops clean. Tidy up classroom areas when they need it. Make sure recycling items are placed where they should be.	\$600

Source: <http://myclassroomeconomy.org/>

Figure 2: MCE Teacher Materials: Fines

## FINES

In the classroom economy, the role of fines is to help students understand costs and consequences—it is **not to punish them**. The list of fines should be short and direct, matching your classroom priorities. Our list is an example.

RULE	TICKET AMOUNT
Dishonesty	\$500
Rudeness	\$100
Messy desk or cubby	\$100
Missing work	\$50
Off-task behavior	\$50
Tardiness	\$50

Although the Police Officers write tickets for fines, you control the process through an offense log. As you correct a student, you can mention that you're adding the violation to the log. Then, when Ticket Day comes, the Police Officers write tickets based on the entries in your log. In this way you retain explicit authority over dealing with misbehavior.

Source: <http://myclassroomeconomy.org/>

Figure 3: MCE Teacher Materials: Bonuses

## BONUSES

In addition to the salaries that students earn from their jobs, they can earn bonus money by performing well academically and participating in extracurricular activities. Students need to earn bonuses to make rent and save up for the auction. In addition, bonuses can be useful incentives for your own class goals.

The following bonuses should be included if at all possible. The bonus amounts are a suggestion.

ACTIVITY	BONUS AMOUNT
Earn 100% on a small test or quiz.	\$50
Earn 100% on a major test.	\$200
Earn 90% to 99% on any assignment.	\$100
Complete an outside reading assignment.	\$100
Get a compliment from another teacher.	\$200
Join in an extracurricular activity.	\$100

Source: <http://myclassroomeconomy.org/>

Figure 4: MCE Teacher Materials: Currency



Source: <http://myclassroomeconomy.org/>

Table 1: Elementary Schools in Study

	MCE 1st mean/sd	MCE later mean/sd	No MCE mean/sd
2015 Math Level	3.11 (0.66)	3.37 (0.61)	2.81 (0.60)
Pct Minority	0.59 (0.28)	0.54 (0.21)	0.73 (0.42)
Pct Free Lunch	0.55 (0.29)	0.43 (0.25)	0.63 (0.34)
English Learner	0.18 (0.17)	0.17 (0.16)	0.19 (0.38)
2015 Absent Days	7.49 (1.34)	7.32 (1.14)	7.86 (2.33)
Schools	9	10	118
Total Records	1241	1378	8892

Note: Mean (sd). MCE 1st are schools with MCE in first trimester. This is treatment in student assessment estimates. MCE later are schools where MCE was started in the 2nd trimester. This is the control for student assessments. No MCE are students drawn from other elementary schools with no MCE during the 2015-16 school year. All data summarized at school level based on administrative data. Total numbers of students at comparison schools unavailable. Mean among students in the available data is 80 students per school. Math scores measured at grade level, where 5 is highest performing (see <http://www.fldoe.org/accountability/assessments/k-12-student-assessment/fsa.stml>)

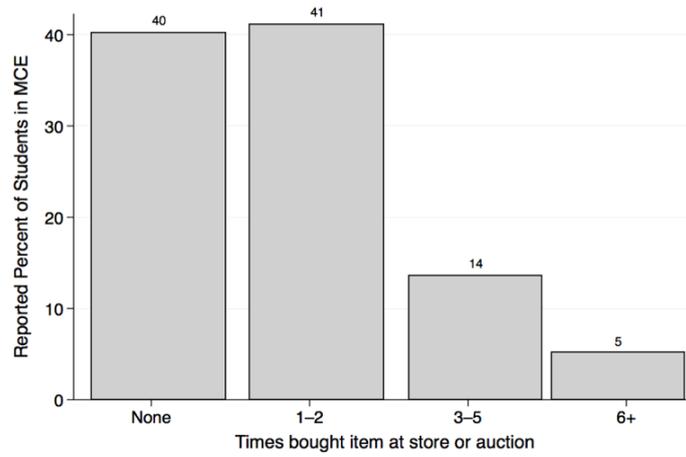
Table 2: Scale Construction: Cronbach's Alpha

Scale	Reliability
Financial Knowledge	0.63
Budgeting	0.68
Propensity to Plan	0.60
Financial Socialization	0.47
Economic Experience	0.48

Scale reliability coefficient coefficient at baseline.

