

Measuring Financial Literacy of Children Aged 4 to 6 years: Design and small-scale testing

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1. Introduction

This project aimed to develop and test a measure of four to six year old children's financial literacy, defined here as a combination of children's understanding of concepts connected with money management and finance and their ability to describe their own experiences of situations involving money. In this report, we outline the background to the project and review the research literature on young children's knowledge, understanding and experience of money and finance. We then discuss our approach to the design of a measure of financial literacy and describe a small-scale evaluation study we conducted using the newly developed measure. Finally, we discuss recommendations for next steps with the measure.

Evidence suggests that there are low levels of financial literacy in the UK. For example, Atkinson et al. (2007) reports that "At least half of the UK population needs reminding that it is dangerous to live for the day and make no provision for changes in circumstance, unexpected expenditure, or retirement" (p.29). This is also an issue internationally: an OECD survey of financial literacy levels among 15 year olds in 20 OECD countries (not including the UK) showed that around one in four were "unable to make even simple decisions on everyday spending" (OECD, 2020).

Previous research also suggests that one of the best predictors of later financial well-being is the age at which children start learning about money and finance – the younger that children are when they start, the better (OECD, 2017; Agnew, 2018). As such, a good measure of young children's financial literacy could serve two main purposes: it could provide a baseline of where we are now in terms of the distribution of financial literacy among young children; and it could provide a way to track any improvements over time for a sample of children. In these ways, a good measure could bring more attention to the need for financial education for children and could help determine whether new approaches to improving financial education are effective.

1.1. Background to this project

In 2013, Money Advice Service (MAS) published a study on habit formation and learning in young children (Whitebread & Bingham, 2013). The report detailed how various cognitive and metacognitive processes emerge in young children before the age of seven years. It offers useful insights on what parents/caregivers and teachers can do to encourage positive habits of self-regulation and related metacognitive skills in young children and thus support their financial understanding. The first ever survey of children and their parents/carers to better understand the financial literacy of children and young people, the MAS 2016 Financial Capability Survey for Children and Young People, included children aged four to six. However, after this pilot the MAS team concluded that it was not possible to adapt questions used with an older participant group to adequately assess financial literacy within this younger group and that a new approach was needed.

In 2019/20, Money and Pensions Service (MaPS) completed a piece of qualitative research exploring what financial literacy might mean and look like at a young age (four to six years) and began to think about ways in which that could be measured (Redfern & Benfield, 2020). In March 2021, MaPS brought together a group of academics and clinical psychologists in a workshop to discuss further what could be possible and appropriate in terms of measuring financial capability and meaningful financial education for children of four, five, and six years of age at a UK scale (Money and Pensions Service, 2021). This workshop concluded that a key challenge in developing such a measure would be the need for it to be meaningful and engaging for a diverse range of children with varying levels of literacy and experience. Based on this, members of the panel suggested that a play-based or story-based measure could be a useful approach in this regard. The workshop also determined that it would be important to assess both children's understanding of financial concepts (e.g., buying, saving, and so on) and their experience of money. It was also determined that any measure should focus on one concept at a time, rather than addressing

more than one concept within a given question, to avoid overloading children's capacity.

Besides the work commissioned by Money and Pensions Service discussed above, to our knowledge measures of financial capabilities have not successfully been developed for children below teenage years (Rieger, 2020). Previous research indicated that children's understanding of financial concepts may be unstable and highly dependent on context between the ages of four and six (e.g., Berti & Bombi, 1988). Based on this and similar related research, our approach has been to develop a measure that addresses both children's understanding of financial concepts, and their experience of managing money, under the umbrella term 'financial literacy'. This means that we have developed materials that allow us to assess some basic concepts in financial literacy, but also consider that four to six year old children may only be reasonably expected to understand a limited set of concepts in this domain. Alongside this, we have designed materials to measure experience; including experiences with money that the literature suggests are likely to contribute to good levels of financial literacy, and financial wellbeing in the future, such as having small amounts of money to spend and having opportunities to earn money by doing chores around the house (Whitebread & Bingham, 2013). When children reach a stage where they are managing their own money independently, then financial wellbeing can be defined as a state of feeling secure and in control in situations involving money; being able to make the most of money day-to-day, dealing with the unexpected, and being on track for a healthy financial future. Financial literacy will contribute to financial wellbeing alongside other factors.

1.2. Aims of this project

Drawing on the work described above, the two key aims of this project were:

- To develop a measure of four to six year old children's financial literacy that is engaging and meaningful for children. This should

form the basis of a measure that can be used at scale in the UK for this age group.

- To evaluate the usability and feasibility of the measure, in both: 1) in-person interviews with children in a nursery/ early years context, and 2) remote interviews with a parent/guardian and child by video call. The focus of this evaluation was to test whether the materials were meaningful and engaging for children and that they yielded an appropriate distribution of scores. Further work will be needed to assess validity and reliability.

2. Review of literature on young children's financial literacy

The main aims of this narrative review of the literature were to:

- identify a set of concepts and experiences to include in the testing materials
- determine key challenges and design principles for the creation of testing materials

2.1. The importance of good financial education

Financial literacy is important for individuals but also society as a whole. Low levels of financial literacy in adulthood are “associated with negative credit behaviours such as debt accumulation, high-cost borrowing, poor mortgage choice, and mortgage delinquency and home foreclosure” (Hastings et al. 2013, p.15). While improving financial literacy would not remove these behaviours altogether, it would likely reduce their prevalence.

Overall, the existing evidence suggests that there are rather low levels of financial literacy in the UK. The OECD/INFE 2016 Survey of Adult Financial Literacy Competencies, showed that adults in the UK scored below the average of OECD countries: just above Thailand and Albania, and well below France, Norway, and Austria. Furthermore, another OECD survey showed that around one in four 15 year olds across twenty countries (excluding the UK) were “unable to make even simple decisions on everyday spending” (OECD, 2020), “such as dealing with bank accounts and debit cards, understanding interest rates on a loan, or choosing between a variety of mobile phone plans”. Evidence from MaPS' own survey of seven to 17 year olds shows that nearly four in ten 16 to 17 year olds don't have a current account, six in ten don't have a savings account, and nearly one in five have no bank account at all (neither savings nor current account). Of those that do have an account, 32% have never deposited money, 40% have never been into a bank, and 40% don't look

after their own banking details. Taken together, these and similar findings (e.g. Atkinson, 2007) suggest that there is a need to increase levels of financial literacy in the UK population across all ages.

Consideration of financial literacy in the early years of a child's life seems important since one of the best predictors of later financial well-being is the age at which children start having conversations about money and finance with their parents – the younger children were when these conversations started, the better their later financial well-being (OECD, 2017; Agnew, 2018). With regard to financial education in schools, England is something of an outlier, as the majority of OECD countries do include financial literacy in the primary/elementary curriculum to some extent, including Wales, Scotland, and Northern Ireland. However, it is important to note that parental involvement has been found to be important for children's learning even in countries where financial literacy education is part of the curriculum. For instance, a longitudinal study in the US found that the effects of parental influence on children's financial literacy learning outcomes were significantly stronger than those of financial literacy education in schools (Shim et al., 2010).

Cultural factors play a part in children's opportunity to learn about money. For example, Fauziah and Sari (2019) highlighted that in Indonesia, discussions surrounding finances with children are considered taboo and are thus very rare. Such cultural specificities will influence when and how much exposure children have to financial information which in turn is likely to limit their acquisition of financial literacy. This seems critical as research carried out by the Australian Securities and Investment Commission (ASIC) in 2014 suggests that, by the age of seven years, children have already started to show some of the financial behaviours they will take into their adult life. Thus, avoiding early financial education may lead young children to assuming false information and, in turn, adopting poor financial habits (Borden et al., 2013).

2.2. Measuring financial literacy

The development of valid instruments for the measurement of financial literacy is important for at least two main reasons. First, a good measure allows for evaluation of interventions and curricula that have been designed to improve financial literacy. This is critical as research has shown evaluation to be a crucial component of the development of effective financial literacy education (e.g., Fox et al., 2005; McCormick, 2009). Yet such evaluation is currently limited because of the lack of valid instruments. Second, a good measure may motivate positive changes in policy and practice to address knowledge and skill gaps that the measure identifies in a population.

