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Teaching the Euro to Pupils with General Learning Disabilities

JOSEPH TRAVERS is a lecturer in the Department of Special Education, St. Patrick's College, Drumcondra, Dublin.

INTRODUCTION

The ability to handle money is an essential life skill and is a core area of the maths curriculum. The introduction of the euro focuses attention on some of the key issues in teaching about money. This article examines the literature on approaches and sequences in teaching money and how they can be adapted for pupils with general learning disabilities. Taking into account the large variability between pupils, suggestions are offered which are suitable for pupils who have mastered basic counting and computation and for those for whom by-passing academic skills is more appropriate. The following are key stages in understanding money.

Experiencing the language and purpose of money

Pupils will have different experiences in using money. They need to realise that coins can be exchanged for goods and that these have different values and are exchanged for different amounts. They need to experience the language of money: 'buy', 'shop', 'money', 'coins', 'pay', 'change', 'how much?' 'one, two, three euro cents'*, etc. The classroom shop is possibly the best way of developing such language.

Early experiences should also incorporate sorting activities: money from non-money, coins from notes, euro coins from sterling, to sorting coins by size, colour, and type. Thornton, Tucker, Benny, Dossey & Bazik (1983, p.170) argue that "it is both natural and practical to correlate the development of basic money concepts and skills with early number work. When children understand what three means, for example, they can count out three cents as model for the number." Early counting should include coins and using 1-cent coins for shopping for items up to 5 cents, and sorting coins worth less than 10 cents.

Coin Discrimination

Bley & Thornton (1995, p.108) point out that "to count money… students must be able to discriminate between size differences and accurately retrieve, from memory, the correct name and/or value to match a given size." Discriminating between coins has further language demands, for example, bigger than and smaller than.

* In formal, official usage euro and cent are used both in the singular and plural. As common usage is likely to take the form of euros and cents, government guidelines allow teacher discretion on this issue (Ireland, 2000). Consequently the plural version is used here.
Pupils may not understand this language: "Does bigger mean size or value?"

Activities to develop coin discrimination can include introducing the euro cent by discussing the similarities and differences between it and the other coins. Emphasise colour, size, and images on the coin and whether its edge is smooth or rough. Match on a coin line; have the child place the cent on a coin line and see how the size and colour of the two coins are the same. Some pupils can find it difficult to relate a real coin to its picture. Pupils could make pictures using a cent coin stamp. For extra reinforcement and for those who learn best kinaesthetically, tracing paper could be taped over a sheet of euro cent coins and the pupils trace over each coin. Coin bingo is also a useful reinforcement activity.

Teaching coin values

Gooseman (1993, p.34) gives sound advice suggesting that "when working on money activities, it is important to use real coins as much as possible, giving opportunity for finding total costs and giving change in real situations. In doing this the children will become familiar with the actual size, feel and weight of the coins, rather than struggling with plastic or card substitutes." However, using real money may not be enough.

While using real coins is most beneficial in teaching money, it is important to appreciate that coins are not concrete representations of their own value. For example, a 5-cent coin does not look like 5 single cent coins. This means that coins are abstract models when they are used to teach their values (Drum & Petty 1999). Therefore, we need coin models that are proportionately sized according to the value of each coin.

This can be difficult to do but the following suggested models have potential. Drum & Petty (1999) take a blank hundred square and write 1c in each square. They then take a 5-cent coin and stick it onto a piece of card which is equivalent to 5 of the 1c squares on the hundred square. The card with the attached coin is then placed on the hundred square and the pupil can see its value in relation to 1 cent and 100 cents. A similar procedure is used with all other coins.

As an alternative to the 100 square, Bley & Thornton (1995) demonstrate the use of a number line graded with coin values. In conjunction with this they use "tailed coins" whereby a 5-cent coin, for example, has a colour-coded length of masking tape attached and folded lengthways in half. The "tail" on the coin is equivalent in length to 5c on the coin line. Pupils can see how two 5 cent coins stretches as far as one 10 cent coin on the line by using the tailed coins. An appreciation of the value of coins is necessary to understand coin equivalence.

