Financial literacy of Dutch children: Does education matter? [1]

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Abstract

In this paper we examine a Dutch school project called Cash Quiz, targeting 10- to 12-year-old children in the last years of primary school. The objective of this analysis is to study which elements of the Cash Quiz project are effective at improving financial literacy, so as to help design more effective financial education programs in schools. Although the design of the study has many limitations, the analysis shows that some elements are effectively covered in a one-time financial education program like Cash Quiz, whereas others are not, as they are already covered in class during the school year. Financial education programs for primary students should focus on improving specific elements of financial knowledge and the skills necessary to manage money in daily life.

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1. Introduction

Society has changed considerably; money has become more invisible, and complex financial products have become the norm. Social security has become less generous and individuals have become more responsible for their financial security before and after retirement. As a result, attention has turned to improving financial literacy and financial capability. Studies show that financial literacy improves financial behaviors such as making ends meet and managing debt (see, among others, Lusardi and Tufano, 2015; Madern and Van der Schors, 2012; Van Geuns et al., 2011). Greater financial knowledge is also positively related to savvier saving and investment decisions, more retirement planning, greater participation in the stock market, and greater wealth accumulation (Lusardi and Mitchell, 2014).

To improve financial knowledge, financial education programs have been implemented over time in different settings and for different population subgroups. The evidence of the effectiveness of financial education programs is mixed. For example, in a meta-analysis of many programs, Fernandes et al. (2014) show that interventions to improve financial literacy explain only 0.1% of the variance in financial behaviors. On the other hand, a meta-analysis by Miller et al. (2013) indicate that financial literacy and capability interventions can have a positive impact in some areas (i.e., increasing savings and promoting financial skills such as recordkeeping). A drawback of these meta-analyses is that they lump together studies of very different programs targeting very diverse groups, from young people to adults. This approach may fail to capture the fact that a specific element within one program can be effective for one group (e.g., the young) but not for others. Lusardi and Mitchell (2014) find that programs targeting specific groups are likely to be more effective than one-size-fits-all financial education programs, since there

is substantial heterogeneity in both financial literacy and financial behavior. In addition, as argued by Alsemgeest (2015), basic financial education is necessary if people are to understand how to manage day-to-day finances. This raises the question of how to set up an effective financial education program for a specific target audience. A lot of educational programs focus on students. But given the large number of topics that must already be covered in school curricula, it is imperative we know which topics are most important to focus on when implementing financial education programs in schools. According to Lusardi and Mitchell (2014), relatively few studies have used carefully designed evaluation approaches. The authors also argue that a short program that is not tailored to the needs of the specific group under consideration is unlikely to have any effect.

In this paper we examine a Dutch school project called Cash Quiz, targeting 10- to 12-year-old children in the last years of primary school. The objective of this analysis is to study which elements of the Cash Quiz project are effective at improving financial literacy, so as to help design more effective financial education programs in schools. This work is only a pilot; as mentioned by Lusardi and Mitchell (2014), program evaluations have to be designed with a treatment group and control group to establish causality and to draw conclusions on effectiveness. Unfortunately, like many other financial education programs, we have no control group. Nevertheless, this study contributes to this field of research, as it is the first study in the Netherlands to examine financial education programs for Dutch primary school students.

The paper is organized as follows. Section 2 describes the Cash Quiz program, Section 3 presents the data and the method of analysis, Section 4 presents the main results, Section 5 provides a discussion of the results and Section 6 offers a final conclusion.

2. Financial Education Program: Cash Quiz

Cash Quiz is an educational game developed by the Dutch Banking Association (NVB). The aim of this game is to teach students about money. Cash Quiz is part of the National Money Week program. During that week (in March), bank employees provide guest lectures to students in the last two years of primary school.[2] As part of the guest lecture visit, students play Cash Quiz with the bank employee acting as quiz master.

The guest lecturer divides the class into teams typically consisting of two to eight members. There are, at most, eight teams within one class. These teams compete with each other in Cash Quiz. During the lecture, twelve open-ended questions are discussed (the questions are presented in Table 1). The difficulty of the questions differs between grades 4, 5 and 6. If the classroom has the appropriate computer facilities, four animation videos are shown during the lecture. Each of the videos covers one of the four themes of the games: (1) money and transactions; (2) planning and managing; (3) savings, borrowing, risk and reward; (4) financial landscape. The themes covered in Cash Quiz are based on the Nibud financial learning goals and competencies for primary and secondary students.[3] These goals are the same as those used in the core competency framework on financial literacy for youth developed by the Organisation for Economic Co-operation and Development's (OECD) International Network on Financial Education (INFE).

Two-thirds of all Cash Quiz game questions test students' knowledge and skills related to money and financial concepts. One-third of the questions are numeracy questions (in the

[2] In the Netherlands, this is "class 7" (comparable to U.S. grade 5; students are 10–11 years old) and "class 8" (comparable to U.S. grade 6; students are 11–12 years old). Some students from class 6 (9- to 10-year-olds) may also play the game, but this normally a small group.
[3] For more detail, see http://www.nibud.nl/consumenten/het-nibud/organisatie/nibud/

context of money). In addition to the twelve open-ended questions, the game has 96 multiple choice questions. These additional questions are not a part of the guest lecture but given to teachers as an additional tool for teachers to use outside of the special program lectures, giving teachers the possibility of playing the game again with new questions. Some of the questions are presented in Table 1. Unfortunately, we do not know whether the guest lecturer was able to discuss all twelve questions, to show the videos, and whether the class played Cash Quiz outside of the lectures with the additional questions provided to teachers.

