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**Evaluating Experiential Financial Capability Education:
A Field Study of My Classroom Economy**

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Abstract

The development of financial capability for all Americans remains an elusive goal. Over the past decade, the focus of financial education policies has shifted from high school to earlier grades, but we currently know little about the efficacy of such initiatives. We contribute to this nascent literature by conducting a randomized, controlled trial in upper-elementary classrooms that assesses the impact of participation in a simulated classroom economy on several hypothesized antecedents of financial well-being. We find statistically significant improvements in students' financial knowledge and behaviors, including the frequency with which students engage in budgeting and money management as well as student reports of discussing financial management outside of school. Students also report taking part in more economic experiences, such as using a bank account, although there is no measurable effect on students' reporting that they plan for the future or on self-reported levels of self-control. School assessment data show gains in learning in social studies and economics. Surveys and interviews with teachers show that the program enjoys strong support; thus, it 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.

Introduction

The development of financial capability for all Americans remains an elusive goal (Lusardi & Mitchell, 2014). About 35 states have some form of K-12 personal finance education (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 report in 2006 recommending that states "consider infusing financial and investor education throughout the K–12 curriculum" (p. 20). Similarly, in 2012, the Federal Financial Literacy and Education Commission launched its Starting Early for Financial Success initiative, citing the large potential benefits of reaching young people.¹

Existing research supports focusing on youth (Lusardi, Mitchell, & Curto 2010). Reviews of the literature on children's cognitive development and economic understanding (see, for example, Schug, 1987; Webley, 2005; or Scheinholtz, Holden, & Kalish, 2012) indicate not only that children can understand financial concepts but also that their understanding is well developed by age 12. Moreover, many children control some financial resources by this age (see, e.g., Doss, Marlowe, & Godwin, 1995) and need training and guidance in how to manage them. While other studies have examined the effects of financial programs for older students (see Peng, et al., 2007; Brown et al., 2014; Totenhagen, et al., 2015), elementary school age students are less frequently studied (see Batty, Collins, & Odders-White, 2015a, for a review).

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

¹ See <https://www.treasury.gov/connect/blog/Pages/flec-starting.aspx> and <https://www.treasury.gov/resource-center/financial-education/Documents/Starting%20Early%20Research%20Priorities%20May%202013.pdf>.

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 improve when parents provide financial guidance and oversight (e.g., Pliner, Darke, Abramovitch, & Freedman, 1994; Grinstein-Weiss, Spader, Yeo, Taylor, & Books Freeze, 2011; Kim & Chatterjee, 2013). Moreover, Otto (2013) observes that several studies document a relation between financial socialization and savings behavior in adolescence, although the impact on saving behavior in adulthood is less clear (Ashby, Schoon, & Webley, 2011). Although families clearly play a critical role in financial socialization, providing financial education in elementary school may enable educators to counteract misinformation received outside of school, helping students establish positive attitudes early (Suiter & Meszaros, 2005), ideally before negative habits can take hold (Schug & Walstad, 1991). The topic of how parental socialization and the role of non-school based experiences influence young people are an important area of study in general (see Grusec & 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, and Jorgensen & 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 & Meszaros, 2005). This leaves only minimal time for other topics. Moreover, many

teachers feel unprepared to deliver personal finance instruction (Collins & Odders-White, 2015; Way & 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. Many 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 & 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 (Batty, Collins, & Odders-White, 2015a; Wiedrich, Collins, Rosen, & Rademacher, 2014). While bank-at-school programs show promise, they require establishing partnerships that some school districts and financial institutions are uncomfortable with. These challenges limit the widespread use of these programs.

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 (myclassroomeconomy.org), 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 high school financial literacy curriculum, not programs offered at younger ages. Studies document knowledge gains from high school financial education (e.g., Harter & Harter, 2009; Walstad, Rebeck, & MacDonald, 2010). Bruhn, de Souza Leao, Legovini, Marchetti, & Zia (2013) document significant improvements in behavior following a high school financial education intervention, as do Brown and colleagues (2015). A meta-analysis conducted by Fernandes, Lynch, & Netemeyer (2014) suggests that these interventions have very small, or no impacts on financial behaviors, however.

There are only a handful of formal evaluations of economic or financial education programs targeted to elementary school students (e.g., Harter & Harter, 2009; Sherraden, Johnson, Guo, & Elliott, 2011; Batty et al., 2015a). Collectively, these studies document increases in financial knowledge among upper-grade elementary students following a classroom financial education program, and find some evidence of positive changes in student attitudes and behaviors. We build on this work by conducting a randomized, controlled trial in upper-elementary classrooms that assesses the impact of My Classroom Economy (MCE) on several hypothesized antecedents of financial well-being, including financial knowledge, financial attitudes and habits (socialization), and other salient characteristics, such as propensity to plan and self-control. We find statistically significant improvements in students' financial knowledge and behaviors, including the frequency with which students engage in budgeting and money management as well as student reports of discussing financial

management outside of school. Students also report taking part in more economic experiences, such as using a bank account, although there is no measurable effect on students' reporting that they plan for the future or on self-reported levels of self-control. 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.

Study Design

My Classroom Economy (MCE) is a K-12 experiential financial education program that centers around 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 many Common Core standards as well as state and national standards for financial literacy, and materials are available to teachers free of charge online. Appendix C shows samples of some of the materials used in MCE. For example, Figure C1 displays example jobs that student could have in the classroom, including a banker and custodian. Figure C2 shows a schedule of fines for problem behaviors, and C3 bonuses for positive behaviors or achievements. Figure C4 shows copies of in-classroom currency. The MCE teacher's guides provide many other materials, including paychecks, loan applications and job descriptions.

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 country, with a total nearly 23,000 faculty and staff (Snyder et al., 2016). The SDPBC serves a diverse student base across its 276 schools. Among the District’s more than 85,000 elementary-school students, 33% are white, 28% black, and 33% Hispanic, with the remainder from Asian, American Indian, or other backgrounds. 61% of K–5 students qualified for free or reduced lunch in 2015, and 18% were English Language Learners (Palm Beach Schools, 2016).