Measures of financial literacy do exist for teenagers and adults (including the previously mentioned OECD measure), but few, if any, measures have been validated for younger populations (Rieger, 2020). The only measure for young children that we are aware of is that used by the Money and Pensions Service (MaPS) to assess financial literacy among children as young as seven-years-old (Money and Pensions Service, 2019).

As regards young children, it needs to be noted that it can be challenging to measure any form of cognitive ability, knowledge, or skill. Children in the Early Years phase of education (up to and including Reception class in English schools, where children are aged five and six years) generally have significantly lower levels of literacy and vocabulary than older children, and significantly shorter attention spans (Ruff & Lawson, 1990). Due to children's levels of reading ability and limitations in ability to follow complex instructions, children generally need to be assessed in one-to-one sessions with a researcher/assessor interviewing one child at a time. To avoid such challenges and to ensure shared understanding of questions and valid answers to questions, measurement materials must be suitably engaging and familiar to children being assessed.

Additionally, careful attention must also be paid to the risk of bias. There is a well-established literature on potential bias on various measures

(e.g., on IQ tests, which are likely to correlate with measures of financial literacy) when young children are tested – for example, children from lower socio-economic status backgrounds tend to perform at a disproportionately lower level than those from higher socio-economic status backgrounds when testing materials or the tester themselves are unfamiliar (Fuchs & Fuchs, 1986). Interestingly, recent research also shows that disadvantaged students tend to perform worse in mathematics tests when questions are about money (Duquennois, 2022). A particular challenge in measuring financial literacy is that it is influenced by past experiences with the subject matter and each child within a given classroom will have had varying experiences with money and financial services and varying opportunities to talk about these experiences with a more knowledgeable person (e.g., Danziger, 1958; Schug & Birkey 1985; Johnson & Sherraden 2007). Thus, measurement instruments should account for this, to give children opportunities to demonstrate their understanding while acknowledging and potentially allowing for differences in experience and in vocabulary to talk about such experiences. It is important to ensure that materials communicate the situations and experiences that we want to question children on clearly so that they are meaningful to children who may have experienced such situations in quite different contexts.

For the above reasons, it is important to identify a focused set of concepts to include within any measure of financial literacy. When a measure includes too many different concepts, then it will be difficult to assess them all within a single testing session as children's attention spans will impose time limits. On the other hand, assessing too few concepts bears the danger of not allowing for a comprehensive assessment of children's understanding of the subject matter. At the same time, one needs to be confident that the concepts to be considered in the measure are sufficiently accessible and meaningful to children of the respective age group.

To determine a core set of concepts to include in a measure, we have reviewed literature from two different research areas. First, we

considered research on economic socialisation, and the psychology of children's economic and financial development. This provided useful information on the kinds of financial and economic understanding we might expect four to six year old children to have, based on their level of cognitive development, and on empirical studies in this field. Second, we considered research, practice, and policy documents that report on curricula and interventions that have been designed to improve financial literacy for the target age group. While perhaps not as rigorous, and therefore as dependable as the available research on economic socialisation, this area of the literature provides useful information on the concepts that are being taught to children in this age group, and so represents a useful additional perspective on concepts that may be measured when assessing financial literacy.

2.3. Economic socialization and development

Berti and Bombi (1988) published one of the first major studies of children's economic development. They drew on a Piagetian 'stage' theory of development and used interviews and observation of Italian children to describe children's understanding of economics and finance at various points during their development. Berti and Bombi labelled the three to six years range as the 'preoperatory period' and characterized this period as a time when children are beginning to recognize certain scripts involving money and transactions, but do not yet fully understand causal relationships or connections between actions. For example, children between three and six years of age may understand a 'shopping' script (i.e., a sequence of actions including asking for and getting goods, giving, and then receiving money), but may not yet understand why the shopkeeper needs money in this transaction, or why the shopper receives change. Similarly, children in this age range may already know that adults work and that they get paid but may not yet understand they get paid *because* they work (Berti & Bombi, 1988).

Using similar methods to Berti and Bombi (1988), but with a sample of US children from kindergarten and elementary schools (children aged five to 11 years old), Schug and Birkey (1985) explored young children's understanding of a set of economic concepts including i) scarcity (the idea that one's supply of money is limited), ii) choice, iii) opportunity cost, iv) monetary value, v) price, vi) exchange, and vii) the function of advertising. Schug and Birkey categorized children's responses to questions about these concepts as either 'unreflective', or as demonstrating 'emergent reasoning'. They found that children in kindergarten and grade 1 showed emergent reasoning in only a small proportion of their responses, while grade 3 children were starting to show emergent reasoning in most of their responses. For example, when asked about how families made choices between things to buy when they did not have enough money for everything they wanted, children's responses in kindergarten and grade 1 included responses such as "they can buy more money" or "get more money from the bank". In contrast, in grade 3, answers like "If you have enough money for what you need to buy, like for food and stuff, it comes first", indicated that children had started to develop an understanding of the respective concepts.

Some researchers have investigated the development of children's understanding of particular economic concepts. For example, Leiser and Beth Halachmi (2006) conducted a study of the development of children's understanding of supply and demand. They found that while children as young as six years old already demonstrated some understanding of this concept, there was still significant improvement in understanding between six and 12 years old. For example, an older child would be able to explain that the price of an item will be higher when there are more children who want it, because some will offer to pay more to make sure they get it. Younger children in the study could sometimes predict likely changes in price but tended to omit explanations connecting price with changing supply and demand.

The studies discussed above indicate that it is likely to be useful for a measure of financial

literacy in the early years to include questions about typical practices, including ways to receive, spend, look after, and save money because children are likely to already have experienced these to some degree. However, it may not be reasonable to expect to observe understanding of the concepts underlying such practices such as supply and demand, or opportunity cost. This is in line with suggestions by Webley and Lea (1993), who caution that researchers in this field often take an overly adult-centred view of economic development, focusing on children's acquisition of adult economic concepts that may not feature in children's lives. They advocate for a more child-centred approach that instead asks how children deal with the economic problems they are faced with.

Along these lines, Webley and Lea (1993) recommend a more pronounced focus on non-monetary activities. Webley and Lea themselves documented what they called a 'marble economy' – based on their observations of children's playground activity during school break times. Children played games of marbles where successful play meant winning one or more marbles from one's opponent. They noted frequent occasions in which one child provided marbles as capital and another child with more playing expertise provided the labour (playing the game). Rules about these arrangements, including how any winnings should be divided, were negotiated entirely by the children with no involvement from adults. In similar studies, researchers following this approach have shown, amongst others, that:

- negotiations between siblings often involve idiosyncratic equivalences between goods (e.g., sweets, cards), labour (e.g., chores), and resources such as time and space (McIntosh & Punch, 2009)
- children may be more willing to share with their siblings at home than with their friends in school, and more with their friends than with strangers (Markovits, Benenson, & Kramer, 2003)
- swapping, sharing, exchanging, and giving gifts, are essential aspects of interactions

with siblings at home and with friends at school (Hay et al., 1999)

Taken together, these studies show that it is likely to be informative to include questions about exchange, swaps, sharing, borrowing, and lending things *other* than money when measuring young children's understanding of economic concepts. Children may well have more experience and therefore more understanding of norms in non-monetary economic contexts than they do of similar transactions involving money.

2.4. Curricula and interventions for young children

In those countries where financial education is a mandatory part of the curriculum for young children, the detail of such curricula may be a useful guide to the concepts that children are likely to be able to understand. For example, Gnatuk and Granovsky (2014) suggest that at five years of age children are generally able to understand the concepts summarised here:

Saving and Spending:

- Money has value because you can exchange, trade, or spend it
- Putting money aside for later spending is called saving
- You can keep track of money by putting it somewhere safe
- Saving money is a way to get something you want instead of hoping it will be given to you

Shopping:

- You can make decisions about how and when to spend money before you go to the shops
- You do not have to spend all your money
- Good shoppers compare prices and choose items that cost less

Working for pay:

- Different jobs pay different amounts of money

Value:

- The amount of money needed to buy something is called its price
- Different items have different prices
- Coins and paper money have different values
- Some things that seem to be free such as food, really cost money

On the other hand, Gnatuk and Granovsky caution that three to five year old children are likely to have difficulty understanding planning for the future, or of where money comes from.