3. Data and Analysis

Nibud was asked to measure the effectiveness of the National Money Week Cash Quiz program. For that purpose, Nibud drew a random sample of 150 schools out of the population of schools that participated in the program and organized the guest lectures for students in grades 4, 5, and 6 (aged 10-12). These schools were asked to offer their students two questionnaires: a pre-test questionnaire to be filled out one week before the guest lecture took place and a post-test questionnaire to be filled out two to three weeks after the guest lecture. Both the pre-test and post-test questionnaires contain quizzes measuring financial literacy, designed with the objective of measuring the effectiveness of National Money Week'sCash Quiz program. In the pre-test, we also included background questions that ask whether the child receives pocket money and whether he or she earns money by doing chores.

The questionnaire could be completed either in paper-and-pencil format or online. Unfortunately, we do not know which of the two interview modes a school chose, so we cannot test for the presence of mode effects, and this could affect our main results.

Note that schools that did not participate in the National Money Week Program are not sampled. Thus, we do not have a control group in our study, which limits the scope of our research. Another problem with our pilot is that the level of participation is low: only 18 schools (out of the 150) participated in the research with one or more classes. Moreover, because there are not many participating students from grade 4, we have lumped them together with grade 5 students in our analysis[4]. Our full sample is sizeable: in total, 591 students filled out the pre-test. However, attrition is rather high: only 365 of those students also participated in the post-test. It is therefore important to assess whether panel attrition is endogenous. We do this by performing a test proposed by Nijman and Verbeek (1992), which checks whether the probability of a correct answer is the same for the "stayers" (students who participate in the pre-test and post-test survey) and the "movers" (students who participate only in the pre-test survey) after accounting for other factors. A rejection of this hypothesis indicates the presence of endogenous attrition.

To consistently estimate the effect of this program, the concepts measured in the pre- and post-test questionnaires should be as similar as possible, and as such, we have tried to keep the complexity of the questions as similar as possible in both questionnaires. The formulation of the pre-test and post-test questions are presented in the first two columns of Table 1. The last three columns of Table 1 summarize the questions posed in Cash Quiz. Notably, the students also have the option to answer the question with "I don't know." We measure the effectiveness of the Cash Quiz guest lectures by looking, among other things, at the difference between the percentage of students answering a question correctly in the post-test and in the pre-test. We also look at the difference in the

[4] From here on, students in this group will be referred to as grade 4/5.

percentage of students who answered "don't know" between the pre-test and post-test. Moreover, we examine whether the effect of Cash Quiz differs between girls and boys and between students in grade 4/5 and grade 6. We examine this for each of six questions individually, to see whether the effect of Cash Quiz differs across financial concepts.

Before looking at the difference between the pre-test and post-test, we analyze the answers on each of the six questions in the pre-test. We examine whether the percentage of correct answers and "don't know" responses differs between boys and girls, between students in grade 4/5 and grade 6, and between students who have and do not have pocket money and who do and do not do chores for money.

4. Results

4.1 Pre-test

Table 2 summarizes the answers to the six questions in the pre-test. In this table we also provide frequency distributions by gender and grade (grade 6 versus grade 4/5). Eighty-eight percent of students answered the following question correctly: *You want to buy something, but you don't have enough money for it. What do you do?* (correct answer: *I will save money, to make sure I can buy it later).* This percentage does not differ significantly across gender and grade. Moreover, very few students (3 percent) provided a "don't know" answer to this question. Apparently, parents teach their children that one should save before buying something. These results are confirmed when using a multivariate linear probability model in which we explain the probability of a correct answer and of a "don't know" answer using a set of explanatory variables. Panel 1 of Table 3 presents the results of these multivariate analyses. In the first specification (see columns 3 and 4) we consider the following explanatory variables: gender, grade (dummy variable), whether the child receives

pocket money (dummy variable), and whether the child earns money by doing chores (dummy variable). In columns 5 and 6, we augment the set of variables by adding year of birth.[5] We add these dummy variables for two reasons. First, *ceteris paribus*, older students might be less talented than younger ones because, within the same grade, older students are more likely to have repeated a grade. Second, some financial concepts are not taught at school but may be learned by experience. In sum, the effect of year of birth could be nonlinear. This turns out to be the case with the first question: we find that students born in 2002 or 2003 are more likely to provide a correct answer than students born after 2003 or before 2002. Except for year of birth, none of the regressors (including grade) has a significant impact on the probability of a correct answer. We also checked whether panel attrition is endogenous, i.e., whether the percentage of correct ("don't know") answers differs significantly between "stayers" (students who participate both in the pre-test and post-test) and "movers" (students who only filled out the pre-test questionnaire). The results presented in columns 1-2 and 7-8 of Table 3 (panel 1) suggest that for the first question, panel attrition does not seem to be endogenous.

Two questions in the pre-test survey aim to measure financial knowledge. The first and the most difficult one is: *What is a budget diary?* Table 2 (panel 2) suggests that only a minority of students (40%) answered this question correctly, with a big difference between grade 4/5 (34% correct) and grade 6 (48% correct). Moreover, many students (30 percent) provided a "don't know" answer. This question is related not to math but to dealing with money. If a child hasn't done any activities related to dealing with money, he or she wouldn't be aware of this concept. The results of the multivariate analyses are summarized in Table 3 (panel 2), which has the same setup as the first panel of Table 3. Column 3 shows that children in grade

[5] All children in our sample are born between 2001 and 2005.

6 are considerably more likely to provide a correct answer to this question than children in lower grades. This effect disappears, however, once we control for year of birth (see column 5). The year of birth coefficients suggest that younger children have a significantly lower (higher) likelihood of providing a correct ("don't know") answer than older children. Apparently, children also learn things outside of school (e.g., from their parents). Columns 1-2 and 7-8 of Table 3 (panel 2) suggest that attrition is endogenous in the sense that "movers" are more (less) likely to give correct ("don't know") answer than "stayers." This finding suggests that our estimate of the effectiveness of Cash Quiz training on the understanding of the concept of budget diary is presumably biased upward. Notably, the estimates of the other coefficients are barely affected by the inclusion of the selection dummy.