This study is of students in grades 3 to 5, with most students in grades 4 and 5. Upper-elementary students are appropriate for this study for several reasons. First, cognitive development theory and related research suggest that the elementary years may be a window of opportunity when education can influence financial behavior later in life. Studies of cognitive development show that skills related to saving money (ownership, conservation, planning, deferred consumption) are formed in early childhood (Webley & Nyhus, 2006; Scheinholtz et al., 2012). From a developmental perspective, the period between ages 5 and 7 (commonly referred to as the “5–7 shift”) is associated with marked growth in self-control, planning, and formal decision-making abilities. Students by age 8 to 10 are likely to be able to participate actively in MCE and also take part in assessment activities (see Melton, 2013). 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.

SDPBC's K–12 Financial Literacy Coordinators identified schools at the end of the 2014–2015 school year both willing to implement MCE and participate in a study. Participating schools were randomly assigned by the research team into either a treatment group that implemented MCE in the first trimester and a control group that did not implement the program until after the first trimester.

Teachers were provided hands-on opportunities to prepare MCE materials for their classrooms as part of 3-hour trainings provided before the school year began. By the end of the training, each teacher had at least one assembled student packet and other materials to use as a template; in some cases, teachers were able to assemble most or all of their classroom materials during these trainings.

Data

Student outcomes are measured using in-class assessments at the beginning and end of the study period. As shown in Table 1, 1,972 students across 115 classrooms in 24 schools completed these in-class assessments. The 15 schools in the MCE (treatment) group, which started using the program during the first trimester, comprise 1,187 students across 69 classrooms; the comparison group, which started using the program later in the school year, was slightly smaller, with 785 students in 46 classrooms at 9 schools.² In addition, 763 parents completed at-home surveys at the end of the study period, including 364 in the MCE group and 399 in the comparison group.

² Although we randomized treatment by school, some schools opted into or out of the study post-assignment, resulting in an unequal number of schools in the MCE and control groups. The differences in sample sizes between the two groups stems primarily from differences in enrollment in the participating schools.

Table 1: Study Sample Sizes

	Students	Classrooms	Schools	Parents
MCE	1,187	69	15	364
Comparison	785	46	9	399
Total	1,972	115	24	763

Source: Student and Parent Surveys.

Table 2 compares classrooms between the two groups. One measure of school socioeconomic status (SES) is the percent of students at the school receiving free and reduced-price school lunches. This is a means-tested program, and schools with higher proportions of subsidized meals also have higher rates of low-income families and lower SES levels overall. Overall, the average rate of free and reduced-priced school lunch was 51% across all 24 schools in the study. MCE schools tended to have higher rates (60%) relative to the comparison schools (36%). Math performance was similar between the two groups of classrooms. Overall, these differences will be important to control for, and also suggest that a change model (change from baseline measures to follow-up) will provide a less-biased outcome for the evaluation.

Table 2: Comparing Classrooms

	Number of Classrooms	% Free Lunch	2014 Standardized Math Score
MCE	69	60%	52.6
Comparison	46	36%	53.4
Statistically Different?		Yes	No

Note: Based on 2-tail t-test at 95% confidence level. Source: School Administrative Data.

Table 3 shows the overall demographics of students who participated in the study and tests for differences between the treatment and control groups. About two-thirds (63%) of

participants were age 9 at the start of the school year, corresponding to fourth grade. Similar to the District overall, 37% of students in the MCE group are White, with a higher percentage (47%) in the comparison group. There is balance by gender, but MCE students are more likely to have a parent who speaks a language other than English. These differences are in part due to assignment by school, since schools tend to have similar students.

Table 3: Student Demographics

	All	MCE	Control	Sig
Age	9.28	8.98	9.49	***
Percent White (non-Latino)	41%	37%	47%	***
Female	50%	51%	48%	
English as Second Language Parent	32%	36%	26%	**
Number of Students	1,972	1,187	785	

*Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Administrative Data.*

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, Collins, & Odders-White, 2015b). The survey processes and timing were the same for both the MCE and comparison groups. The University of Wisconsin Survey Center (UWSC) distributed and collected the in-class assessments at schools. For the baseline in-class assessments, the UWSC distributed paper forms to schools on Monday, August 31, 2015, and collected them on Thursday and Friday of that week, giving teachers multiple days to administer the in-class assessments in their classrooms. The UWSC returned the week of November 9, the last week of the District’s first trimester for elementary students, to distribute and collect follow-up in-class assessments, following a similar schedule. Parent at-home surveys

were distributed that same week. To ensure privacy, parents were directed to mail their surveys back to the UWSC, using a provided prepaid postage mailer.

In-class assessments included six main measures of interest, each of which is discussed below:

1. Financial Knowledge (13-item quiz)
2. Budgeting Behavior (5-item scale)
3. Propensity to Plan (4-item scale)
4. Self-Control (5-item scale)
5. Financial Socialization (2-item scale)
6. Economic Experiences (5-item scale)

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 A) 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.

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 outcomes, each with five categorical responses. These five items form a normalized scale of 1 to 5 (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?³
- 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 a more general desire or inclination to plan ahead. Thus, the student in-class assessments included four questions about how often the student engages in general planning

³ A pretest showed that confidence is an important item for this scale; although the question does not reference budgeting behavior directly, it was asked in the context of questions about budgeting and planning.

behaviors. The outcome is a normalized scale (averaged across the four items) of responses from 1 to 5 (ordered so higher scores correspond to greater planning). 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?

Self-Control

MCE allows students to practice self-control, and students receive feedback about the consequences of their decisions. This experiential approach may produce a stronger response than simply telling students about the benefits of avoiding behaviors such as excessive impulse spending. The in-class assessments included a set of five questions that measure self-control, three related to money management and two to more general behavior. The outcome again is a normalized scale of responses from 1 to 5 (ordered so higher scores correspond to greater control). The five items include:

- How hard is it for you to avoid spending any money you have right away?
- How likely are you to stop and think about something before you do it?
- How often do you ask yourself if you really need something before you buy it?
- Before making a choice, how often do you tend to think about the good things and the bad things about the choice?
- How much would you rather save money for a rainy day than spend it now on something fun?

Financial Socialization

We include two items related to financial socialization. These measures relate to whether a student's family talks about money at home. 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. The outcome is a normalized scale of responses from 1 to 5 across these two items:

- How often does your family talk about how you spend money?
- 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 five yes or no questions that form a normalized 0-1 scale of responses (ordered so higher scores correspond to more experiences). The items include:

- In the last month, have you gotten money from a job?⁴
- 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?