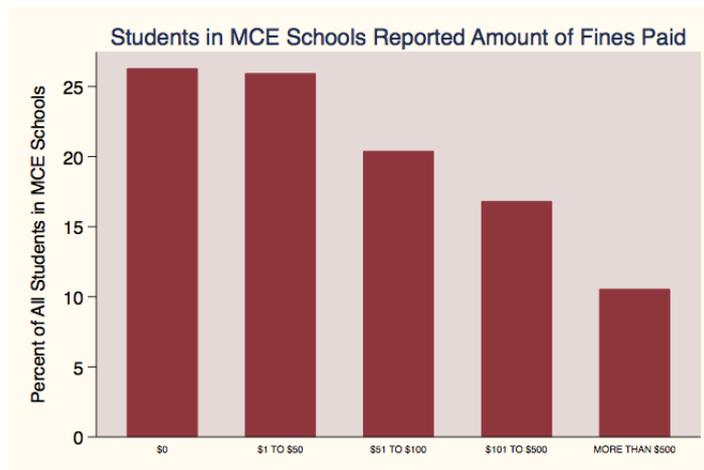
Source: Baseline student assessment surveys (n=1574).

Figure 5: Student Reported Store Usage



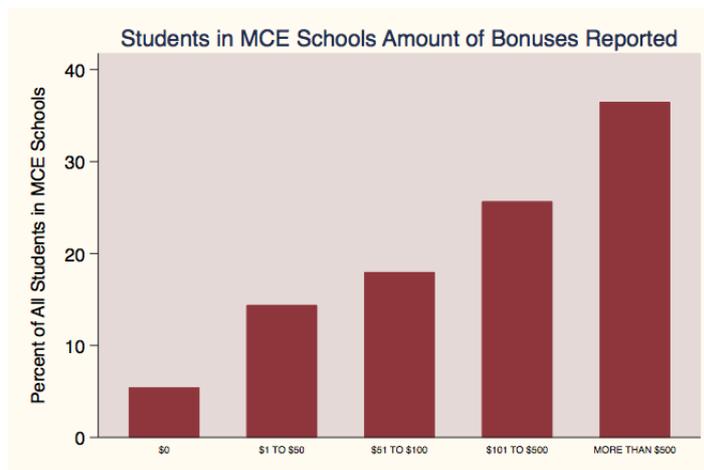
Source: Student Assessment Surveys, MCE Group

Figure 6: Student Reported Fines



Source: Student Assessment Surveys, MCE Group

Figure 7: Student Reported Account Balances



Source: Student Assessment Surveys, MCE Group

Table 3: Means and Standard Deviations

	MCE Later	MCE First	All
Baseline IRT Score	50.50 (8.113)	50.69 (8.140)	50.59 (8.123)
Followup IRT Score	49.97 (8.144)	51.67 (8.369)	50.76 (8.290)
Baseline Sum Score	5.737 (2.623)	5.845 (2.590)	5.787 (2.608)
Baseline Sum Score	6.832 (2.744)	7.319 (2.794)	7.058 (2.777)
Baseline Budget	3.425 (0.766)	3.692 (0.768)	3.549 (0.778)
Followup Budget	3.579 (0.771)	3.778 (0.766)	3.672 (0.774)
Baseline Planning	3.287 (0.791)	3.562 (0.796)	3.415 (0.805)
Followup Planning	3.345 (0.864)	3.496 (0.857)	3.415 (0.864)
Baseline Socialize	2.311 (0.993)	2.702 (1.085)	2.493 (1.055)
Followup Socialize	2.379 (1.041)	2.806 (1.102)	2.577 (1.090)
Baseline Experience	2.921 (1.516)	3.318 (1.558)	3.105 (1.548)
Followup Experience	3.080 (1.597)	3.535 (1.555)	3.291 (1.593)

Standard Deviations in parentheses. Source: Student assessment surveys (n=1574).