The formulation of the second knowledge question is as follows: *Jan gets a loan from the bank. What is true?* (correct answer: *Jan has to repay the loan and he has to pay an extra amount (interest)*). Sixty-two percent of students answered this question correctly and only a few (5 percent) answered with "don't know." Findings reported in Table 2 and in the multivariate analyses (Table 3, panel 3) suggest that there is a strong grade effect, even accounting for year of birth. Apparently, in the last year at primary school (end of grade 4/5 beginning of grade 6) students begin to pay attention to concepts such as borrowing and loans. There is no gender effect found for this question, and attrition is endogenous in the same way that it was in the previous knowledge question.

The pre-test survey also includes three numeracy questions. In all three numeracy questions, the panel attrition seems to be exogenous. In other words, the percentage of correct ("don't know") answers to the numeracy questions does not significantly differ between "stayers" and "movers." The first numeracy question reads as follows: *What is the minimum number of euro*

coins needed to pay 1.25 euro without needing any change? (correct answer: *3 coins*). 72 percent of students provided a correct answer to this question, and only 2 percent answered with "don't know." We do not observe significant differences in the answer patterns between boys and girls. However, the percentage of correct answers is significantly higher for children in grade 6 than for children in lower grades (79% versus 66%). This difference can be explained by the fact that some numeracy lessons on money-related issues, such as calculating change and how to pay with exact change, are typically taught late in the primary school curriculum. These themes are introduced in grade 4/5 and extended in grade 6.

Sixty three percent of students answered the second numeracy question correctly: *Your soccer team needs 20 new soccer balls. Which of the following offers is cheaper?* (correct answer: *A leather ball for 20 euro. Each fifth ball you buy is free*). Not surprisingly, this percentage is much higher for students in grade 6 than for students in grade 4/5 (73% versus 56%). The frequency of "don't know" answers is also lower for this grade (4% versus 8%). It is the only question in which we observe a significant difference in the percentage of correct answers between boys and girls, even after correcting for other factors in the multivariate analyses (table 3, panel 5).[6] This difference can possibly be explained by the context of the question, which could be of more interest to boys than girls.

The last (sixth) numeracy question is about (compound) interest and was inspired by the measure designed by Lusardi and Mitchell (2014): *Minou has 100 euro in her savings account. The interest rate is 2% per year. She leaves the money in her account for five years without making any withdrawals. How much will she have in her savings account after five years?* (correct answer: *More than 102 euro*). Notice that many children,

[6] We observe a similar significant gender effect if we analyze the corresponding question posed in the post-test.

especially girls and students in grade 4/5, provided a “don’t know” answer to this question. As a result, only 65 percent of students answered this numeracy question correctly. Students in grade 6 answered this question correctly more often than students in grade 4/5: a difference of 21 percentage points. After accounting for other factors (especially year of birth) in the multivariate regressions, this difference is still 16 percentage points. Children in lower grades answered with “don’t know” significantly more often than children in grade 6 (24% versus 10%). This difference holds even after accounting for other confounding factors in the multivariate analysis (table 3, panel 6). These grade differences can be explained by the fact that students in Dutch primary schools start with percentage calculations in grade 4/5. So, students in grade 6 are more familiar with these kinds of calculations.

Although girls selected the “don’t know” option more frequently than boys (22% versus 13%) in the pre-test, we do not observe a gender difference in the relative frequency of correct answers. This suggests that boys seem to be more (over)confident than girls when it comes to their financial knowledge. In the multivariate analysis, the difference between boys and girls is still 9 percentage points, *ceteris paribus*. This gender difference has been found in researchers studying adult financial literacy (see Bucher-Koenen et al, 2016). Children who earn money by doing chores answered the interest question correctly more often and replied with “don’t know” less frequently than children who don’t earn money by doing chores. Possibly, children who earn money by doing chores are more interested in money and are dealing more actively with money than children who do not.

4.2 The Effectiveness of Cash Quiz

The concepts measured by the pre-test and post-test questions are the same as those assessed by Cash Quiz. However, as we discussed in Section 2, the questions in the three 'surveys' (pre-tests, cash quiz tests, and post-tests) are not identical (see Table 1). It should also be noted that Cash Quiz contains different questions for grade 4/5 and 6. Moreover, we don't know whether the quiz master (bank employee) had covered all questions and videos in the classroom visit. He or she might have missed some questions presented in the last three columns of Table 1 so that our pre-test and post-test surveys do not exactly measure the effectiveness of Cash Quiz.

As we stated in section 2, we measure the effectiveness of the guest lectures by looking at the difference in percentage of correct answers between the post-test and the pre-test. Table 4 summarizes the results of this analysis. From panel 1 of this table, one can see that the percentage of correct answers to the question *You want to buy something, but you don't have enough money for it. What do you do?* increased by 5 percentage points. This increase is neither gender nor grade specific and is rather small. The fraction of "don't know" answers remained constant between the two waves. This is not a surprising result because the fraction of "don't know" answers was already low in the pre-test, so that the room for improvement was rather limited.

The effect of Cash Quiz is much larger in the case of the knowledge question *Jan gets a loan from the bank. What is true?* In this instance, the percentage of correct answers increased by 22 percentage points between pre- and post-tests; see the estimated intercept term reported in the second column of Table 4 (panel 3).[7] The progress of children in grade 4/5 (33

[7] This effect might be overestimated because panel attrition seems to be endogenous (see subsection 4.1).

percentage points) was bigger than the progress of children in grade 6 (15 percentage points), keeping gender constant, see column 4.[8] The reverse pattern is observed in the fraction of "don't know" answers. The percentage of "don't know" answers decreased by 3 percentage points, cf. the estimated intercept term reported in the third column of Table 4 (panel 3). This decrease does not seem to be gender or grade specific (see the last column of Table 4, panel 3).

Children also demonstrated increased understanding of the concept of a budget diary after playing Cash Quiz (see panel 2 of Table 4): The percentage of correct answers increased by 18 points and the "don't know" answers decreased by 21 points. This improvement does not seem to be gender or grade specific.