⁴ Students could be reflecting on their jobs as part of MCE rather than on economic behaviors outside of school; students in the MCE group would have been assigned jobs around the time of the baseline survey and would have held their jobs for several weeks by the follow-up survey. Since the analysis is of changes in scales, this one item should not introduce significant bias.

Table 4 provides summary statistics for each outcome at baseline across all students in the evaluation. The reliability column shows the scale’s internal reliability using Cronbach’s alpha, a test statistic used to gauge how well the questions describe a common characteristic. As noted above, all measures were pretested prior to the study with other groups of students 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, Collins, and Odders-White (2015b).

Table 4: Baseline Summary Statistics

Outcome	Mean	St Dev	Reliability
Financial Knowledge	50.00	18.90	0.63 [^]
Budgeting	3.56	0.78	0.68
Propensity to Plan	3.42	0.81	0.60
Self-Control	3.52	0.71	0.52
Financial Socialization	2.50	1.07	0.47
Economic Experience	0.52	0.26	0.48

[^] Using correct-incorrect summed scale (0–13), not the estimated score analyzed in later sections of this paper. Source: Student Survey

Although we did not solicit direct feedback from students about their experiences with MCE, the student in-class assessments offers some data on how students report using the program. Figure 1, Panel A, shows the number of times students recall buying something at the classroom store (or auction); the majority of students (60%) 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.) Nearly three out of four students reported paying a fine (Figure 1, Panel B), consistent with the classroom management aspects of MCE. Panel C shows that 95% of students received bonuses, demonstrating the use of positive incentives as well as fines to influence classroom behavior.

Other data from students show that at the end of the first trimester, the average student had an MCE account balance of \$1,295 (median \$1,000) and only 10% had less than \$20. About one in three students (32%) had used their income to buy their desks outright, which eliminated the need to pay weekly rent. All these student-reported behaviors indicate that MCE was implemented as intended, and that students had a range of experiences with the simulation.

As noted above, in addition to student-reported outcomes, we measure parents' perceptions of student behavior. This information was recorded only once, after students in the treatment group completed MCE, but before the program began for students in the comparison group. The parent survey and consent forms were included in materials schools sent home with students. Thirty-nine percent of parents completed this survey, a response rate comparable to Batty et al. (2015a). Parent surveys have indicators for the school but are not linked to individual students in order to protect student and parent privacy; thus, we focus solely on differences in responses to the parent survey between parents of treatment and comparison-group students.

Table 5 shows average classroom characteristics for students whose parents responded to the at-home survey. Compared to the overall data presented in Table 2, parents who responded to the survey were more likely to have students in higher-performing classrooms (based on standardized math scores) and from classrooms in which parents speak English as a first language. Any outcomes estimated using parent survey data will need to be interpreted with caution due to these differences.

Table 5: Comparing Parents Responding to Survey

	Number of Parents	2014 Standardized Math Score	% Non-White	% Parents ESL
MCE	364	55.7	46%	34%
Comparison	386	54.8	44%	31%
Statistically Different?		Yes	No	Yes

Note: Based on 2-tail t-test at 95% confidence level. Source: Parent Survey

Parent surveys are used to assess five outcomes, each based on a single item in the parent survey. The first two outcomes are yes/no questions: whether the child has a bank account in the child’s own name and whether the child earns money of his or her own to manage (e.g., through chores or an allowance). The other three outcomes are measured on five-point scales indicating how often the parent reports the activity occurs. The three activities include the student managing his or her own money, the school teaching the student about money, and the parent discussing financial issues with the child. The means for all five outcomes are shown in Table 6.

Table 6: Parent Survey

	All	MCE	Comparison
Student banked	0.58	0.57	0.59
Earn \$ from allowance/chores	0.53	0.54	0.52
Student manages own money	3.13	3.21	3.06
School teaches about money	2.83	3.48	2.09
Parents discuss financial issues with their children	3.36	3.43	3.28

N=762 Source: Parent Survey.

To understand teachers’ experiences implementing MCE during the course of the evaluation, three additional sets of data were analyzed: a teacher survey collected by the research team in November 2015, a teacher feedback survey collected by the district in May

2016, and six teacher interviews. Overall, these data sources document the success of the evaluation design, along with high teacher satisfaction with the program. Each is discussed in more detail below.

Teacher Surveys at the End of the Study Period

Sixty teachers who implemented MCE during the study period completed a nine-question teacher survey. Ninety-four percent of the responding teachers were women, and nearly one-quarter of respondents had been teaching professionally for more than 20 years (24%), with another 36% having taught for between 11 and 20 years. The survey included questions specific to the implementation of MCE. A total of 58% of teachers felt “very” or “extremely” prepared to teach students about personal finances. Further, 30% rated their overall experience with MCE as excellent, 52% as good, 17% as adequate, and just 2% (one teacher) as poor. In line with this high level of satisfaction, 95% of teachers reported that they planned to continue using the program. A majority (52%) of teachers reported giving students opportunities to earn income more than once per day. Although a small percentage of teachers (10%) reported giving students opportunities to buy items at a store or auction once a week or more often, 40% reported doing so once every other week, in line with suggested guidelines from the training.

End of the School Year Teacher Surveys

At the end of the 2015–2016 school year, the district surveyed teachers about their experiences with MCE; 72 teachers completed this survey, including 50 who started implementing MCE in the first trimester and 22 who used it later in the year. Teachers again

indicated high satisfaction with the MCE program, with nearly all respondents reporting that they continued to use the program for the rest of the 2015–2016 school year and 93% planning to use it in the future. Respondents also reported high satisfaction with the resources they had access to, including printed program materials, and in-service teacher training. Teachers did struggle with the time required to administer the program. Although only 8% of respondents “strongly” agreed that MCE takes too much time, another 44% “somewhat” agreed. Managing banking and payments was cited as the most difficult aspect of the program. Teacher’s responses reinforced the idea that they did not feel like they needed prior experience with financial education to be successful with MCE. This is encouraging in light of previous studies documenting a lack of training and confidence among teachers tasked with implementing financial literacy curricula (e.g., Way & Holden, 2009).