Holden et al. (2009) provided a review of financial education programmes for young children. They concluded that among the curricula reviewed there was little evidence of alignment between curriculum content and the available research on children's cognitive development. They further noted that there is currently little understanding of what the key building blocks for children's future financial capability are, and so programmes they reviewed tended to focus more on concrete and practical lessons. Amagir et al. (2018) provided a similar review of financial education programmes for children and adolescents. They found programmes generally included overlapping content on:

- Planning and budgeting
- Banking services
- Income and careers
- Insurance
- Investing
- Saving
- Spending and credit

In addition, we have reviewed several examples of voluntary and mandatory curricula that are being used around the world, including:

- New Zealand Curriculum: Financial Capability Progressions (<https://nzcurriculum.tki.org.nz/Curriculum-resources/Financial-capability/Financial-capability-progressions>)
- JumpStart Foundation: National Standards in K-12 Personal Finance Education (US)

(<https://www.jumpstart.org/what-we-do/support-financial-education/standards/>)

- Young Money, Part of Young Enterprise: Financial Education Planning Framework 3-11 years (UK) (<https://www.young-enterprise.org.uk/resources/financial-education-planning-framework-3-11-years/>)
- InCharge Financial Literacy for Kids (US) (<https://www.incharge.org/financial-literacy/resources-for-teachers/financial-literacy-for-kids/>).
- Northern Ireland curriculum (<https://www.ccea.org.uk/about/what-we-do/curriculum>); The Council for the Curriculum, Examinations and Assessment has a dedicated financial capability microsite http://www.nicurriculum.org.uk/curriculum-microsite/financial_capability/index.asp)
- Scotland's Curriculum for Excellence (<https://education.gov.scot/education-scotland/scottish-education-system/policy-for-scottish-education/policy-drivers/cfe-building-from-the-statement-appendix-incl-btc1-5/>)
- Wales curriculum (<https://hwb.gov.wales/curriculum-for-wales>)

In the following sections, we discuss three of these curricula in more detail as the countries are broadly comparable with the UK as regards their school system and include curriculum guidance for children aged four to six years old. These have also been chosen for their broader coverage of concepts compared with some more limited curricula.

2.4.1. New Zealand Curriculum: Financial Capability Progressions

This framework comes from the New Zealand national curriculum, which applies to English-medium New Zealand schools.

The main headings for this framework are:

- Money
- Spending

- Credit & Debt
- Saving & Investing
- Income & Taxation
- Budgeting & Financial Management
- Setting Financial Goals and Planning Ahead
- Identifying and Managing Risk
- Rights and Responsibilities

The New Zealand school curriculum has eight levels, and children in the four to six year old age group would be expected to be working at level one. In level one, there are between one and three learning outcomes under each heading. Some examples of learning outcomes include:

- Under 'Saving & Investing': Discuss why and how people save money
- Under 'Budgeting & Financial Management': Give examples of "needs" and "wants"
- Under 'Setting Financial Goals and Planning Ahead': Identify a short-term money goal and discuss how to attain it

The level one learning goals (14 in total) lend themselves well to the development of a measure as they cover a broad range of concepts and link closely to questions and prompts that could be designed to assess children's understanding. For example, a measure could include a prompt to ask children to identify a short-term money goal as in the example above, by asking if they have saved up for something in the past. The learning goals translate well to a UK context.

2.4.2. Jump\$tart Foundation: National Standards in K-12 Personal Finance Education (US)

This curriculum is optional for schools to use depending on the requirements of their jurisdiction, as curriculum requirements vary between states in the US. It lists 65 knowledge statements and benchmarks for children in kindergarten (five to six year olds) under six main headings:

- Spending & Saving
- Credit & Debt

- Employment & Income
- Investing
- Risk Management & Insurance
- Financial Decision Making

This is a well-developed curriculum that aims to cover a large amount of content. Under 'Spending & Saving', for example, there are 30 statements, including:

- Planning helps people make choices about how to use their money
- Spending, saving, and sharing are ways to use money
- A trade is possible when both parties are satisfied with the benefits received

Other headings contain relatively fewer knowledge statements. For example, under 'Risk Management & Insurance' there is only one knowledge statement for five and six year olds: "There are ways to keep possessions, including money, safely at home and other places."

The large number of knowledge statements overall means that it would be difficult to include all of them in a measure. However, many of the statements overlap with one another to some extent. The majority would translate well to the UK context, although there is a greater emphasis on charitable giving and on employability than we might expect to see with children of this age in the UK.

2.4.3. Young Money, Part of Young Enterprise: Financial Education Planning Framework 3-11 years (UK)

This curriculum is optional for schools to use and has been developed by a charity in the UK, independent of the UK Department of Education. It includes learning goals grouped under four main headings:

- How to manage money
- Becoming a critical consumer
- Managing risks and emotions associated with money
- Understanding the important role money plays in our lives

For children aged five to seven, there are eight learning objectives that can each be achieved at three levels. For example, one of the components of 'How to manage money' is 'Keeping track of money' – the three levels of understanding of this component are:

- I know there are ways of keeping track of my money and what I spend e.g., keeping a spending diary
- I can keep simple financial records e.g., recording the amount saved in a money box and how it has been used
- I am beginning to understand I might run out of money unexpectedly if I don't keep track of it

In a similar way to the New Zealand example above, the learning objectives set out in this curriculum lend themselves to the development of a measure as they represent very testable statements. For example, for the learning objectives given in the example above, it would be straightforward to ask children how they keep track of how much money they have.

As might be expected, there is considerable overlap between the content of these three exemplar curricula. However, it is not reported if any of the three curricula has been evaluated for effectiveness in leading to the intended learning outcomes so far. Nevertheless, they are all in current use in early years settings and primary schools with children in our target age group and so have practical credibility. There is also overlap between the concepts included in these three curricula and those reported in the cognitive developmental literature discussed in the previous section. This again is to be expected, and helps to add confidence in those concepts that appear in both parts of the literature.

2.5. Summary and Conclusions

To generate a longlist of concepts for inclusion in the measure, we synthesised those statements about money that appear in at least two of the exemplar curricula described in the previous section and are also proposed in the cognitive developmental literature in relation to children

in our target age range. Following the approach outlined above, the initial longlist of concepts (reflected by exemplary statements) included:

Knowledge of Money

- I understand that paper money and coins have different values.
- I understand that money can be used in different forms including cash, bank cards and other electronic transactions

Spending Money

- I understand that different goods or services have different prices.
- I understand the importance of waiting for and checking change.
- I can explain the difference between something I need and something that I might want.
- I understand that people have different needs and wants.
- I understand that money can be spent only once — after buying something a person needs more money to buy something else.
- I can describe an example of a purchase or an activity that did not meet expectations.

Saving Money

- I can describe why I might want to save my money e.g., for something special or to buy a present for someone else.
- I can share an experience of waiting to have enough money to buy something.
- I can describe an experience of deciding not to spend money.

Keeping Track of Money

- I know I can keep money in different places, and that some places are safer than others e.g., in a money box or a bank.
- I understand that money saved in a bank is still a personal belonging.
- I know there are ways of keeping track of money and what I spend.
- I know I could run out of money unexpectedly if I don't keep track.

- I understand the consequences of losing money or having it stolen, and how it might make me feel.
- I can explain the reasons for not sharing personal information with strangers.

make it possible to carry out research to address this gap which in turn could provide valuable information of the value of early financial education.

Planning and Budgeting

- I can make a plan for saving and spending and stick to it.
- I know that planning can help to make good choices about how to use my money.