Table 4: Grading Standards: Mean in 3rd Trimester

	Non-MCE	MCE 1st+	MCE Later	Total
Soc Studies Stds Met	0.344 (0.111)	0.334 (0.122)	0.354 (0.0895)	0.344 (0.108)
Pct SS Stds Concerned	0.471 (0.0982)	0.480 (0.0948)	0.455 (0.0681)	0.468 (0.0871)
Math Stds Met	0.749 (0.191)	0.747 (0.182)	0.759 (0.133)	0.752 (0.167)
Pct Math Stds Concerned	0.0823 (0.180)	0.0733 (0.181)	0.0379 (0.132)	0.0621 (0.165)
Schools	27	10	9	46
Students	1,338	1,835	2,029	5,202

Standard deviations in parentheses

Source: 2015-2016 Administrative Data, 3rd Trimester only.

Table 5: IRT Financial Literacy Scores, Change from Baseline in First Trimester

	(1) Change in Score	(2) Change in Score
MCE First	1.185*** (0.346)	1.312*** (0.347)
Controls	No	Yes
Observations	1574	1574

Standard errors in parentheses

Student Assessment Survey. Controls include race, gender, age, math test scores.

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ 

Table 6: Raw Score Changes in First Trimester

	(1) Fin Lit	(2) Budget	(3) Planning	(4) Socialization	(5) Experience	(6) Experience B
MCE First	0.282* (0.119)	0.0685 (0.0351)	0.00370 (0.0386)	0.263*** (0.0525)	0.281*** (0.0719)	0.123* (0.0590)
<i>N</i>	1574	1574	1574	1529	1520	1514

Standard Errors in parentheses

Student Assessment Survey.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 7: Normalized Measures (0-1), Changes in First Trimester

	(1)	(2)	(3)	(4)	(5)	(6)
	Fin Lit	Budget	Planning	Socialization	Experience	Experience B
MCE First	0.0275*** (0.00931)	0.0252*** (0.00750)	-0.000155 (0.0103)	0.0329** (0.0145)	0.0409*** (0.0127)	0.0287* (0.0157)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean	0.531	0.734	0.851	0.575	0.546	0.517
Sdev	0.221	0.156	0.217	0.267	0.266	0.326

Standard errors in parentheses

Student Assessment Survey. Controls include race, gender, age, prior math test scores.

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Table 8: Trimester Grades Improvements: Social Studies Standards

	(1)	(2)	(3)	(4)
	Stds Met	Pct Concerned	Stds Met	Stds Concerned
Post MCE	0.0855*** (0.0158)	-0.0604*** (0.0110)	0.0734*** (0.0154)	-0.0536*** (0.0108)
Controls	No	No	Yes	Yes
Student FE	Yes	Yes	No	No
Mean	0.287	0.509	0.288	0.508
Sdev	0.115	0.0905	0.115	0.0910
N	4616	4616	4343	4343

Source: 2015-2016 Administrative Data. Clustered standard errors in parentheses

3 period panel. Controls include student race, days absent, English learner, grade level.

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Table 9: Trimester Grades Improvements: Math Standards

	(1)	(2)	(3)	(4)
	Stds Met	Pct Concerned	Stds Met	Pct Concern
Post MCE	0.111*** (0.0139)	-0.0321*** (0.00646)	0.107*** (0.0138)	-0.0321*** (0.00608)
Controls	No	No	Yes	Yes
Student FE	Yes	Yes	No	No
Mean	0.670	0.0791	0.658	0.0811
Sdev	0.199	0.181	0.196	0.183
N	4721	4721	4445	4445

Source: 2015-2016 Administrative Data. Clustered Standard errors in parentheses

Notes: 3 period panel. Controls include student race, days absent, English learner, grade level.