Methods

We use regression analysis to examine the impact of MCE on each of the student outcomes discussed above. Assignment to use MCE during the first trimester of the school year (“treatment”) occurred at the school level. Therefore, we use MCE school dummies to estimate the effects of MCE, as follows:

$$Y_{i,2} - Y_{i,1} = \alpha + \beta MCE_i + \delta Y_{i,1} + \gamma X_{i,1} + \varepsilon_i$$

where $Y_{i,t}$ is the outcome of interest for student i at time t (baseline=1; follow-up=2); MCE_i is an indicator for MCE participation; and $X_{i,1}$ is a set of demographic characteristics including student race, student gender, student age, and student scores on a standardized math test in the prior school year. We are primarily interested in the estimate of β , which represents the

causal effect of MCE on the change in each outcome from baseline to follow-up. This approach controls for time-invariant student characteristics and for the influence of baseline responses and demographics on changes in responses for all participants, regardless of MCE participation. Overall, this is a robust and relatively conservative approach that allows us to isolate the effect of a student being in a school assigned to the MCE group during the study period.

We also estimate several additional models that reveal how MCE's effects may vary by demographic characteristics. These sub-groups are based on prior studies showing the potential for heterogeneous effects due to certain existing cognitive or experiential differences. These include gender based on prior work showing women and girls experience financial issues in different ways than men and boys (Edwards, Allen, & Hayhoe, 2007; Lusardi, et al., 2010). Another sub-group is students from non-English speaking households; these students may have differential benefits from experiential learning methods (Crosnoe and Turley, 2011). Students from lower income areas or households may also differentially benefit from economic experiences in the classroom (Sherraden, et al., 2011). Finally, because so many financial and economic decisions require quantitative reasoning, the relationship between math ability and MCE effects is explored (Agarwal & Mazumder, 2013).

In each case, we add an interaction term that is the product of the MCE indicator and the characteristic of interest; we also include the characteristic as an independent control variable if it is not already part of $X_{i,1}$. These models include:

- Female and MCE (a 0–1 indicator if the student is female)
- ESL and MCE (a 0–1 indicator if the student's parent or guardian speaks English as a second language)

- School SES and MCE (the fraction of students at a school that receive free or reduced-price lunch; ranges from 13% to 99% across schools in the evaluation)
- Math score and MCE (each student’s 2014 Florida standardized math test score, ranging from 1 to 99)

When calculating students’ financial knowledge score for use in the regressions above, 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 model to analyze quiz results, 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, so the scale resembles a 0–100 test score statistic, where 100 is a high score. The resulting standardized score is based on parameters estimated from the initial quiz; changes in scores from the baseline to follow-up allow for a consistent knowledge measure. The model and parameters, as well as a principal components factor table, are provided in Appendix B.⁵

We also analyze responses to the parent survey questions. We compare treatment and comparison-group parents through a cross-sectional model:

$$Y_i = \alpha + \beta MCE_i + \gamma X_i + \delta W_{c(i)} + \varepsilon_i$$

where Y_i is the outcome of interest and X_i is a set of parent characteristics recorded in the survey: whether the parent has a college savings plan for the child, how well the parent believes he or she manages his or her own finances, the parent’s perception of the child’s

⁵ This model codes missing answers as incorrect responses. Each item in the 13-question scale was skipped by about 10% to 20% of students, although just over one-third (35%) of students skipped the question about compound interest.

performance in school, the parent's education level. $W_{c(i)}$ is a set of school- and classroom-level demographic characteristics: percentage of students that receive free or reduced-price lunch, percentage of minority students, percentage of parents in the class who speak English as a second language, and the average standardized math score of students in the class.

In addition, we estimate interactions with the parent's education (measured on an eight-point scale), the parent's assessment of the student's academic performance (four-point scale), the school-level proportion of students receiving free or reduced-price lunch (Class SES), and the classroom's average score on the standardized math test (Class Math).

Results

For ease of interpretation, we express effect sizes from the student in-class assessments as the fraction of the standard deviation of the outcome. For example, 0.10 indicates one-tenth of a standard deviation. These effect sizes are commonly called sigma units and are used in studies of the effects of educational programs to gauge the size of impacts from an intervention. We also show the confidence interval around each point estimate for the effect size. All estimates are based on a 95% confidence interval (the 5% significance level). When the confidence interval includes zero, the estimate is not significant at the 5% level.

In each table below, the leftmost column provides the overall Intention-to-Treat (ITT) estimate for a student assigned to an MCE classroom. However, we are also interested in testing whether the average effects also hold for the subgroups of particular interest. The columns to the right of the overall estimate include the interactions of MCE and gender (female), language (ESL), economic status (SES), and student scores on the 2014 standardized

math test. The interaction terms estimate the incremental impact of MCE for these students relative to other groups. In other words, a negative coefficient indicates that the program had a smaller effect on that subgroup, not that MCE was detrimental to them. We only discuss subgroup interactions in cases where the estimates are statistically meaningful.

Student Outcomes

Table 7 shows changes in the financial literacy or knowledge quiz, as scored using item response theory. The overall estimate, in terms of effect size relative to the standard deviation (also sometimes called a sigma unit), is 0.13, or just over one-tenth of a standard deviation. The range of the 95% statistical confidence interval is as low as 0.05 and as high as 0.21, but does not cross zero, indicating statistical significance. It is notable that, as measured in effect-size units, the size of the financial gain is similar to that found in Batty et al. (2015a), which tested a formalized course that taught specific content that appeared on the student knowledge quiz. Our results indicate that MCE produces similar knowledge gains without a formal curriculum. There are no statistically significant (larger or smaller) effects among the four subgroups, although there is a pattern of schools with more lower-income students (SES, measured by the free and reduced-priced school lunch rate) potentially having weaker impacts from MCE.

Table 7: Knowledge Gains

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	0.13 **	-0.01	0.08	-0.31	0.00
Conf. Interval	[0.05-0.21]	[-0.16-0.13]	[-0.07-0.23]	[-0.67-0.05]	[-0.01-0.01]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

Table 8 shows changes in the normalized student budgeting scale. The overall estimate of MCE’s effect is 0.11 sigma units, with a confidence interval as low as 0.03 and as high as 0.20, again not crossing zero and therefore indicating statistical significant at the 95% level. Thus, MCE appears to have an impact on students’ self-reported budgeting behaviors and attitudes, as measured by the scale. None of the interactions are statistically significant.