Borrowing and Lending

- I know that there are two kinds of sharing: Some things that are shared must be returned, but something shared that does not have to be returned is a gift.
- I can explain the difference between buying and borrowing.
- I know that borrowers have the responsibility to return items in good condition.
- I can explain how to take care of something that has been borrowed.
- I can identify actions a borrower can take to satisfy a lender when a borrowed item is lost or damaged.

Where Money Comes From

- I know that money can come to me in different ways e.g., earning, winning, borrowing, finding, being given.
- I know that older people have jobs that pay money.

This longlist was used as a basis for the design of the current measure of children's financial literacy. The following section describes the design process employed to embed questions about these concepts within a meaningful and engaging story for the target population.

It should be noted that there is currently an important gap in the literature in terms of connecting financial literacy in the early years with financial capability and other outcomes in adolescence or early adulthood. A valid measure of financial literacy in the early years would

3. Design of the Measure

3.1. Effectiveness of Picture and Comic Books

Our aim was to assess four to six year old's financial literacy. Thus, it was important to ensure that the materials we developed were engaging and appealing to this young target group, whilst maintaining an educational element. The MaPS workshop (Money & Pensions Service, 2021) had concluded that a play-based or story-based approach could help achieve this goal. While there are individual differences in familiarity with different forms of games and play, which could affect engagement with a particular play-based approach, the vast majority of children are familiar with stories. The research team chose to develop a story-based approach for this measure in order to maximise engagement for as diverse a group of four, five, and six year olds as possible.

Research suggests that picture books are an effective and engaging tool for assessing mathematical concepts in young children. For instance, van den Heuvel-Panhuizen et al. (2009) conducted a study in the Netherlands with five and six year old children to evaluate how picture books can facilitate the comprehension of mathematical concepts in young children. They found that these books were effective in stimulating mathematical thinking by providing a meaningful context for learning mathematics, in a way that traditional lessons alone may struggle to deliver. These books were particularly effective when teachers used them as a springboard to begin discussions surrounding mathematical concepts such as geometry, data handling, and measurement. For example, in a book about a princess with long hair, the teacher asked the children, "In the book, it says her hair grows even faster than the princess. How can one tell?", which initiated a basic discussion about how things are measured and relative changes in size/length. This illustrates a key conducive element of picture books – they can engage young children and stimulate

conversations with teachers, as well as encourage further reflection (Brown & Ferguson, 2017).

Furthermore, Grody et al. (2008) conducted a study with third graders (eight to nine years of age) and illustrated the positive impact that picture book reading can have on children's financial literacy. Their program involved reading the book *Where the Money Grows!!*, which is part of the elementary school Child Finance Series in the US. A pre- and post-test questionnaire was administered to assess children's financial knowledge and learning before and after the program. After just a single reading of the book by the school librarian, children in the experimental group showed significant improvement compared to the control group.

These examples, amongst others, illustrate the beneficial impact of supporting classroom learning with picture book reading by providing a context to young children's learning of financial concepts and mathematics (van den Heuvel-Panhuizen & Elia, 2012). As the literature suggests, a key component of why reading picture books may help children in learning mathematics and financial concepts has to do with the meaningful context of the stories included in them (Columba, Kim, & Moe, 2005). Using picture books allows children to be faced with mathematical dilemmas to solve, where they must search for answers, consider different points of views, reflect, and discuss with others (van den Heuvel-Panhuizen et al., 2016). This is likely to be particularly effective in financial education, where it is especially beneficial for children to encounter the real-life contexts in which financial knowledge can be applied.

Recent research has begun to look specifically at the potential benefits of comic strips on mathematical education. Chu and Toh (2020) suggest that a comic strip, compared to a traditional textbook, can be more inviting and appealing to young children by increasing their motivation levels. Through clever uses of

humour, relatability, and with an interesting plot, comic strips motivate students and young children to engage with the material. Another key component of comic strips is that they typically require little to no text for the story to develop, allowing the material to be accessible to all children, regardless of reading ability. We felt this was particularly important given our age range; for instance, at the age of four, children are only just beginning to recognise letters of the alphabet and read their own name (Reading Eggs, 2016). Therefore, we chose to develop a measure for assessing financial capabilities and experiences in four to six year old children using comic strips.

3.2. Designing the measure: “Arlo’s adventures”

The first stage of the design was to review the longlist of concepts included in [Section 2.5](#). A small number of concepts were not included in the final measure, after discussion within the research team and with the MaPS advisory group. These included the understanding that money in a bank was still a personal possession; and reasons why one should not share personal information with a stranger. These were thought likely to be too difficult to understand for the target population and therefore not likely to be useful in the measure to discriminate between higher and lower levels of financial literacy. During this process we were also mindful of keeping the length of the story appropriate for the attention span of the children being tested.

At this stage, a story was outlined, based on possible everyday scenarios where the revised list of financial concepts could be integrated. For example, the main character in the story taking part in chores and receiving money as a result, making decisions about what he could spend the money on, and the consequences of his spending behaviours. We incorporated different ways that money can be obtained (e.g., through chores, winning money, receiving money as a gift), where money can be saved, and different ways that money can be spent. Depicted in comic

strips, this provided a foundation for asking children questions to assess their understanding of financial concepts, by assessing the extent to which they understood what was occurring in the story, and the decisions that were made by the main character. This also allowed us to ask children questions regarding their own related experiences and the decisions they would make if they were in the same position as the main character (see Appendix A for an overview).

In developing the main character of the comic book there were several factors to be considered. Initially, a gender-neutral character was intended, in order for the story to be as inclusive as possible for both boys and girls. However, initial piloting showed that all children referred to the character as ‘he’ or ‘him’ regardless of the language used by the interviewer. For this reason, the main character in the story was referred to as male. The research team aimed to ensure that the character was likable, interesting, and appealing to young children. As such, we decided our main character would be an alien named Arlo, who had crash-landed onto Earth and needed to fix his spaceship to return home. To buy spare parts, he needs money, and this is where his journey on financial concepts and experiences begins. Whilst other characters are involved in the story (e.g., family members), their faces are not shown throughout the comic because we acknowledge that families can look very different and did not want to project any ideals in terms of what a family should look like.

The story starts with Arlo flying around in his spaceship, but then facing issues with the spaceship, which lead him to fall and crash to Earth. Arlo then meets a family who agrees to take him into their home and help him on his journey of getting money for the spare parts he needs to fix the spaceship. This provided a context through which different financial scenarios could occur. One of these scenarios (see Figure 1) depicts Arlo completing a chore (cutting the grass) and then receiving money for

this. A script for use by the researcher was designed alongside the cartoon strip being shown to the child, and this guided the researcher to ask questions including ‘*why do you think Arlo received money here?*’ and ‘*have you ever been given money for completing chores or helping around the house?*’, to assess aspects of children’s financial knowledge and experience, respectively. When writing the questions and narrative, it was important to use language and vocabulary that was accessible to the target age group. The script and questions did not involve any inaccessible financial terminology to help ensure that the instrument measured understanding of the concepts and story, rather than linguistic abilities or comprehension.



Figure 1: Example comic strip from Arlo's adventures

The process of matching story components with the set of concepts to be included in the measure was continued and refined through discussion within the research team and with the MaPS advisory board, until all questions on all concepts were included in a story thought likely to be meaningful and engaging for the target population. Appendix A includes a table showing all comic strips, narrative, questions asked, and concepts assessed. This shows how the comic strip story and the interview script align with one another to assess the set of concepts to be tested.

3.3. Scoring Template

The scoring method for the measure was designed to be as easy as possible to administer for an interviewer during the interview, while also providing sufficient detail to differentiate between children’s levels of financial literacy.

For most questions asked, answers were scored on a three-point scale from zero to two points. A score of zero indicates no or limited understanding of a concept, which may mean the child is not familiar with, or shows low levels of knowledge surrounding basic aspects of the concept. For example, a child may receive a score of zero on a question if they merely state that they don’t know how to respond/what they would do or, for more objective questions, provide the wrong answer. A score of one indicates some or emerging reasoning of the concept, which may mean the child has some familiarity with the concept but struggles with some underlying mechanisms of that concept, e.g., if they provide the correct answer but struggle to explain why, or if they are able to reason with some key aspects of a concept but not others. For instance, if they rightfully acknowledge that notes have more value than coins but struggle to explain why, or if they understand that they must return something that they have borrowed yet struggle to understand that it does not belong to them.