The three questions in which there is no difference in the fraction of correct answers between the pre-test and post-test are the numeracy questions (see panels 4-6 of Table 4). This result is not surprising because numeracy is a skill that is developed extensively during the school year. The value added by one extra guest lecture to the accumulation of numeracy skills is rather limited. At the same time, primary schools barely pay attention to concepts such as a budget diary. This is the reason we find an improvement in students' financial knowledge and attitudes following Cash Quiz play.

For the question on interest rate on a savings account, the percentage of "don't know" answers decreases by 8 percentage points for boys in grade 4/5. This decrease is much smaller for boys in grade 6: 1 percentage point. The difference is understandable: students in grade

[8] We also included in a sensitivity analysis regressors such as year of birth, and the pocket money and chore dummies. These extra regressors were never jointly significant in any of the regressions of the type reported in Table 4.

4/5 answered “don’t know” in the pretest more than students in grade 6. The gender gap in the fraction of “don’t know” answers diminished between the pre- and post-tests, although not significantly.

5. Discussion

The results of the pre-test show large differences in correct answers between grades 4/5 and grade 6. This suggests that there are financial education topics already being effectively implemented within the school curriculum. Information impacting numeracy as it relates to financial topics seems to be taught particularly effectively already. With regard to numeracy-related questions, we do not see any effect of playing Cash Quiz. This raises the question of whether it is worthwhile to focus on numeracy-related topics within a small-scale financial education program like Cash Quiz. The outcomes of our analysis indicate that it is more effective to focus on topics that are closely related to the improvement of financial knowledge and financial skills necessary to cope with money in daily life. Questions assessing knowledge of these topics were more often answered correctly after the Cash Quiz play and guest lecture than before. Here we see an effective element of Cash Quiz. Obviously, our findings should be viewed with care because of the lack of a control group. So it is questionable whether we can make rigorous claims about the effectiveness of the guest lecture and Cash Quiz play. It is possible that there are other unobservable factors that have a positive effect, for example the learning effect of having completed a pre-test questionnaire. Furthermore, please note that these are not firm conclusions since we have limited information on the content of the guest lecture; for instance which questions were discussed, how actively children participated and what they did with the Cash Quiz after the guest lecture. Moreover, we don’t have information about the quality of teaching by the guest

lecturer. Lusardi and Mitchell (2014) mention that it is risky to draw inferences when having limited knowledge of these elements.

Nonetheless, the pre-test results show that financial literacy (numeracy) differs across grade (even accounting for year of birth). So, without looking at the effects of the Cash Quiz program itself, it becomes clear that some financial aspects are already taught within the school curricula. The advantage is that such activities within the school curriculum, like math, are given repetitively during the year, and thus students may already have a baseline knowledge of some concepts covered in the program.

6. Conclusions

In this paper we examine the effectiveness of a one-time financial education program called Cash Quiz for Dutch children in the last years of primary schools (age 10 to 12). Although the design of the study has many limitations, the analysis shows that some elements are effectively covered in a one-time financial education program like Cash Quiz, whereas others are not, as they are already covered in class during the school year. A financial education program for primary students should focus on improving specific elements of financial knowledge and the skills necessary to manage money in daily life.

This study is currently being repeated on a larger scale. In the new study, the treatment group, which will play Cash Quiz, will be compared to a control group. With this improved design, we hope to be able to draw more rigorous conclusions about the effectiveness of specific elements of Cash Quiz including the game play and guest lectures.

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Table 1 – Pre- and post-test questionnaires

Pre-test	**Post-test**	**Cash Quiz** **Grade 6**	**Cash Quiz** **Grade 5**	**Cash Quiz general questions**
You want to buy something, but you don't have enough money for it. What do you do?	You want to buy something, but you don't have enough money for it. What do you do?			Isa want to borrow money to buy apps. Eva wants to save for it. Who is more wise?
a) I buy something I prefer less, but which I can afford directly.	*a) I wait to buy it until I have saved enough money.*			
b) I will save money, to make sure I can buy it later.	b) I withdraw money from my savings account, although the money in my savings account is actually meant for the future/long term goals.			
c) I ask my parents or someone else for money.	c) I borrow money from my parents or from a friend.			
d) I don't know.	d) I ask if someone else can buy it for me. e) I don't know.			
Jan gets a loan from the bank. What is true?	Peter gets a loan from the bank. What is true?	Some friends borrows money from each other. Before you do that, you have to think if you need the money. And it is important to make a good agreement.	Bas' parents want to rebuild their house. They are able to get a loan from the bank of 10.000 euro. Nevertheless, Bas' parents decide not to rebuild the house.	Your friend borrows 5 euro from you. What does your friend have to do?
a) Jan has to repay the loan and he has to pay an extra amount (interest).	a) Peter has to repay the loan and he has to pay an extra amount (interest).		What could be a reason why Bas' parents decide not to get the loan from the bank? [open question]	a) He once has to borrow you 5 euro as well
b) Jan has to repay the loan.	b) Peter has to repay the loan.	What is important to make an agreement on?		b) He has to pay you the money back
c) Jan has to repay a certain amount of the loan, but not everything.	c) Peter has to repay a certain amount of the loan, but not everything.			c) He has to show you what he bought with the money
d) Jan doesn't need to repay anything.	d) Peter doesn't need to repay anything.	[open question]		
e) I don't know	e) I don't know			