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

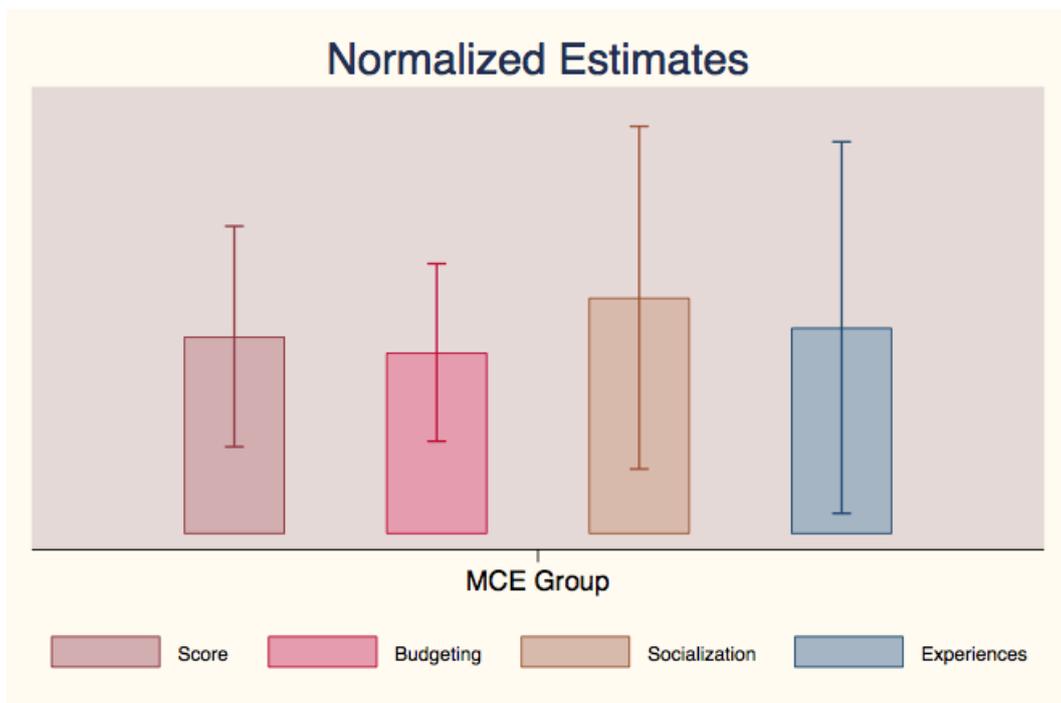
Table 10: Improvement From 2014-15 to 2015-16 School Year using Annual School District Records

	(1)	(2)	(3)	(4)
	Days Absent	Days Absent	Math FSA Std Test	Math FSA Std Test
MCE vs Comparison	0.244 (0.206)		0.0243 (0.0293)	
MCE First		-0.0810 (0.301)		0.101* (0.0572)
Ever MCE		0.0980 (0.311)		0.130*** (0.0452)
Mean	7.575	7.776	3.466	3.164
Sdev	7.034	7.661	1.326	1.359
N	2619	11510	2605	11484