Sequence for teaching the counting of money

Snell (1993) advocates combining the teaching of counting and computation with teaching money. This provides a realistic context for the practice and use of these skills. "Carefully structured, money activities can reinforce number meanings and skills, and help numbers to come alive in the child's world" (Thornton et al., 1983, p.170). For example, providing 1, 2, and 5-cent coins, pupils can progress to taking

the three coins and finding the total and repeating with a different set of three coins. Ways of spending 10 cents are helpful as preliminary work for the number bonds to 10 (Clemson & Clemson, 1994). In the Syracuse Curriculum, for pupils with a moderate learning disability, Ford, Davern, Schnorr, Black, & Kaiser (1989) outline an approach which uses counting, a number line and a calculator to plan and make purchases. For example, a pupil who can count out 8 cents could check his or her number line by matching the coins to circles on the number line to see if they had enough money to buy 5 cents worth of sweets. They suggest a sequence as being especially appropriate for pupils with mild or moderate general learning disabilities. Adapting it to suit the euro gives us the following:

Count by ones to 10 cents
Equate 10 cents to 1 ten cent coin
Count the 10 cent coins to 1 euro
Count the 20 cent coins to 1 euro
Count the 50 cent coins to 1 euro
Count by tens beginning with 50 cents
Count by 5 cent coins to 1 euro
Count by 5's beginning with 20, 50 or 70
Count by tens and then switch to counting by fives
Count by 20's and switch to counting by tens
Count using 5's, 10's, 20's and 50
Count euros to two euros
Count 1 euro to 10 euros
Count 2 euros to 10 euros
Count 1 and 2 euro coins and 5 euro notes to 20 euros
Count 10 euro notes and 1 euro coins to 20 euros
Count 20, 10 and 5 euro notes and 2 and 1 euro coins to 20 euros

In counting money certain prerequisite skills make the task much easier. Bley and Thornton (1995) outline these as:
Automatic recognition of some coin equivalents - two 5c's (10c; two 50c's (1 euro; five 20c's (1 euro, etc.
The ability to count on from midpoint.
A strong understanding that size and value do not always match.
Ability to apply skip counting by 2's, 5's or 10's to a money situation and to switch skip counting (start by 5's and switch to 10's).

Tailed coins on the money line are useful for teaching these skills. Pupils can also practice adding any two numbers from the set (1, 2, 5, 10, 20, 50) including doubling and trebling.

Adapted sequence

Lowe & Cuvo (1976) simplify the sequence by teaching counting by fives for all coins. In a research project with pupils with mild general learning disabilities, pupils were selected on the basis of their ability to count by ones and fives to 100, recall and name the value of five coins but were unable to add coin combinations. Four pupils

participated with a mean chronological age of 14.8 years.

Participants were first taught to count each coin singly, and then in combination with other coins previously learned. It was assumed that skill acquisition would be facilitated by students first learning coins that were to be counted in sequences of five with the later inclusion of single units.

Obverse/reverse orientation and the angular position of the figure on the coin were not of concern when placing it in front of the pupils. Pupils were taught to place one finger next to the coin for each time that the coin was divisible by five, while counting by fives until the coin's value was reached. Instruction involved modelling by the teacher, modelling with pupil's imitation, and independent counting by the pupil.

After teaching pupils to count a single coin, they were taught to add the value of that coin in combination with other coins previously taught. For each coin the finger counting procedure was begun again with the index finger of the counting hand. For example, applying the technique to the euro, a five cent coin in combination with a ten cent coin is taught by placing the index finger next to the five cents and saying, "five," the index finger next to the ten cents and saying "ten," and placing the middle finger next to the ten cents also, and saying "fifteen." If an error occurred, the pupil was manually guided through the counting procedure until it was performed correctly.

When a coin combination includes cents, all coins counted by fives are done first, and the cents added later. Applying this to the euro again, a ten cent coin and two single cents are counted, "5, 10," as the index and middle fingers are placed next to the ten cent coin, and then "11, 12," as the index finger is placed over each cent in turn. Fifty-one coin combinations were successively taught over approximately twelve 30-minute sessions.

Coin Equivalence

Clemson & Clemson (1994, p.73) suggest that in teaching money "the crucial concepts are to do with conservation and equivalence of value." Bley & Thornton (1995) point out that an important step in understanding money is to see one coin and name it as 2 cents and realise it is equivalent to 2 cents. It does not look like 2 one cents which can cause difficulty. With repeated experience and careful instruction pupils will associate the correct coin with its value. Appropriate activities include discussing ways of selecting coins to make 3c, 4c, 6c, 7c, 8c, and 9c, and placing coins in order of value. Shopping again provides the most natural context: buying two items up to 15c, buying one/two items and giving change, spending the same amount of money in two different ways. Progress to buying 3 items and giving change from 50c, counting and matching coins to prices.