What is a budget diary? a) A book in which you write down all your income and daily expenses. b) A book in which you keep all important papers. c) A book in which you keep all your bills, to make it possible to pay them at once at the end of the month. d) I don't know.	What is a budget diary? a) A book in which you write down all your incomes and daily expenses. b) A book in which you keep all your bills, to make it possible to pay them at once at the end of the month. c) A book in which you keep all important papers. d) I don't know.			You get 25 euro for your birthday. You spend 15,95 euro. How do you write this down in a budget diary? [open question] How does a budget diary look like? [open question]
What is the minimum number of euro coins needed to pay 1.25 euro without needing any change. a) 2 coins *b) 3 coins* c) 4 coins d) 5 coins e) I don't know	What is the minimum number of euro coins needed to pay 2.75 euro without needing any change. a) 2 coins b) 3 coins *c) 4 coins* d) 5 coins e) I don't know	Bas needs 80 euro for his first big purchase. Each week he receives 2.50 euro pocket money. In his savings account he has already an amount equal to 4 weeks of pocket money. And in a box he has 200 coins of 20 cents and 12 eurocoins. How many week does Bas still need to have saved the total amount of 80 euro? [open question]		You need to pay 28,50 euro. You have 2 notes of 10 euro, 2 notes of 5 euro, 4 50-cent coins and 2 coins of 20 eurocent. How much money do you have after paying? [open question] You need to pay 33,50 euro. You don't want to have any change. How do you pay? [open question]

Your soccer team needs 20 new soccer balls. Which of the following offers is cheapest? *a) A leather ball for 20 euro. Each fifth ball you buy is free.* b) A leather ball for 20 euro. Buy it now and get a 10% discount. c) I don't know	Your korfballteam you needs 10 new korfballs. Which of the following offers is cheapest? a) A leather ball for 10 euro. Each fifth ball you buy is free. b) A leather ball for 10 euro. Buy it now and get a 15% discount. c) I don't know	Bas has saved 100 euro. He wants a race course of 46.89 euro and a racing car of 53.99 euro. Is Bas able to buy the racing car and the race course? Why (not)? [open question]	Grade 4 consists of 25 children. They receive 150 euro to buy a musical. They choose the musical *Chillen*, which costs 119.95 euro. The children want to rehearse at home. Therefore they need a karaoke version. This costs 1.19 euro per child. Do they have enough money to make sure that all children are able to rehearse at home? [open question]	
Minou has 100 euro in her savings account. The interest rate is 2% per year. She leaves on the money in her account for five years without making any withdrawals. How much will she have in her savings account after five years? *a) More than 102 euro* b) Exactly 102 euro c) Less than 102 euro d) I don't know	Gea has 100 euro in her savings account. The interest rate is 3% per year. She leaves on the money in her account for three years without making any withdrawals. How much money will she have in her savings account after five years? a) More than 103 euro b) Exactly 103 euro c) Less than 103 euro d) I don't know			There is 100 euro in your savings account. The interest rate is 2,5% per year. How much will you have in your savings account after one year? [open] The lifetime of a laptop is five years. Which percentage of the new price of laptop do you have to save each year to make sure that you can buy a new laptop after five years? [open]

Table 2: Descriptive Results from the Pre-test (Observations: Boys-317, Girls- 274; Grade 4/5-318, Grade 6- 273; Total- 591)
Correct answer indicated in italics

1. You want to buy something, but you don't have enough money for it. What do you do?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
I buy something I prefer less, but which I can afford directly	2.21	2.19	2.52	1.83	2.2
I will save money, to make sure I can buy it later	86.75	89.78	88.05	88.28	88.16
I ask my parents or someone else for money	8.83	7.3	8.18	8.06	8.12
I don't know	2.21	0.73	1.26	1.83	1.52
Total	100	100	100	100	100
chi2(3) (p-value)	0.442		0.889		
chi2() correct/incorrect (p-value)	0.256		0.932		
chi2() no dk/dk (p-value)	0.143		0.57		

2. What is a budget diary?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
A book in which you write down all your income and daily expenses	40.69	39.42	33.65	47.62	40.1
A book in which you keep all important papers	5.99	12.04	9.75	7.69	8.8
A book in which you keep all your bills, to make it possible to pay them at once at the end of the month	22.71	19.34	24.53	17.22	21.15
I don't know	30.6	29.2	32.08	27.47	29.95
Total	100	100	100	100	100
chi2(3) (p-value)	0.07		0.006		
chi2() correct/incorrect (p-value)	0.752		0.001		
chi2() no dk/dk (p-value)	0.773		0.256		

3. Jan gets a loan from the bank. What is true?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
Jan has to repay the loan and he has to pay an extra amount (interest)	62.46	61.31	52.83	72.53	61.93
Jan has to repay the loan	25.24	23.72	30.5	17.58	24.53
Jan has to repay a certain amount of the loan, but not everything	3.15	5.11	4.72	3.3	4.06
Jan doesn't need to repay anything	5.36	4.38	6.29	3.3	4.91
I don't know	3.79	5.47	5.66	3.3	4.57
Total	100	100	100	100	100
chi2(3) (p-value)	0.599		0		
chi2() correct/incorrect (p-value)	0.775		0		
chi2() no dk/dk (p-value)	0.327		0.17		

4. What is the minimum number of euro coins needed to pay 1.25 euro without needing any change?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
2 coins	14.83	19.34	19.5	13.92	16.92
3 coins	72.56	72.26	66.35	79.49	72.42
4 coins	4.73	2.92	4.72	2.93	3.89
5 coins	5.68	3.65	7.86	1.1	4.74
I don’t know	2.21	1.82	1.57	2.56	2.03
Total	100	100	100	100	100
chi2(4) (p-value)	0.355		0		
chi2() correct/incorrect (p-value)	0.937		0		
chi2() no dk/dk (p-value)	0.742		0.394		

5. Your soccer team needs 20 new soccer balls. Which of the following offers is cheaper?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
A leather ball for 20 euro. Each fifth ball you buy is free	67.82	58.39	55.66	72.53	63.45
A leather ball for 20 euro. Buy it now and get a 10% discount	26.81	34.31	35.85	23.81	30.29
I don’t know	5.36	7.3	8.49	3.66	6.26
Total	100	100	100	100	100
chi2(2)	0.059		0		
chi2() correct/incorrect	0.018		0		
chi2() no dk/dk	0.333		0.016		

6. Minou has 100 euro in her savings account. The interest rate is 2% per year. She leaves on the money in her account for five years without making any withdrawals. How much will she have in her savings account after five years?