Finally, a score of two indicates good or developed understanding of the concept, where the child illustrates a high level of knowledge and holistic understanding of the concept.

The three-point scale allows the interviewer to make a quick decision and to record a score without interrupting the flow of the interview and the associated story. A more fine-grained scale (a four, or five-point scale, for example) was considered unlikely to give rise to additional benefits, as limitations due to children's vocabulary and language-skill, and those due to interviewers' ability to rapidly distinguish between fine-grained levels of understanding, could affect validity.

4. Evaluation methods

The first version of the comic book, script, and questions was evaluated with a sample of participants. The aim of the evaluation process was to determine whether the materials were engaging and meaningful to children, and whether the materials produced a valid measure of children's financial literacy. The limited scope of the evaluation means the emphasis was on children's engagement with and understanding of the materials.

Children aged four to six were recruited for the evaluation through a primary school, a nursery, and via parents through social media. Data collection for the study took place during February and March 2022, a time when schools were open but still experiencing significant difficulties due to the COVID-19 pandemic. This limited both the size and diversity of the participant sample for the study as many educational settings were not able to accept visitors. A total of 35 children were interviewed – 20 in person in the primary school, five in person in the nursery, and ten by video call with a parent. Table 1 below shows the distribution of participants by age and gender. Parents of participating children gave their opt-in informed consent to children taking part, and children themselves gave verbal and written consent by drawing a smiley face in an assent form to confirm their willingness to participate prior to interviews. The study was reviewed and approved by Loughborough University's Ethics Review Sub-Committee.

Interview sessions lasted approximately 20 minutes for both in-person and video call sessions. The sessions began with introductions between the researcher and child (and parents during online interviews). With children, this involved a conversation about what they had been doing that day in school or at home, to build rapport. The researcher then explained that the child will be shown a comic strip about an alien and asked some questions about it. They were instructed to try their best and were reassured it was not a problem if they did not know the answer to a question. At the beginning of the online interview, parents/guardians were

instructed to try and refrain from helping their child with the questions as much as possible.

	4 years	5 years	6 years
Male	4	8	7
Female	5	6	5

Table 1: Distribution of participants by age and gender

During interviews, data were recorded using the Qualtrics survey platform, using the scoring method described above (also see Appendix A). After questions directly relating to the measure were completed, four additional questions were posed to gauge children's engagement and understanding of the story:

- What have you learned from Arlo's story?
- What did you think about the story?
- What did you think about Arlo the alien?
- Did you like Arlo?

The interviewer also recorded qualitative field notes on children's engagement and understanding of the story and of questions.

5. Findings

5.1. Children's understanding of the materials

After initially testing the materials with a small sample of ten participants, we noted some minor issues with the comic strips that caused some difficulties with comprehension and clarity of the material. Subsequently, changes were made to the comic strips as outlined below.

Firstly, in the sections that show Arlo going to the shops/looking online for the spare parts he needs, they are labelled as 'rocket parts'. This caused some confusion as there is a toy rocket in another scenario and some children highlighted this. These labels were then altered to say 'spaceship parts' instead. This was consistent with Arlo crashing into Earth in a spaceship. Secondly, in the scenario where Arlo is borrowing a toy from a friend, the strips did not show Arlo returning the toy but rather putting it into a box. The panel was changed to clearly show him returning the toy to the friend. Finally, when Arlo and the family went to the supermarket, some children noted that the food in the basket did not look realistic, so these items were altered to look more like real-life food that children would be familiar with. These changes proved to be effective and were conducive to the clarity of the story and children's understanding of the material.

5.1.1. Children's Knowledge and Understanding

In terms of questions and concepts, there was some variation in the level of understanding and knowledge observed. In terms of spending money, a concept that proved particularly challenging for most participants was the concept of change, more specifically what is occurring when change is given in a shopping scenario and why shopkeepers give change. In relation to this, most participants were familiar with paper money and coins, and many were also familiar with bank cards, though struggled to outline other forms of payment, e.g., via mobile phone. The concept of buying goods online yielded mixed results; younger participants found this very difficult to comprehend and

whilst older participants were more familiar with this, some still struggled to acknowledge that buying something online does not mean that it is free. Another aspect of spending that participants found difficult was describing a purchase that did not meet expectations, and the disappointment the buyer may feel when this occurs; most reported never having experienced this themselves.

On the other hand, participants were very comfortable with the notion that money can only be spent once and that once you have bought something, you cannot spend that money again. Participants were also comfortable with explaining why it's important to keep your money in a safe place, as well as listing some possible safe and unsafe places, though struggled to reason with the concept of keeping track of money and what can happen if you do not check on it regularly. Participants showed a good level of knowledge and understanding surrounding the different ways that they could obtain money, e.g., earning through chores, winning, being given etc. but some struggled with describing and explaining how adults or their parents/guardians earn money. Most participants felt comfortable describing and explaining the concept of borrowing, the borrowers' responsibilities and how the lender would feel if the borrower failed to fulfil their responsibilities of returning and looking after the borrowed object.

5.2. Children's engagement with the materials

Children across all ages included in this study showed a high level of engagement throughout the interviews. Participants illustrated a vested interest in Arlo and his decisions, for instance showing concern when Arlo could not buy the items needed for the spaceship. Children actively engaged in discussions surrounding what Arlo should do next. The inclusion of personable characteristics and behaviours in Arlo were particularly effective in aiding engagement and enjoyment of the story. For example, children reported liking Arlo because he was 'kind,'

referring to his gift of chocolates to the family (before he leaves to fly home after having been able to repair his spaceship, see Section 9 Appendix A). Participants also enjoyed Arlo's appealing facial expressions; in particular, younger children tended to imitate his different facial expressions.

Evidence for children's engagement is supported by the answers participants provided to questions posed at the end of the interview, regarding their thoughts and opinions of Arlo and the story. These questions yielded largely positive answers; children found Arlo a very likeable character and were particularly drawn to the spaceship element of the story – many children referred to Arlo finally fixing the spaceship as their favourite part of the story.

When asked what they learnt from the story, children provided a variety of responses. Common responses involved being careful with your money, for instance 'do not spend your money straight away', 'think before you spend your money', 'you need money to fix important things' etc. Other responses to this question involved ways to earn money, such as 'you can do chores for pocket money' and 'you can earn money if you help people'. These comments further illustrate engagement with the story as they were able to recall and describe elements that stood out for them.

5.2.1. Age- and gender-differences in engagement and understanding

The measure proved to be accessible for all children within the target age range. In terms of engagement, it took a longer time to build and establish rapport with younger participants (typically, those that were four years old) prior to testing. With these participants, the researcher took some time to play with the children to build a rapport with them before introducing them to the materials and beginning the interview. The additional time required to interview four year old children was limited to approximately two minutes on average relative to five and six year olds.

In terms of understanding the materials and questions, many of the age-based differences

that were observed seemed to be dependent on previous experiences with money and linguistic development; older children typically reported increased experience of having and saving their own money and illustrated better understanding of some financial concepts. For example, responses revealed that older children were more likely to be familiar with the word 'change' in the context of shopping, though this did not necessarily mean they understood the concept to a greater degree than younger participants. In fact, this was a concept that all ages struggled with; many five and six year olds explained that they knew the act of giving change was 'fair' and 'happens a lot' when shopping but were not sure why. Related to this point, younger children within the age range were more likely to ask the interviewer to provide clarification on certain questions, or for questions to be explained further.

There were no striking differences observed between male and female participants, both in terms of their engagement with the comic nor their understanding of the questions and concepts. Children of each gender were equally enthusiastic when engaging with the material and answering questions about the story as well as their own experiences.