Table 8: Budgeting

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	0.11**	0.09	-0.09	-0.13	0.00
Conf. Interval	[0.03–0.20]	[-0.07–0.24]	[-0.26–0.07]	[-0.57–0.30]	[-0.01–0.01]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

Table 9 shows there are no significant changes in the normalized propensity-to-plan scale, indicating that MCE did not have measurable effects in this area. None of the subgroup effects are statistically significant.

Table 9: Propensity to Plan

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	0.00	-0.11	0.17	0.02	-0.01
Conf. Interval	[-0.1–0.09]	[-0.28–0.06]	[-0.01–0.34]	[-0.43–0.46]	[-0.02–0.0]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

Table 10 shows changes in the normalized student-reported self-control scale. Similar to the results for the propensity-to-plan scale, the overall and subgroup effects are small and not statistically significant.

Table 10: Self-Control

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	-0.03	-0.03	0.09	-0.19	0.00
Conf. Interval	[-0.12-0.06]	[-0.2-0.14]	[-0.08-0.26]	[-0.64-0.26]	[-0.02-0.01]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

Table 11 shows changes in the normalized student-reported financial socialization scale. Here, the overall MCE effects and the female subgroup effects are statistically significant and of relatively robust magnitudes. The effects are lower for students in lower-SES schools, however, which may be consistent with generally lower levels of financial socialization overall among these students.

Table 11: Socialization

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	0.19***	0.23**	-0.08	-0.53*	0
Conf. Interval	[0.09-0.28]	[0.06-0.40]	[-0.26-0.1]	[-0.99- -0.07]	[-0.1-0.01]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

Table 12 shows changes in the normalized student-reported financial experiences scale. Here the overall effect of MCE is statistically significant and larger than prior estimates. This finding is consistent with MCE encouraging students to engage in more economic activity in the real world, including at home, although students may also have been reflecting on MCE activities rather than economic behaviors at home. There is evidence that the effect tends to be smaller in low-SES schools (defined as those with more students receiving free or reduced-price meals). Of the five items in the scale (money from a job, money for chores from family, having a bank account, receiving spending money, making decisions about spending) only one or two

seem likely to be viewed in the context of MCE. The timing of the initial student survey would have also picked up some of this as well. Even if biased upward due to students in the treatment group responding based on their experiences in MCE rather than external economic experiences, the results are consistent with students engaging in greater levels of economic activities after their experience with MCE.

Table 12: Financial Experiences

	Interactions				
	All	Female	ESL	SES	Math
MCE Effect	0.21*	0.11	-0.04	-0.42	0
Conf. Interval	[0.12-0.30]	[-0.06-0.27]	[-0.21-0.13]	[-0.85-0.0]	[-0.01-0.01]

*N=1,972 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Student Survey.*

School Administrative Data

In addition to student in-class assessments, SDPBC provided data at the end of the school year on student grades from each trimester, student progress toward grade-based learning standards, and scores on the 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; we therefore use a regression specification analogous to that used to analyze the parent survey responses. The similarity between average math scores for the MCE group and the control group shown in Table 2 helps to ease concerns that any effects we document are due to differences between the two groups' ability or past academic preparation. In addition, because students in the control group may have taken part in MCE in the 2nd and 3rd trimesters and some classes in the MCE group may have stopped using it, these estimates may represent lower-bounds of potential effects.

Table 13 shows the MCE estimated effect on students achieving state standards for social studies (which includes economics)⁶ in Columns 1 and 2, the effect on students achieving economics standards (a subset of social studies) in Columns 3 and 4, and the impact on the likelihood of receiving a passing grade in the third and final trimester in social studies in Columns 5 and 6. The MCE estimated effect on students achieving social studies standards is 0.044, relative to a mean of 0.527, or about 8 percent as a marginal effect and an effect size relative to the standard deviation of 0.30. The results remain when adding in controls (race, absences, English learners, and grade level), as well. The MCE estimated effect on students achieving any of the two economics learning standards is 0.273, which is an effect size relative to the standard deviation (0.311) of close to 0.9 (i.e., close to one sigma unit). The results remain significant when adding in controls, but are greatly reduced in magnitude. Grades at the elementary level are measured as Exemplary, Proficient, Approaching, or Needs Development, with the first two categories considered passing. Columns 5 and 6 show that there is no effect on these grades by the final trimester based on assignment to MCE.

Table 13: Social Studies and Economics Standards Met

	(1)	(2)	(3)	(4)	(5)	(6)
	% Soc Studies Stds Met	% Soc Studies Stds Met	% Econ Stds Met	% Econ Stds Met	Passing Grade 3rd Tri	Passing Grade 3rd Tri
MCE Group	0.044***	0.049***	0.273***	0.076***	-0.009	0.015
	[0.030,0.057]	[0.037,0.061]	[0.250,0.296]	[0.061,0.090]	[-0.027,0.010]	[-0.006,0.036]
Controls	No	Yes	No	Yes	No	Yes
Observations	1885	1885	1833	1833	1772	1772
Mean (sd)	0.527 (0.15)		0.390 (0.311)		0.5537	

Notes: Social Studies out of 16 possible standards. Economics out of 2 possible standards. Controls include student race, days absent, English learner, grade level. Source: Administrative Data. * p < 0.05, ** p < 0.01, *** p < 0.001

⁶ Results are similar when economics standards are excluded. In all cases, success at achieving standards is based only on those standards for which the individual student was assessed during the study year.

Table 14 shows the MCE estimated effect on students achieving state standards for math in Columns 1 and 2, the impact on FSA standardized math test levels in Columns 3 and 4, and the effect on 3rd trimester math grades in Columns 5 and 6. The MCE estimated effects on students achieving math standards and the FSA test are not statistically significant. A student in a classroom assigned to MCE earns a 3rd trimester math grade that is about 3.2 percentage points higher than students in other classrooms. The effect size relative to the standard deviation is small in magnitude, close to 0.09, but statistically significant.