	Gender		Grade		Total
	Boy	Girl	4/5	6	
More than 102 euro	65.93	63.87	55.35	76.19	64.97
Exactly 102 euro	11.99	8.76	11.01	9.89	10.49
Less than 102 euro	8.83	5.47	9.75	4.4	7.28
I don’t know	13.25	21.9	23.9	9.52	17.26
Total	100	100	100	100	100
chi2(3) (p-value)	0.017		0		
chi2() correct/incorrect (p-value)	0.6		0		
chi2() no dk/dk (p-value)	0.004		0		

Table 3: Explaining financial knowledge and numeracy: results from the pretest (robust standard errors in parentheses; 591 observations)

Panel 1. You want to buy something, but you don't have enough money for it. What do you do? Correct answer: I will save money, to make sure I can buy it later.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			0.0329	-0.0168	0.0282	-0.0167	0.0277	-0.0166
			(0.0267)	(0.0107)	(0.0263)	(0.0105)	(0.0263)	(0.0105)
grade 6			4.00e-05	0.00668	0.0116	0.00780	0.0112	0.00784
			(0.0265)	(0.0101)	(0.0399)	(0.0128)	(0.0398)	(0.0128)
pocket money=yes			0.0606	-0.0223	0.0612	-0.0225	0.0604	-0.0224
			(0.0417)	(0.0192)	(0.0427)	(0.0195)	(0.0429)	(0.0194)
chores=yes			0.00610	-0.00969	0.00271	-0.00960	0.00216	-0.00954
			(0.0284)	(0.0119)	(0.0282)	(0.0116)	(0.0281)	(0.0115)
2002.gebyear					0.104**	-0.00337	0.104**	-0.00344
					(0.0456)	(0.0163)	(0.0457)	(0.0163)
2003.gebyear					0.0870	-0.00277	0.0870	-0.00277
					(0.0605)	(0.0186)	(0.0605)	(0.0186)
2004.gebyear					0.0580	0.00755	0.0592	0.00741
					(0.0750)	(0.0267)	(0.0755)	(0.0270)
in both waves	-0.0198	0.00316					-0.0188	0.00207
	(0.0269)	(0.0101)					(0.0270)	(0.00993)
Constant	0.894***	0.0133*	0.811***	0.0455	0.731***	0.0468	0.744***	0.0454
	(0.0205)	(0.00763)	(0.0530)	(0.0297)	(0.0693)	(0.0297)	(0.0715)	(0.0276)
R-squared	0.001	0.000	0.007	0.010	0.019	0.011	0.020	0.011

Panel 2. What is a budget diary? Correct answer: A book in which you write down all your income and daily expenses.

VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			-0.0171	-0.0118	-0.0140	-0.0154	-0.0165	-0.0124
			(0.0405)	(0.0381)	(0.0403)	(0.0379)	(0.0400)	(0.0376)
grade 6			0.139***	-0.0449	0.0193	0.00814	0.0174	0.0105
			(0.0403)	(0.0378)	(0.0614)	(0.0533)	(0.0614)	(0.0530)
pocket money=yes			0.0707	-0.0314	0.0806	-0.0368	0.0770	-0.0323
			(0.0559)	(0.0542)	(0.0558)	(0.0544)	(0.0559)	(0.0541)
chores=yes			-0.00487	0.0118	-0.0111	0.0103	-0.0138	0.0136
			(0.0434)	(0.0406)	(0.0432)	(0.0405)	(0.0430)	(0.0403)
2002.gebyear					0.0209	0.0546	0.0239	0.0509
					(0.0614)	(0.0533)	(0.0613)	(0.0522)
2003.gebyear					-0.134	0.0664	-0.134	0.0664
					(0.0824)	(0.0714)	(0.0822)	(0.0705)
2004.gebyear					-0.242**	0.262***	-0.236**	0.254***
					(0.0956)	(0.0966)	(0.0957)	(0.0975)
in both waves	-0.0958**	0.120***					-0.0921**	0.114***
	(0.0417)	(0.0374)					(0.0412)	(0.0372)
Constant	0.460***	0.226***	0.288***	0.344***	0.390***	0.260***	0.452***	0.183**
	(0.0332)	(0.0279)	(0.0653)	(0.0625)	(0.0935)	(0.0815)	(0.0974)	(0.0828)
R-squared	0.01	0.011	0.046	0.013	0.046	0.016	0.056	0.026

Panel 3: Jan gets a loan from the bank. What is true? Correct answer: Jan has to repay the loan and he has to pay an extra amount (interest).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			-0.0142	0.0148	-0.0131	0.0156	-0.0158	0.0168
			(0.0397)	(0.0172)	(0.0400)	(0.0172)	(0.0398)	(0.0172)
grade 6			0.198***	-0.0237	0.176***	-0.0352	0.174***	-0.0343
			(0.0390)	(0.0171)	(0.0584)	(0.0286)	(0.0579)	(0.0284)
pocket money=yes			0.00428	-0.0494	0.00562	-0.0491	0.00152	-0.0474
			(0.0573)	(0.0313)	(0.0574)	(0.0318)	(0.0569)	(0.0316)
chores=yes			0.0555	-0.0148	0.0545	-0.0155	0.0515	-0.0142
			(0.0432)	(0.0189)	(0.0435)	(0.0191)	(0.0431)	(0.0189)
2002.gebyear					-0.00763	-0.00854	-0.00425	-0.00995
					(0.0562)	(0.0252)	(0.0557)	(0.0251)
2003.gebyear					-0.0392	-0.0301	-0.0392	-0.0301
					(0.0792)	(0.0374)	(0.0781)	(0.0372)
2004.gebyear					-0.0262	0.00913	-0.0192	0.00620
					(0.101)	(0.0524)	(0.0988)	(0.0519)
in both waves	-0.108***	0.0453***					-0.104***	0.0433***
	(0.0403)	(0.0155)					(0.0400)	(0.0154)
Constant	0.686***	0.0177**	0.493***	0.102***	0.520***	0.119***	0.590***	0.0902**
	(0.0309)	(0.00879)	(0.0668)	(0.0352)	(0.0885)	(0.0403)	(0.0896)	(0.0391)
R-squared	0.012	0.011	0.044	0.014	0.045	0.017	0.055	0.027

Panel 4: What is the minimum number of euro coins needed to pay 1.25 euro without needing any change.Correct answer: 3 coins.

VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			-0.00472	-0.00534	-0.00158	-0.00565	-0.00285	-0.00536
			(0.0371)	(0.0111)	(0.0373)	(0.0113)	(0.0373)	(0.0114)
grade 6			0.131***	0.0101	0.124**	0.0140	0.123**	0.0142
			(0.0362)	(0.0118)	(0.0537)	(0.0146)	(0.0535)	(0.0146)
pocket money=yes			0.0534	-0.00248	0.0528	-0.00276	0.0509	-0.00232
			(0.0533)	(0.0163)	(0.0529)	(0.0163)	(0.0528)	(0.0162)
chores=yes			0.0212	-0.00944	0.0234	-0.00947	0.0220	-0.00915
			(0.0399)	(0.0129)	(0.0400)	(0.0127)	(0.0400)	(0.0125)
2002.gebyear					-0.0699	0.00454	-0.0683	0.00418
					(0.0485)	(0.0175)	(0.0484)	(0.0176)
2003.gebyear					-0.0603	0.00733	-0.0603	0.00734
					(0.0703)	(0.0208)	(0.0703)	(0.0208)
2004.gebyear					-0.0271	0.0120	-0.0239	0.0112
					(0.0912)	(0.0278)	(0.0917)	(0.0283)
in both waves	-0.0525	0.0114					-0.0482	0.0111
	(0.0373)	(0.0111)					(0.0370)	(0.0114)
Constant	0.757***	0.0133*	0.606***	0.0267	0.659***	0.0199	0.692***	0.0125
	(0.0286)	(0.00763)	(0.0635)	(0.0185)	(0.0815)	(0.0225)	(0.0836)	(0.0205)
R-squared	0.003	0.002	0.024	0.002	0.027	0.003	0.030	0.004

Panel 5: Your soccer team needs 20 new soccer balls. Which of the following offers is cheapest?

Correct answer: A leather ball for 20 euro. Each fifth ball you buy is free.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			-0.107***	0.0171	-0.107***	0.0192	-0.107***	0.0199
			(0.0394)	(0.0207)	(0.0393)	(0.0204)	(0.0394)	(0.0204)
grade 6			0.171***	-0.0493**	0.104*	-0.0261	0.104*	-0.0255
			(0.0386)	(0.0195)	(0.0581)	(0.0238)	(0.0582)	(0.0236)
pocket money=yes			0.0797	-0.0136	0.0854	-0.0169	0.0853	-0.0158
			(0.0572)	(0.0308)	(0.0573)	(0.0311)	(0.0574)	(0.0309)
chores=yes			-0.0768*	-0.0382	-0.0814**	-0.0350	-0.0816**	-0.0342
			(0.0415)	(0.0239)	(0.0414)	(0.0234)	(0.0414)	(0.0233)
2002.gebyear					0.0365	-0.0676**	0.0366	-0.0685**
					(0.0557)	(0.0302)	(0.0558)	(0.0302)
2003.gebyear					-0.0618	-0.0271	-0.0618	-0.0271
					(0.0791)	(0.0412)	(0.0791)	(0.0411)
2004.gebyear					-0.111	0.0557	-0.111	0.0538
					(0.0996)	(0.0636)	(0.0997)	(0.0635)
in both waves	-0.00429	0.0297					-0.00404	0.0280
	(0.0408)	(0.0194)					(0.0398)	(0.0190)
Constant	0.637***	0.0442***	0.590***	0.115***	0.631***	0.138***	0.633***	0.119***
	(0.0320)	(0.0137)	(0.0660)	(0.0370)	(0.0914)	(0.0467)	(0.0957)	(0.0443)
R-squared	0.000	0.004	0.050	0.018	0.063	0.049	0.063	0.052

Panel 6: Minou has 100 euro in her savings account. The interest rate is 2% per year. She leaves on the money in her account for five years without making any withdrawals. How much will she have in her savings account after five years?

Correct answer: More than 102 euro

VARIABLES	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)	Pr(correct)	Pr(dk)
Girl			-0.0155	0.0800***	-0.0192	0.0792***	-0.0193	0.0806***
			(0.0385)	(0.0305)	(0.0384)	(0.0300)	(0.0384)	(0.0300)
grade 6			0.210***	-0.148***	0.156***	-0.0687*	0.156***	-0.0676*
			(0.0378)	(0.0294)	(0.0550)	(0.0393)	(0.0551)	(0.0394)
pocket money=yes			0.0210	-0.0170	0.0261	-0.0245	0.0260	-0.0224
			(0.0550)	(0.0458)	(0.0556)	(0.0455)	(0.0557)	(0.0455)
chores=yes			0.131***	-0.119***	0.122***	-0.114***	0.122***	-0.113***
			(0.0423)	(0.0351)	(0.0426)	(0.0352)	(0.0426)	(0.0351)
2002.gebyear					0.140**	-0.0428	0.140**	-0.0445
					(0.0567)	(0.0386)	(0.0567)	(0.0386)
2003.gebyear					0.00800	0.0601	0.00800	0.0601
					(0.0788)	(0.0562)	(0.0789)	(0.0562)
2004.gebyear					0.0173	0.181**	0.0176	0.177**
					(0.100)	(0.0829)	(0.101)	(0.0839)
in both waves	-0.00829	0.0574*					-0.00436	0.0528*
	(0.0404)	(0.0309)					(0.0389)	(0.0299)
Constant	0.655***	0.137***	0.453***	0.300***	0.414***	0.252***	0.417***	0.216***
	(0.0317)	(0.0229)	(0.0648)	(0.0539)	(0.0885)	(0.0664)	(0.0923)	(0.0689)
R-squared	0.000	0.005	0.065	0.074	0.081	0.094	0.081	0.098

*** p<0.01, ** p<0.05, * p<0.1

Table 4: The effectiveness of the Cash Quiz training: a multivariate analysis

Panel 1

Wave 1
You want to buy something, but you don't have enough money for it. What do you do?
a) I buy something I prefer less, but which I can afford directly.
b) I will save money, to make sure I can buy it later.
c) I ask my parents or someone else for money.
d) I don't know.