5.2.2. Differences between in-person and online testing

It is important to note that in-person interviews were conducted one-to-one with individual children, while online interviews were conducted with a parent present. Therefore, it is not possible to separate any potential issues relating to the interview medium from any issues relating to the presence of a parent. Nevertheless, overall, there were no notable differences between in-person and online testing in terms of children's engagement with the materials and their understanding of questions. There were, however, some minor observed differences in the conduct of interviews; for instance, participants were more likely to divert from the questions and begin discussing topics irrelevant to the material or concepts in in-person testing. There could be several explanations for this; participants may have felt more comfortable

with the interviewer in person, or it may be the presence of the parent/guardian that prevented them from doing this in the online sessions. However, these observations should be taken with caution given the small sample size and disproportionate distribution of participants across in-person and online conditions.

Whilst parents successfully refrained from helping their child with the questions during online testing, they would often re-word questions posed by the researcher if they felt the participant was struggling to understand the question. Related to this, parents would also often try to explain what their child meant by the answers they provided to the researcher if they felt it was unclear or perhaps unrepresentative of their knowledge. These observations were particularly common in parents of younger participants and occurred less frequently for five and six year olds. However, it should be noted that parents did refrain from suggesting answers and that their contributions were restricted to attempts to clarify questions. Further evaluation may be needed to determine whether it is better for parents to be present or not during interviews, and whether the scoring system should be adjusted to account for any parental intervention.

5.3. Children's scores on the measure

Total scores on the measure ranged from 18 to 61, out of a possible maximum score of 68, where higher scores indicate a higher level of financial literacy. Figure 2 shows that the distribution of scores was approximately normal, with a slight negative skew. There was a mean of 43.6 and standard deviation was 11.9. These data show a good spread of scores, with no evidence of a floor- or ceiling-effect for the target population.

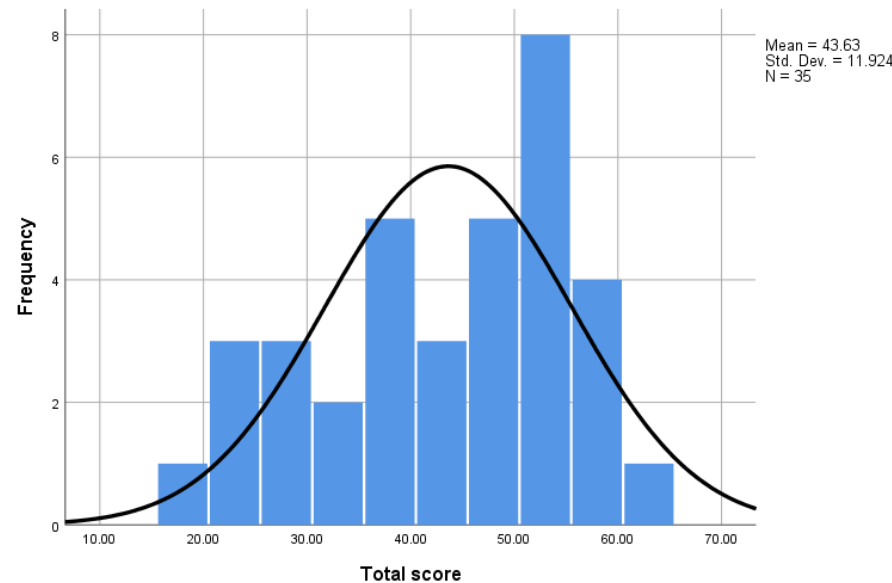


Figure 2: Distribution of total score

There was some variation in scores for all questions on the measure. Average scores for each question are included in Appendix B. Questions that gave rise to the highest scores included those asking children why Arlo had no money left after spending his money on sweets in Section 3, and a question about why it is important to return something that has been borrowed. Questions giving rise to the lowest average scores included one asking children whether they had ever been disappointed with something that they had purchased, and one about children's knowledge of payment methods other than cash or card. The fact that some variation was observed in all questions is positive as it shows that each question is helping discriminate between higher and lower levels of knowledge and experience to some extent.

In the next stage of analyses, we carried out comparisons across groups to check for potential bias in the data. Firstly, scores were compared for boys and girls. Figure 3 shows average total score for male (n=19) and female (n=16) participants. A t-test revealed no significant difference in total score between genders ($t_{33}=0.14$, $p=.89$). There is no indication from this data that there is a systematic bias towards boys or girls.

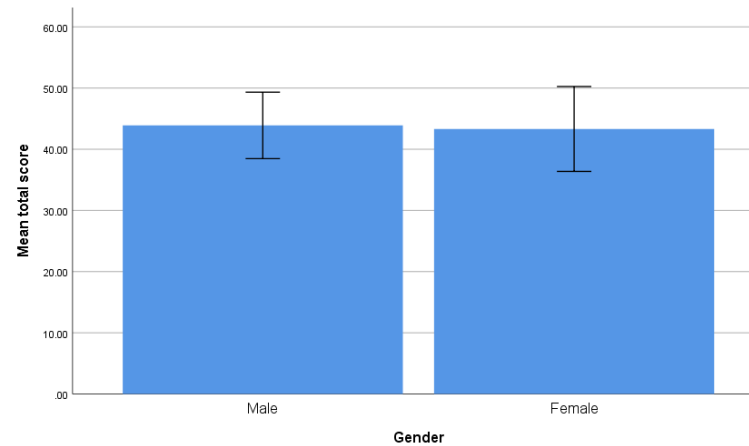


Figure 3: Mean total score by gender; error bars represent 95% confidence interval

Scores were also compared by age. Figure 4 shows average total score for four- (n=9), five- (n=14), and six-year-old (n=12) participants. Scores tended to increase with age as expected.

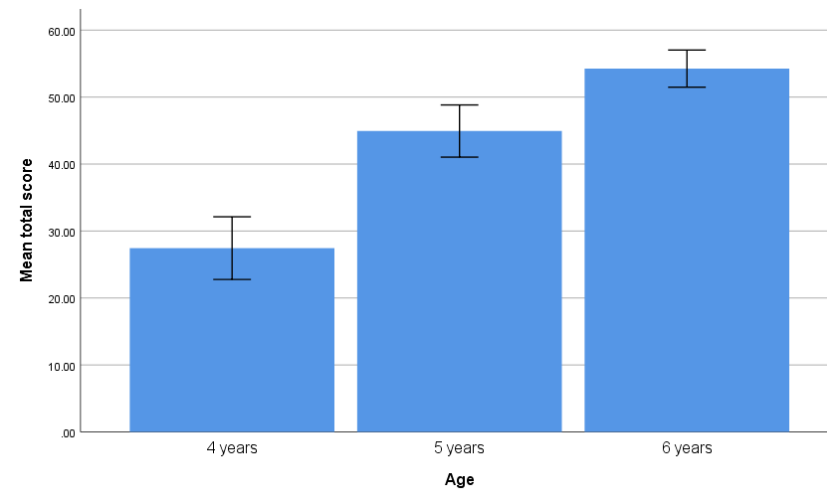


Figure 4: Mean total score by age; error bars represent 95% confidence interval

Finally, we compared scores for those children taking part in in-person interview to those for children taking part in video call interviews, accompanied by a parent. Figure 5 shows mean total score for in-person and video-call interviews for four, five and six-year-olds. A 2-way ANOVA showed that while there was a significant main effect of age ($F_{2,29}=41.0$, $p<.0005$), there was no significant main effect of interview method ($F_{1,29}=0.63$, $p=.43$) and no interaction between age and interview method ($F_{2,29}=0.24$, $p=.79$). This suggests that there is no systematic bias in scores due to interview method. However, for all of these comparisons it should be noted that there was a small sample of data for the analyses carried out and we recommend that a larger sample of data is collected to explore further and to confirm lack of bias across these and other factors.