Table 14: Math Standards, Grades and Standardized Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)
	% Math Standards Met	% Math Standards Met	FL Math Test Level 16	FL Math Test Level 16	Exemplary Grade 3rd Trimester	Exemplary Grade 3rd Trimester
MCE Group	-0.010	0.003	-0.051	-0.047	0.032*	0.034*
	[-0.026,0.006]	[-0.014,0.021]	[-0.125,0.023]	[-0.120,0.027]	[0.003,0.061]	[0.005,0.063]
Controls	No	Yes	No	Yes	No	Yes
Observations	1883	1883	1741	1741	1739	1739
Means	0.6756		3.457		0.169(0.374)	

Notes: Math out of 12 possible standards; FL Standardized Assessment (FSA) test score Exemplary Grade 3rd Trimester. Controls include student race, days absent, English learner, grade level, prior year FSA

Source: Administrative Data. * p < 0.05, ** p < 0.01, *** p < 0.001.

Because we do not have detailed student characteristics in the school administrative data, we can only test for heterogeneous treatment effects based on a subset of the characteristics examined using the survey results. No interactions with English language learners or lower SES schools were statistically significant.

As a further test of the effects of students in schools assigned to MCE, we were able to obtain a random sample of 2,450 student standards assessments for 4th and 5th graders who attend schools where MCE was not offered. This better manages the cross-over effects in the prior estimates. However, the data contain no student characteristics—only indications as to

whether or not they met the assessed learning standards. Table 15 compares the percentage of assessed standards in social studies, economics, and math met by the MCE group to the percentage for this comparison group. The magnitudes of the effects are relatively large and statistically significant, ranging from 7 percentage points more standards met to over 10 percentage points more standards met. Given that the mean percentage of standards met in these data was approximately 49% for social studies, 35% for economics and 64% for math, these are relatively large effects.

Table 15 Social Studies and Math Standards Met Using Non-MCE school as Comparison

	(1)	(2)	(3)
	% Soc Studies Stds Met	% Econ Stds Met	% Math Assessed Stds Met
MCE vs Comparison Group	0.072***	0.106***	0.104***
	[0.059,0.085]	[0.092,0.120]	[0.086,0.121]
Observations	4311	3489	4347

Notes: Soc Studies out of 16 standards. Economics out of 2 standards. Math out of 12 standards. Source: Administrative Data.

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

Parent-Reported Outcomes

Tables 16–20 show the results for the five outcomes from the parent surveys. After controlling for the factors outlined in the regression model, the MCE (treatment) group displays statistically significant differences from the control group for three outcomes: student banking, money management, and the school’s role in teaching students about financial literacy. Recall that we have no pre-study data from parents, so we cannot separately identify the impact of MCE from differences in the two samples. As a result, the “MCE effects” reported below should be interpreted cautiously.

Table 16 shows that, based on parents' survey responses, students in the MCE (treatment) group appear more likely to be banked.

Table 16: Parent Survey—Student Has Bank Account.

	All	Parent's Ed	Academic	Class SES	Class Math
MCE Effect	0.16*	0.09*	-0.06	-0.28	0.01
Conf. Interval	[0.0-0.33]	[0.01-0.17]	[-0.24-0.12]	[-1.01-0.46]	[-0.01-0.04]

*N=763 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Parent Survey.*

In contrast, there does not appear to be a strong effect of MCE on parents' responses based on standard statistical significance levels (as shown in Table 17).

Table 17: Parent Survey—Chores / Allowance

	All	Parent's Ed	Academic	Class SES	Class Math
MCE Effect	0.13	0.02	-0.16	0.02	0.01
Conf. Interval	[-0.04-0.31]	[-0.07-0.11]	[-0.35-0.04]	[-0.79-0.83]	[-0.02-0.03]

*N=763 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Parent Survey.*

Table 18 shows parents' reports of students managing their own money. In the student survey, MCE students tended to report higher levels of making their own money decisions than treatment students even before MCE began (87% vs 84%). In the parent survey, conducted after the treatment period, parents of students in the MCE group confirm that their children manage their own money at higher rates than the comparison group.

Table 18: Parent Survey—Student Manages Own Money

	All	Parent's Ed	Academic	Class SES	Class Math
MCE Effect	0.42 **	0.14	-0.17	-0.72	0.01
Conf. Interval	[0.08-0.76]	[-0.03-0.32]	[-0.56-0.21]	[-2.13-0.69]	[-0.04-0.05]

*N=763 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Parent Survey.*

Table 19 shows that, not surprisingly, parents of students in MCE schools are much more likely to report that their students are being taught about money at school (over two times the standard deviation). These are very large effects and suggest that positive spillover effects (from children to parents and vice-versa) may be possible.

Table 19: Parent Survey—School Teaches Student About Personal Finance

	All	Parent's Ed	Academic	Class SES	Class Math
MCE Effect	2.6 ***	0.28 **	-0.25	-0.81	0
Conf. Interval	[2.24–2.97]	[0.08–0.48]	[-0.68–0.17]	[-2.45–0.83]	[-0.06–0.05]

*N=763 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Parent Survey.*

Table 20, which examines parents' reports of talking about finances at home, suggests that these benefits were not realized in the short 10-week period of our study. Whereas the student survey shows some positive socialization effects from MCE, the parent survey does not; no effects in Table 20 are statistically significant.

Table 20: Parent Survey—We Discuss Financial Issues at Home

	All	Parent's Ed	Academic	Class SES	Class Math
MCE Effect	0.18	0.06	-0.01	0.44	0
Conf. Interval	[-0.16–0.52]	[-0.13–0.24]	[-0.44–0.42]	[-1.12–1.99]	[-0.05–0.05]

*N=763 Notes: * p<0.05, ** p<0.01, *** p<0.001. Source: Parent Survey.*

Discussion

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 10 weeks of participation in the program. These findings are echoed in the parent survey. Moreover, school administrative

data suggest gains in learning in social studies and economics, and teachers' feedback on the program was very positive. Teacher support is critical to the success of any school-based program, especially given the many demands on teachers' time. Collectively, these results show the potential of experiential programs like MCE to begin to build financial capability.

In general, 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. The effects are not concentrated among higher-SES schools, or even among students who are more proficient at math. 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.

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 10-week version of the program used for this study generated effects similar in magnitude to those from a prior study that evaluated the effects of formal, classroom-based financial education lessons (Batty, Collins, & Odders-White, 2015a). The full, year-long version of MCE would likely show more substantial effects, and with decreasing demands on classroom time as the year goes on.

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.