Wave 2
You want to buy something, but you don't have enough money for it. What do you do?
a) I wait to buy it until I have saved enough money.
b) I withdraw money from my savings account, although the money in my savings account is actually meant for the future/long term goals.
c) I borrow money from my parents or from a friend.
d) I ask if someone else can buy it for me.
e) I don't know.

VARIABLES	dif2_correct	dif2_dk	dif2_correct	dif2_dk
girl			0.00951	0.00623
			(0.0365)	(0.0187)
grade 6			-0.0135	-0.00527
			(0.0365)	(0.0196)
Constant	0.0493***	0.00274	0.0511	0.00230
	(0.0184)	(0.00989)	(0.0332)	(0.0199)

Panel 2

Wave 1
What is a budget diary?
a) A book in which you write down all your income and daily expenses.
b) A book in which you keep all important papers.
c) A book in which you keep all your bills, to make it possible to pay them at once at the end of the month.
d) I don't know.

Wave 2
What is a budget diary?
a) A book in which you write down all your incomes and daily expenses.
b) A book in which you keep all your bills, to make it possible to pay them at once at the end of the month.
c) A book in which you keep all important papers.
d) I don't know.

VARIABLES	dif6_correct	dif6_dk	dif6_correct	dif6_dk
girl			0.0814	-0.0950*
			(0.0566)	(0.0505)
grade 6			0.0469	-0.0835*
			(0.0568)	(0.0504)
Constant	0.184***	-0.205***	0.125***	-0.124***
	(0.0281)	(0.0251)	(0.0436)	(0.0381)

Panel 3

Wave 1
Jan gets a loan from the bank. What is true?
a) Jan has to repay the loan and he has to pay an extra amount (interest).
b) Jan has to repay the loan.
c) Jan has to repay a certain amount of the loan, but not everything.
d) Jan doesn't need to repay anything.
e) I don't know

Wave 2
Peter gets a loan from the bank. What is true?
a) Peter has to repay the loan and he has to pay an extra amount (interest).
b) Peter has to repay the loan.
c) Peter has to repay a certain amount of the loan, but not everything.
d) Peter doesn't need to repay anything.
e) I don't know

VARIABLES	dif4_correct	dif4_dk	dif4_correct	dif4_dk
girl			-0.0578	-0.0336
			(0.0504)	(0.0249)
grade 6			-0.173***	0.0124
			(0.0497)	(0.0250)
Constant	0.222***	-0.0301**	0.327***	-0.0205
	(0.0256)	(0.0125)	(0.0438)	(0.0209)

Panel 4

Wave 1
What is the minimum number of euro coins needed to pay 1.25 euro without needing any change.
a) 2 coins
b) 3 coins
c) 4 coins
d) 5 coins
e) I don't know

Wave 2
What is the minimum number of euro coins needed to pay 2.75 euro without needing any change.
a) 2 coins
b) 3 coins
c) 4 coins
d) 5 coins
e) I don't know

VARIABLES	dif7_correct	dif7_dk	dif7_correct	dif7_dk
girl			-0.0130	-0.0179
			(0.0595)	(0.0168)
grade 6			-0.00147	-0.0294*
			(0.0590)	(0.0165)
Constant	-0.0411	-0.0137*	-0.0345	0.00784
	(0.0299)	(0.00820)	(0.0529)	(0.0120)

Panel 5

Wave 1

Your soccer team needs 20 new soccer balls. Which of the following offers is cheapest?

a) A leather ball for 20 euro. Each fifth ball you buy is free.

b) A leather ball for 20 euro. Buy it now and get a 10% discount.

c) I don't know

Wave 2

Your korfball team you needs 10 new korfballs. Which of the following offers is cheapest?

a) A leather ball for 10 euro. Each fifth ball you buy is free.

b) A leather ball for 10 euro. Buy it now and get a 15% discount.

c) I don't know

VARIABLES	dif8_correct	dif8_dk	dif8_correct	dif8_dk
girl			0.0343	-0.0282
			(0.0643)	(0.0318)
grade 6			0.0228	0.0292
			(0.0642)	(0.0310)
Constant	-0.0493	-0.0274*	-0.0753	-0.0279
	(0.0317)	(0.0159)	(0.0481)	(0.0289)

Panel 6

Wave 1

Minou has 100 euro in her savings account. The interest rate is 2% per year. She leaves on the money in her account for five years without making any withdrawals. How much will she have in her savings account after five years?

a) More than 102 euro

b) Exactly 102 euro

c) Less than 102 euro

d) I don't know

Wave 2

Gea has 100 euro in her savings account. The interest rate is 3% per year. She leaves on the money in her account for three years without making any withdrawals. How much money will she have in her savings account after five years?

a) More than 103 euro

b) Exactly 103 euro

c) Less than 103 euro

d) I don't know

VARIABLES	dif9_correct	dif9_dk	dif9_correct	dif9_dk
girl			0.0395	-0.0670
			(0.0596)	(0.0435)
grade 6			-0.00652	0.0710*
			(0.0590)	(0.0416)
Constant	-0.0274	-0.0795***	-0.0424	-0.0813**
	(0.0298)	(0.0214)	(0.0517)	(0.0356)
Observations	365	365	365	365

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1