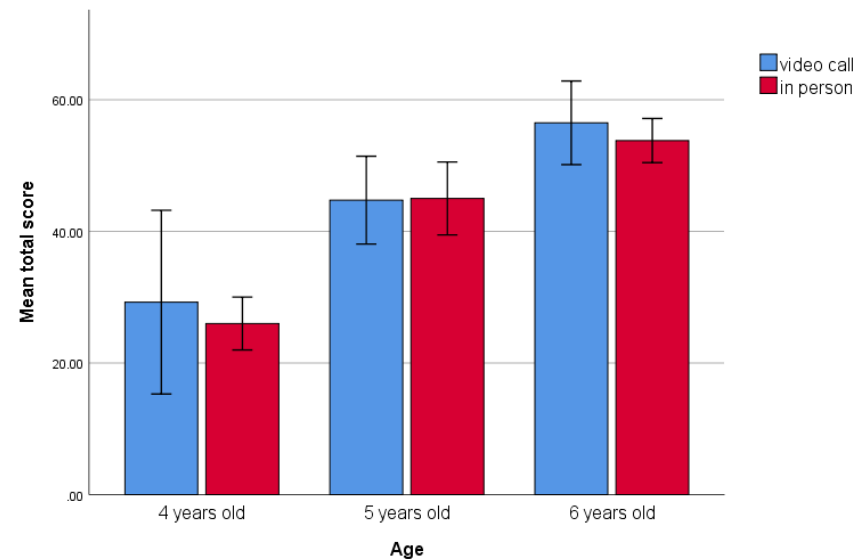


Figure 5: Mean total score by age and interview method; error bars represent 95% confidence interval

Cronbach's alpha was calculated to assess the reliability of scores; this provides a measure of the extent to which the questions are measuring the same thing. This indicated excellent internal consistency, $\alpha=0.915$. However, we recommend repeating this analysis with a larger sample of data to add confidence.

Further data collection would enable some additional questions to be addressed. For example, a larger sample could be analysed to determine whether all questions in the measure assess one single factor (financial literacy), or more than one factor (e.g., understanding of financial concepts, and ability to describe financial experiences). This kind of analysis could be useful in further refining the measure – for example by identifying any redundant questions.

6. Recommendations for future work

From the project, we have learned that the measure is engaging for children and that it produces an appropriate range of scores for children within the target age range. We also have evidence to argue that the measure has good face validity, in that it appears to measure children's understanding of money and financial concepts and their level of experience of money in the world. However, further research is now needed to evaluate whether the measure is ready to be used at scale and yields reliable and valid scores for the target population at large.

It would be useful to evaluate the reliability of the scoring system, by having a second independent scorer assess children's responses. It will also be useful to explore relationships between children's results on this measure and on other measures where one might expect there to be an association; this could include measures of numeracy, self-regulation, or ability to delay gratification. This would help to establish predictive validity, and again add further confidence in the measure.

Similarly, as described in the previous section, further data collection would allow analysis to determine the extent to which all the questions in the measure address the same factor, or whether a multi-factor model might be more appropriate. This analysis could help identify need for additional questions or removal or redundant questions.

Thirdly, it would be useful to assess the extent to which the measure yields different ranges or average scores for different demographic groups. In the analyses presented above, we have shown that for the data collected to date there is no evidence of differences in scores due to gender or to interview method. However, the sample does not allow us to explore potential differences due to ethnicity, speaking English as an additional language, socio-economic status, or experience of learning difficulties, for example. A larger sample could allow for further analysis of any differences across demographic variables to

determine suitability of the measure for different populations.







Further development of the measure may be needed as payment practices change. Data from the initial evaluation reported here suggest familiarity with notes and coins, some familiarity with payment by debit/credit card, but limited familiarity with other forms of payment including online purchases and payment via smartphone or smartwatch. As payment practices in families continue to change, the comic strips and questions may need updating to reflect this.







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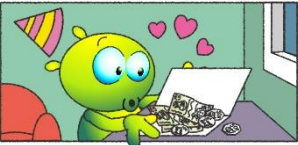

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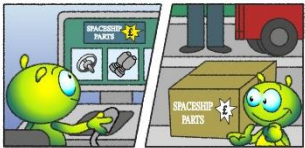


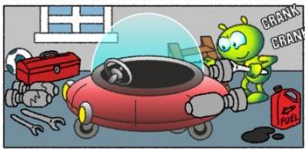


Appendix A: Comic Strip Questions, and Concepts

<p>SECTION 0: CONTEXT</p> <p>0.1</p> 	<p>0.2</p> 	<p>0.3</p> 	<p>Narrative:</p> <p>0.1: Look, this is Arlo the Alien. Arlo is flying around space in the spaceship!</p> <p>0.2: Oh no, what is happening here?</p> <p>0.3: It looks like Arlo's spaceship is falling!</p> <p>Money related questions:</p> <p>-</p> <p>Money concepts assessed:</p> <p>-</p>
<p>SECTION 1: CONTEXT</p> <p>1.1</p> 	<p>1.2</p> 	<p>1.3</p> 	<p>Narrative:</p> <p>1.1: Oh no, it looks like the spaceship from outer space has crashed on Earth! The spaceship is broken so it looks like Arlo the Alien is stuck on Earth.</p> <p>1.2: Here, you can see Arlo is looking at a map. Arlo is very confused. Arlo does not know where they are and wants to return home! Arlo needs a new steering wheel for the spaceship! Arlo is going to have to get some money to help fix it.</p> <p>1.3 Oh look, it seems like Arlo might have come across a family that will help Arlo and let Arlo stay in their home until the spaceship is fixed.</p> <p>Money related questions:</p> <p>-</p> <p>Money concepts assessed:</p> <p>-</p>

<p>SECTION 3:</p> <p>3.1</p> 	<p>3.2</p> 	<p>3.3</p> 	<p>Narrative:</p> <p>3.1: Look, Arlo has spent all the money on lots and lots of sweets!</p> <p>3.2/3.3: Oh no! It looks like Arlo cannot buy the steering wheel needed to fix the spaceship!</p> <p>Money related questions:</p> <p>3.1: Why can Arlo not buy the steering wheel for the spaceship?</p> <p>3.1: Why does Arlo have no money left?</p> <p>3.2: Do you think Arlo is happy about spending all the money on sweets? If no, why?</p> <p>3.3: Have you ever bought something with your own money? If yes, ask participant to describe this experience</p> <p>3.3: If yes, have you ever been disappointed by something you have bought? For example, a toy that you did not like after buying</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Spending money
<p>SECTION 4:</p> <p>4.1</p> 	<p>4.2</p> 	<p>4.3</p> 	<p>Narrative:</p> <p>4.1: Look, Arlo is at a funfair playing a game!</p> <p>4.2: Now it seems like Arlo has gotten some money</p> <p>4-3.: Look, where is Arlo putting the money?</p> <p>Money related questions:</p> <p>4.1: Why was Arlo given money at the funfair?</p> <p>4.2: Arlo saw many toys at the funfair that they liked - why didn't Arlo buy any of these toys?</p> <p>4.3: Why is it important to put your money in a safe place?</p> <p>4.3: Can you think of some safe places where people might keep their money? Can you think of some places that are not so safe?</p> <p>4.3: Do you have a safe place where you keep your money? If yes, what makes this place safe?</p> <p>4.3: Have you ever saved money for something important or something that you really wanted? Waited to buy something?</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Where money comes from - Spending money - Saving money - Keeping track of money

<p>SECTION 5:</p> <p>5.1</p> 	<p>5.2</p> 	<p>5.3</p> 	<p>Narrative:</p> <p>5.1: Arlo wants to play with some toys but does not have a toy to play with!</p> <p>5.2: But look, one of Arlo's friends have kindly let Arlo borrow a toy to play with!</p> <p>Money related questions:</p> <p>5.3: Why is it important to return something that you have borrowed?</p> <p>5.3: Why is it important to look after something that you have borrowed?</p> <p>5.3: How would the friend feel if Arlo had broken the toy? Why?</p> <p>5.3: Have you ever borrowed something from a friend? Or let them borrow something of yours? If yes, ask child to describe this experience</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Borrowing and lending
<p>SECTION 6:</p> <p>6.1</p> 	<p>6.2</p> 	<p>6.3</p> 	<p>Narrative:</p> <p>6.1: Now Arlo and the family are going to a supermarket to buy some food</p> <p>6.2: As you can see, in the basket, there are eggs, milk, and bread. These are things that the family needs</p> <p>Money related questions:</p> <p>6.2: Can you name other things that a family might need from a supermarket? Can you name things that they might want but not really need?</p> <p>6.3: There is someone else paying for their food at the till. What do you think is happening here? What is this person using to pay for their shopping?</p> <p>6.3: Have you ever been to the shop to help with food shopping? If yes, can you describe what happened?</p> <p>6.3: Have you ever seen someone using a bank card to pay for something?</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Spending money - Knowledge of money