Conclusion

This paper presents results of a formal evaluation of an experiential approach to increasing financial capability in elementary school students called My Classroom Economy (MCE). Based on 1,972 students primarily in grades four and five (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 about one-tenth of a standard deviation 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 discussing financial management at home and outside of school. Students in schools with MCE also report taking part in more economic experiences, such as using a bank account. Parents of students in MCE schools report that their children's school is more likely to teach personal finance topics. The size of these effects varies, but all are statistically significant and positive. We find no measurable effect of MCE on students' reporting that they plan for the future or on self-reported levels of self-control, perhaps because both of these items may draw on more

engrained behaviors that involve broader issues than financial management experience. The effects of MCE also appear to spillover into learning about social studies, economics, and math. This finding supports the use of MCE to achieve broader learning objectives.

The findings suggest that experiential financial learning can have positive effects that equal or exceed those of more formal grade school financial literacy efforts. 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. Surveys and interviews with teachers show the program enjoys strong support among teachers who participated in the pilot and the evaluation; in fact, 95% 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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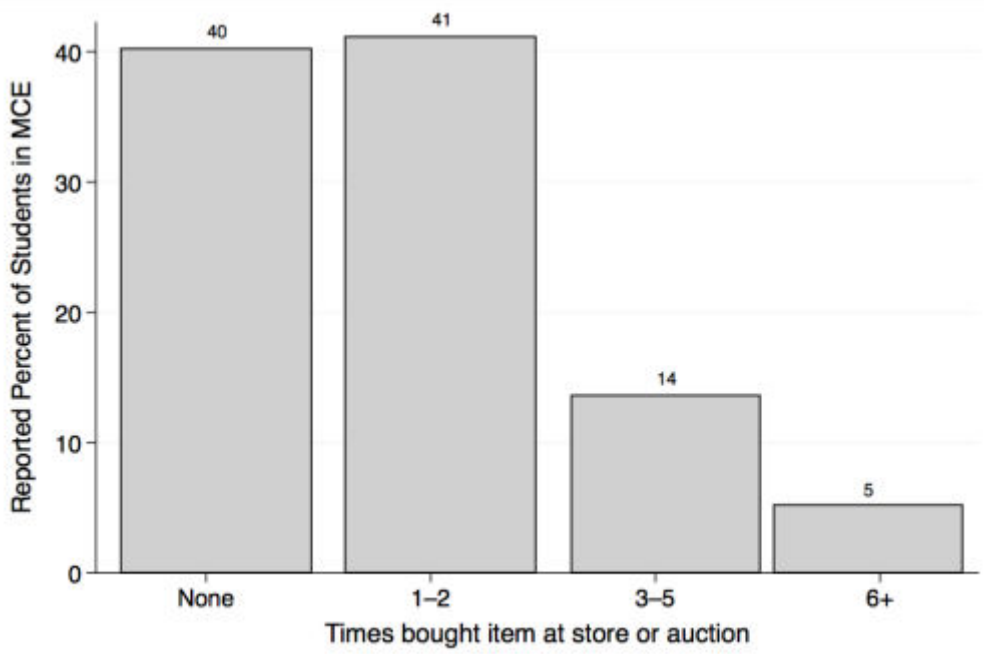
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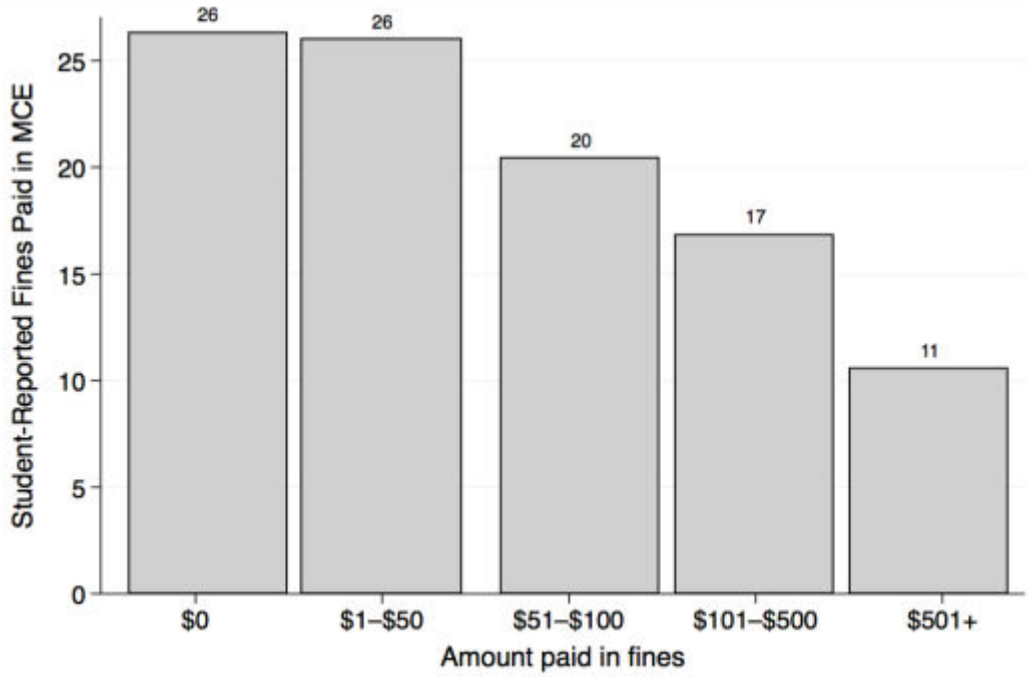
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Figure 1: Student-Reported Use of MCE