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

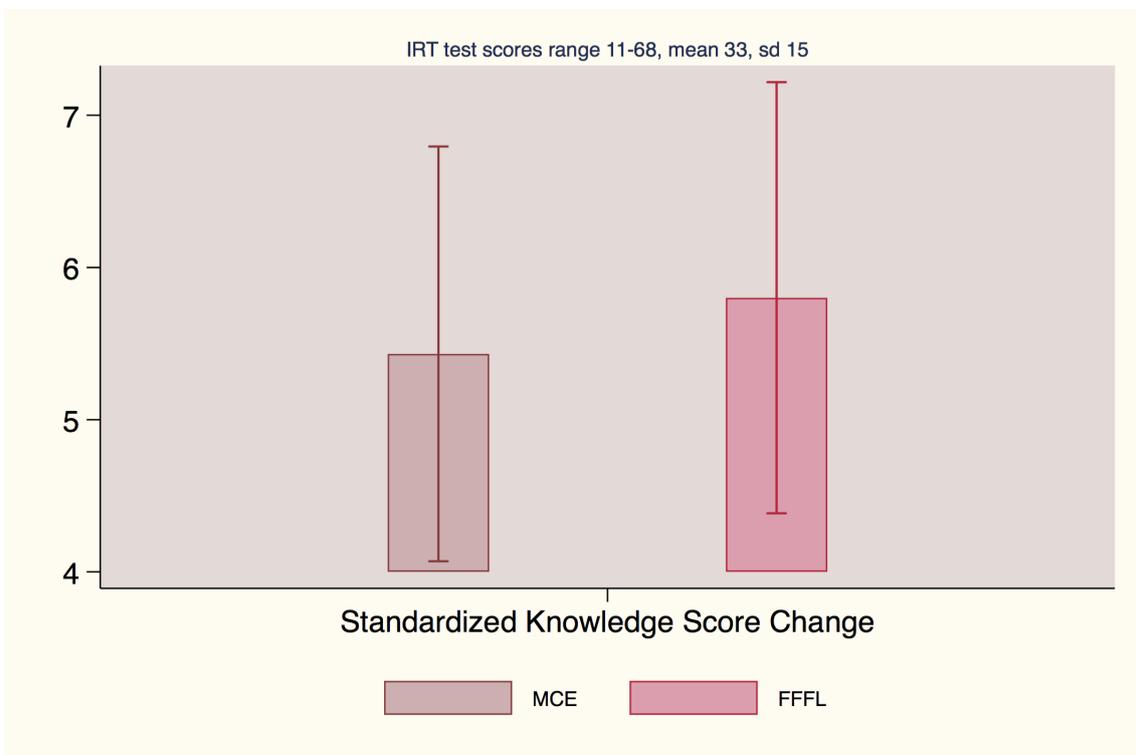
Notes: Estimates are change in outcome from prior school year. Standard errors in parentheses where Col 2 and 4 clustered errors at school level, Col 1 and 3 are robust standard errors. Controls include prior year outcome, student race, English learner status. Source: Administrative Data.

Figure 8: Summary of Estimates



Source: Student Assessment Surveys

Figure 9: Comparison of MCE to Prior FFFL Study Results



Source: Batty et al. (2015a)