<p>SECTION 7:</p> <p>7.1</p>	<p>7.2</p>	<p>7.3</p>	<p>Narrative:</p> <p>7-1: Now it is the family's turn to pay for their shopping.</p> <p>7.1: We have seen people paying with a bank card, and we have seen people paying with notes and coins.</p> <p>7.3: Then the family head home and are now having a lovely dinner with the food that they bought from the supermarket</p> <p>Money related questions:</p> <p>7.1: Have you ever seen someone paying for something with notes and coins?</p> <p>7.1: Do you know any other ways that people can spend their money? (or how else can they spend their money - what else could they use?)</p> <p>7.1: How can the family afford to buy food from the shop? Where do you think adults get their money from?</p> <p>7.2: In this image, the shopkeeper is giving the family some money. Why did the shopkeeper give the family some money here?</p> <p>7.3: Now, Arlo is enjoying a lovely dinner at home!</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Spending money - Knowledge of money
			
<p>SECTION 8:</p> <p>8.1</p>	<p>8.2</p>	<p>8.3</p>	<p>Narrative:</p> <p>8-1: It's Arlo's birthday! The family have made a cake and thrown a little party!</p> <p>8.2: The family have also given Arlo some money and presents.</p> <p>8.3: 8: Now Arlo is putting the money in a safe place with the rest of the money. Look there are some notes and some coins too.</p> <p>Money related questions:</p> <p>8.2: Why has Arlo received money and presents here? Does Arlo need to give these back?</p> <p>8.2: Have you ever given, or been given, a gift/present for a birthday?</p> <p>8.3: Do you think you can buy more things with a note or with a coin? Tell me some values that coins have. Tell me some values that notes have.</p> <p>8.3: How will Arlo know when there is enough money for the steering wheel needed for the spaceship?</p> <p>8.3: How do you know how much money you have in your safe place? / What can happen if you never check on your money?</p>
			

			<p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Where money comes from - Knowledge of money - Saving money - Planning and budgeting
<p>SECTION 9:</p> <p>9.1</p>	<p>9.2</p>	<p>9.3</p>	<p>Narrative:</p> <p>9.1: Look, Arlo is using the computer to look at the spaceship parts like the steering wheel etc. Now there is a box outside the house for Arlo!</p> <p>9.1: Now Arlo has successfully bought the steering wheel needed to fix the spaceship!</p> <p>9.2/9.3: Arlo realises that there is some money left in the piggy bank so uses the money to buy some chocolates for the family as a gift. Arlo says thank you to the family!</p>
			<p>Money related questions:</p> <p>9.1: Can you describe what you think Arlo has done here? / Can you describe what has happened here?</p> <p>9.1: Earlier Arlo tried to buy these things but could not - Why can Arlo now buy these rocket parts?</p> <p>Money concepts assessed:</p> <ul style="list-style-type: none"> - Spending money - Knowledge of money - Planning and budgeting
<p>SECTION 10: THE END</p> <p>10.1</p>	<p>10.2</p>	<p>10.3</p>	<p>Narrative:</p> <p>10.1: Look, now Arlo has all the tools to start fixing the spaceship!</p> <p>10.2: Here, Arlo is fixing the spaceship and putting fuel in</p> <p>10.3: Arlo waves goodbye to the family and flies away in the spaceship!</p>
			<p>Money related questions:</p> <ul style="list-style-type: none"> - <p>Money concepts assessed:</p> <ul style="list-style-type: none"> -

Appendix B: Average scores per question

The table below gives descriptive statistics for each question in the measure. Each question had possible scores of 0, 1, or 2. The table shows at least some variation on each question and a range of familiarity across the sample of participants with different aspects of financial literacy. Note that further data collection will be needed in order to increase confidence in these figures.

	N	Minimum	Maximum	Mean	Std. Deviation
Now Arlo has some money - Why do you think Arlo has been given money?	35	.00	2.00	1.6571	.53922
Have you ever had your own money?	35	1	2	1.74	.443
Can you remember a time when you got money for helping out around the house or doing chores?	35	.00	2.00	.9143	.98134
What do you think Arlo wants to spend his money on? - What do you think Arlo should spend his money on?	35	.00	2.00	1.2000	.47279
If you had £5 to spend, what would you spend the money on and why?	35	.00	2.00	1.0286	.82197
Why can Arlo not buy the steering wheel for the spaceship?	35	1.00	2.00	1.8571	.35504
Why does Arlo have no money left?	35	1.00	2.00	1.8857	.32280
Do you think Arlo is happy about spending all of the money on sweets? If no, why?	35	.00	2.00	1.6000	.73565
Have you ever bought something with your own money? If yes, ask participant to describe this experience	35	.00	2.00	.6571	.72529

If yes, have you ever been disappointed by something you have bought? For example, a toy that you did not like after buying	35	.00	2.00	.2000	.58410
Why was Arlo given money at the funfair?	35	.00	2.00	1.6000	.73565
Arlo saw many toys at the funfair that they liked - why didn't Arlo buy any of these toys?	35	.00	2.00	1.6000	.69452
Why is it important to put your money in a safe place?	35	1.00	2.00	1.8286	.38239
Can you think of some safe places where people might keep their money? Can you think of some places that are not so safe?	35	.00	2.00	1.6286	.68966
Do you have a safe place where you keep your money? If yes, what makes this place safe?	35	.00	2.00	1.1714	.89066
Have you ever saved money for something important or something that you really wanted? Waited to buy something?	35	.00	2.00	.6000	.84714
Why is it important to return something that you have borrowed?	35	.00	2.00	1.8000	.53137
Why is it important to look after something that you have borrowed?	35	.00	2.00	1.4286	.65465
How would the friend feel if Arlo had broken the toy? Why?	35	1.00	2.00	1.6000	.49705
Have you ever borrowed something from a friend? Or let them borrow something of yours? If yes, ask child to describe this experience	35	.00	2.00	.8857	.71831

Can you name other things that a family might need from a supermarket? Can you name things that they might want but not really need?	35	.00	2.00	1.5429	.61083
There is someone else paying for their food at the till. What do you think is happening here? What is this person using to pay for their shopping?	35	.00	2.00	1.3714	.94202
Have you ever been to the shop to help with food shopping? If yes, can you describe?	35	.00	2.00	1.1714	.61767
Have you ever seen someone using a bank card to pay for something?	35	1	2	1.66	.482
Have you ever seen someone paying for something with notes and coins?	35	0	2	1.00	.243
Do you know any other ways that people can spend their money? (or how else can they spend their money - what else could they use?)	35	.00	2.00	.2000	.53137
How can the family afford to buy food from the shop? Where do you think adults get their money from?	35	.00	2.00	1.0857	.88688
In this image, the shopkeeper is giving the family some money. Why did the shopkeeper give the family some money here?	35	.00	2.00	.6286	.64561
Why has Arlo received money and presents here? Does Arlo need to give these back?	35	.00	2.00	1.6857	.52979

Have you ever given, or been given, a gift/present for a birthday?	35	.00	2.00	1.2286	.54695
Do you think you can buy more things with a note or with a coin? Tell me some values that coins have. Tell me some values that notes have.	35	.00	2.00	1.0286	.92309
How will Arlo know when there is enough money for the steering wheel needed for the spaceship?	35	.00	2.00	.7429	.85209
How do you know how much money you have in your safe place? / What can happen if you never check on your money?	35	.00	2.00	.6857	.75815
Now there is a box outside the house for Arlo! - Can you describe what you think Arlo has done here? / Can you describe what has happened here?	35	.00	2.00	1.4000	.77460
Earlier Arlo tried to buy these things but could not - Why can Arlo now buy these rocket parts?	35	.00	2.00	1.3143	.67612

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