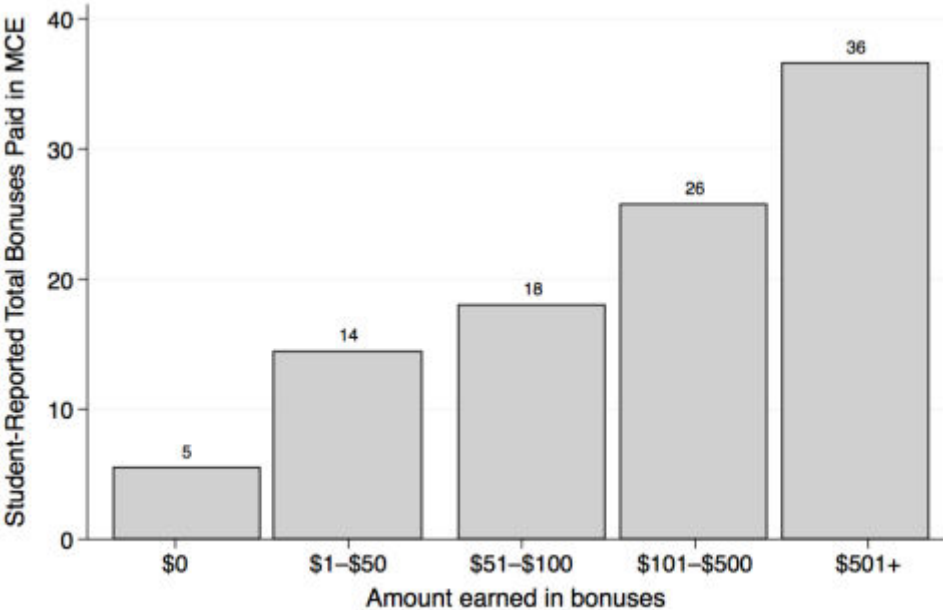
Panel A: Use of Store or Auction



Panel B: Fines Paid



Panel C: Bonuses Earned



Source: Student Survey (MCE group only).

Appendix A: Financial Knowledge Quiz

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% per year. How much would you have in this bank account at the end of 2 years if you leave your account alone?
 - Exactly \$102
 - \$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

Appendix B: IRT Scoring for Quiz Questions

Item response theory (IRT) accounts for differences in the difficulty of individual 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 is the latent trait the scale is attempting to measure. The output (Table B1) shows the parameters used. This output is based on a three-parameter logistic IRT model, which includes difficulty, discrimination, and guessing parameters. The factor analysis (Table B2) shows that 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 to.

Table B1

	Para Coef.	Std. Err.	Z	P>z	[95% Conf Interval]	
Discrim						
Q1	0.7743	0.0783	9.9	0.00	0.621	0.928
Q2	0.5825	0.0683	8.5	0.00	0.449	0.716
Q3	0.8281	0.0820	10.1	0.00	0.667	0.989
Q4	1.1781	0.1111	10.6	0.00	0.960	1.396
Q5	0.9361	0.0861	10.9	0.00	0.767	1.105
Q6	-0.1425	0.0833	-1.7	0.09	-0.306	0.021
Q7	2.4674	0.3375	7.3	0.00	1.806	3.129
Q8	0.8907	0.1038	8.6	0.00	0.687	1.094
Q9	1.0442	0.0930	11.2	0.00	0.862	1.227
Q10	0.8600	0.0808	10.6	0.00	0.702	1.018
Q11	0.9165	0.0833	11.0	0.00	0.753	1.080
Q12	1.1048	0.2475	4.5	0.00	0.620	1.590
Q13	0.8063	0.0810	10.0	0.00	0.648	0.965
Diff						
Q1	-0.6846	0.1042	-6.6	0.00	-0.889	-0.480
Q2	-0.1893	0.1118	-1.7	0.09	-0.408	0.030
Q3	0.5964	0.0946	6.3	0.00	0.411	0.782
Q4	0.6378	0.0731	8.7	0.00	0.494	0.781
Q5	-0.0270	0.0760	-0.4	0.72	-0.176	0.122
Q6	-11.3994	6.5651	-1.7	0.08	-24.267	1.468
Q7	0.5961	0.0498	12.0	0.00	0.498	0.694
Q8	1.2850	0.1195	10.8	0.00	1.051	1.519
Q9	-0.0362	0.0709	-0.5	0.61	-0.175	0.103
Q10	-0.1079	0.0805	-1.3	0.18	-0.266	0.050
Q11	-0.2893	0.0785	-3.7	0.00	-0.443	-0.136
Q12	2.4634	0.2648	9.3	0.00	1.944	2.982
Q13	0.3596	0.0883	4.1	0.00	0.187	0.533
Guess	0.0435	0.0175	2.5	0.01	0.009	0.078

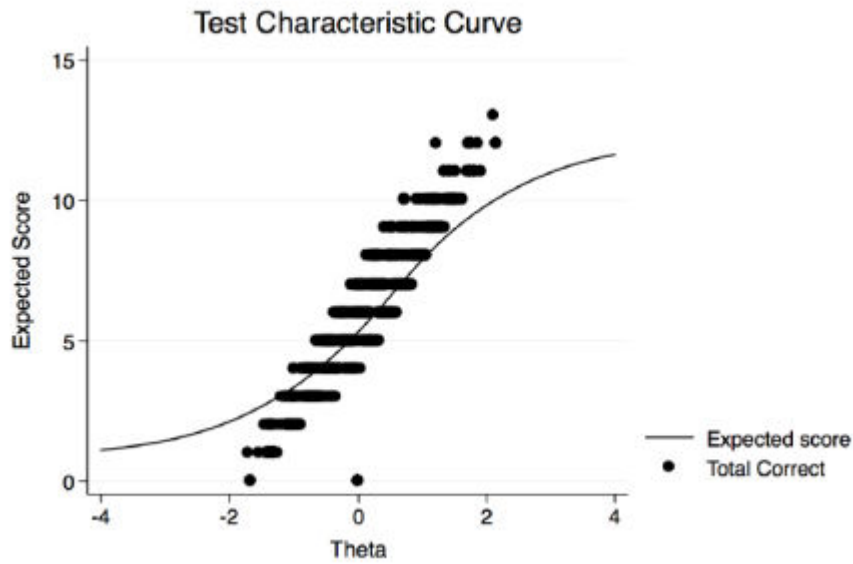
Table B2

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> $\chi^2 = 0.0000$

Figure B1



Appendix C: MyClassroom Economy Materials

Figure C1: Example MCE Jobs

JOBS	JOB DESCRIPTION	MONTHLY SALARY
Banker <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. Requires a recommendation.	\$700
Police Officer <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. Requires a recommendation.	\$650
Loan Officer <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
Clerk <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
Messenger <i>1–2 per class</i>	Deliver written or spoken messages to people throughout the building. Answer the class phone.	\$550
Custodian <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

Figure C2: Example MCE 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.

Figure C3: Example MCE 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

Figure C4: Example MCE Currency