## 11. Appendix 1: Test Scale

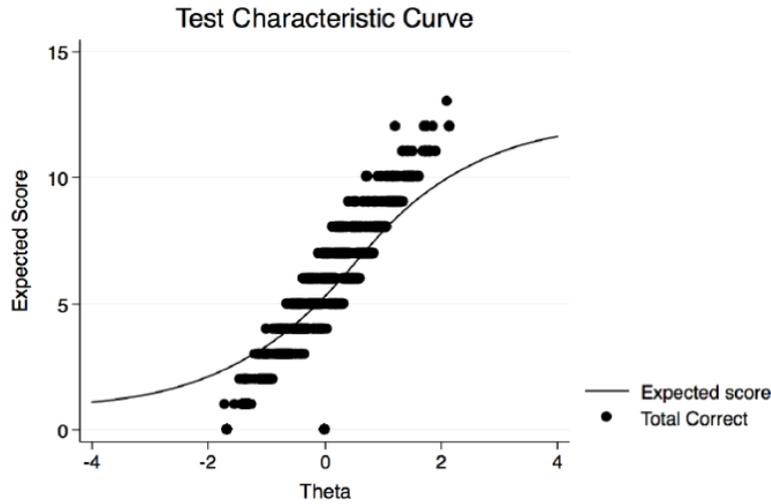
### 11.1. Knowledge Scale Items

1. People who own things may earn money by renting them to other people. (**True**, False, Don't know or not sure)
2. A plan for spending your money is called a [ ... ] (**budget**, stock, credit, balance, Don't know or not sure)
3. David has to pay \$750 in rent for his apartment this month, but he only has \$500 in income. What should he do? (Put \$250 into savings, **Borrow \$250**, Not pay his rent , Don't know or not sure )
4. David just found a job that pays \$2,000 per month. He must pay \$1,000 for rent and \$600 for everything else he needs. How long will it take him to save \$800? (1 month, **2 months**, 3 months, 4 months, Don't know or not sure)
5. Imagine you have to pay \$2 per week to use your desk at school, but you also have the option to buy the desk for \$35 and never pay per week again. If there are 15 weeks left in the school year, is it a good idea to purchase the desk if you have \$35 you can use to buy your desk today? (Yes, **No**, Don't know or not sure )
6. Suppose you have \$100 in a bank account that pays an interest rate of 10 percent per year. How much would you have in this bank account at the end of 2 years if you leave your account alone? ( Exactly \$120 , Less than \$120 , **More than \$120** , Don't know or not sure )
7. Jane sets up a lemonade stand to sell drinks at the park. She paid \$3 for sugar, \$4 for fresh lemons, and \$3 for cups. Jane made \$12 in revenue from selling lemonade. How much profit did Jane make? (\$1 **\$2** \$3 \$4 \$12 Don't know or not sure )
8. The Smiths have \$750 in income, and \$800 in expenses this month. They are saving money this month. (True **False** Don't know or not sure )
9. Tracy has \$250. She wants to buy a nice backpack for \$100 and buy a new tablet for \$200. She decided to buy a simple \$50 backpack. Tracy must have decided it was more important for her to have a nicer backpack than a tablet. (True, **False**, Don't know or not sure )
10. Which is closest to the cost of one ticket to a newly released movie at a regular movie theater? (\$1 **\$10** \$50 \$75 \$100 Don't know or not sure )
11. Which is closest to what one week's worth of groceries cost for a family of 4? (\$5 \$20 **\$200** \$1,000 \$10,000 Don't know or not sure )
12. Ming wanted to buy a fancy notebook for school and save her money to buy a computer. Ming decided to buy a plain notebook that is less expensive so she can save more money for the computer. Ming's decision is an example of [...] (paying interest, depositing money, **making a tradeoff**, choosing a service, Don't know or not sure )
13. Jill had \$50 in her checking account. She made a withdrawal of \$10 and a deposit of \$20. What is Jill's balance in her checking account? (\$10 \$20 \$50 **\$60** Don't know or not sure )

11.2. Appendix 2: Financial Knowledge Test Score

Item response theory (IRT) accounts for differences in the difficulty of individual test questions. The model estimates a parameter for each of the quiz items in terms of how well a correct answer to that question predicts overall performance on the quiz. In addition, the IRT approach determines how well each question discriminates between high- and low-performing students, where ‘performance’ in financial knowledge is the latent trait the scale is attempting to measure. This estimate is based on a three-parameter logistic IRT model, which includes parameters for difficulty, discrimination, and guessing. The test characteristic curve shows the distribution of predicted scale value compared to correct answers. Based on the factor analysis of the scale items, all of the items have a unique loading value for one or more factors, indicating that the scale generally performs well; that is, it measures what it is intended—financial knowledge.

Figure 10: IRT ICC Scale Analysis



Source: Baseline student assessment data.

Figure 11: Knowledge Scale Factor Analysis

Rotated factor loadings (pattern matrix) and unique variances				
Variable	Factor1	Factor2	Factor3	Uniqueness
q1	0.2012	0.4111	0.2386	0.7336
q2	0.1657	0.3447	0.2643	0.7839
q3	0.3391	0.2540	-0.1312	0.8033
q4	0.5575	0.1252	-0.1538	0.6498
q5	0.3692	0.2760	-0.1259	0.7716
q6	-0.0635	0.0205	0.7962	0.3616
q7	0.5699	0.3304	-0.2096	0.5221
q8	0.2529	0.3545	0.1232	0.7952
q9	0.5531	0.0886	-0.1683	0.6579
q10	0.0069	0.7113	0.0318	0.4929
q11	0.0887	0.6314	-0.0738	0.5881
q12	0.5695	-0.1741	0.3359	0.5326
q13	0.5211	0.0379	0.1453	0.7059

LR test: independent vs. saturated:  $\chi^2(78) = 1562.32$  Prob> $\chi^2 = 0.0000$

Source: Baseline student assessment data.