Trace, Cuvo, & Criswell (1977) detail a research project which aimed to teach coin equivalence to a group of pupils with mild general learning disabilities. They were selected for the programme if they could count by ones and fives to 100, recall and name the value of five coins and add a sample of 10 combinations of coins, but could not select combinations of coins that equalled specified target values. Fourteen pupils

were divided in two as a pretest-posttest matched-groups design was used with the experimental group receiving the programme, and a no-training control group.

Teaching was divided into six stages, each focussed on one specific method of combining coins to equal 10 target values from 5 cents through 50 cents. Adapting the six stages to the euro cents results in the following:

To use only 5-cent coins to equal each of the 10 target monetary amounts from 5 cents to 50 cents.
To use one 10-cent coin and a sufficient number of 5-cent coins to equal each of 10 target monetary amounts from 10 cents to 50 cents.
To use the maximum number of 10-cent coins and a 5-cent coin when necessary to equal each of seven target monetary amounts from 20 cents to 50 cents.
To use one 20-cent coin and a sufficient number of 5-cent coins to equal each of the seven target monetary amounts from 20 cents to 50 cents.
To use one 20-cent coin, several 10-cent coins and a 5-cent coin when necessary to equal each of the five target monetary amounts from 30 cents to 50 cents. (e.g., 50 cents = one 20-cent, two 10-cents, two 5-cents)
To use two 20-cent coins and a 10-cent coin or two 5-cent coins to equal 50 cents.

A three-part response chain was used, incorporating (1) naming, (2) selecting and counting, and (3) putting the coins in a coin machine. The instructional procedure involved modelling, shaping, chaining, and fading with correct responses resulting in reinforcement. Experimental participants improved significantly in coin equivalence performance and maintained their skill on follow up tests while the control group did not.

Stimulus Equivalence

Stoddard, Brown, Hurlbert, Manoli, & McIlvane (1989) use stimulus equivalence to teach coin combinations. In applying the technique to the euro, for example, if a 20 cent coin = 20 cents, and one 10 and two 5's = 20 cents, then a 20 cent coin = one 10 and two 5's. Snell (1993, p.470) suggests the following four steps in using the technique for coin-price associations:

Write the coin-price combination on the points of a triangle, for example, 20 cents, the price 20c, and the coin or coin combination.
Choose two points of the triangle for teaching. For example, teach the student to read the price aloud. Also teach the student to show the combination of coins required.
Test if the student can match the prices and the coins. (Teach a = b and a = c; test b = c)
Select a specific set for teaching, for example, prices that are in multiples of five. Teach points b and c. Test the equivalence.

Change computation

Snell (1993, p.457) points out that "sometimes teachers are concerned about the need for change computation so that individuals are not short-changed. However, change

computation is one of the most difficult money skills, because it requires counting up from a price. This skill probably should be taught last in a money sequence, after students are proficient in counting coins."

Cuvo, Veitch, Trace, & Konke (1978), working with pupils with mild and moderate general learning disabilities, outline an experiment which focused on making change using coins. The maximum amount given to make a purchase was $1.00 in coins. The purchase price and the change to be computed were less than $1.00. Four response classes were used for computing change. The range of change computation was as follows: Response Class 1: 1c-4c; Response Class 2: 5c-9c; Response class 3: 10c-45c in even multiples of 5c; and Response Class 4: 11c-49c not involving even multiples of 5c. The coins supplied to compute change required that the most efficient combination (i.e., using the least number of coins) be made.

A task analysis of the change computation skill showed that the process involves three major steps: (a) knowing the item's purchase price, (b) knowing the value of the money given to purchase the item, and (c) computing the difference between the two values. The first two behaviours were prerequisites for participation in the experiment; the latter was the skill taught.

The first phase of instruction for each response class was to present three training items. The following procedure was modelled: (a) a stimulus card was presented showing an object and its purchase price (e.g. "This is 12c")- the object was pointed to and its cost stated; (b) the coins used to purchase the item were selected ("This is 20c"); (c) then the change to be given was stated and selected, adding coins from the lowest to highest value to the purchase price until the amount given was attained. (The change is 8c: 12c pointing to the purchase price, 13c adding a cent, 15c adding 2c and 20c adding 5c)

Snell (1993, p.457) commenting on Cuvo et al (1978) argues that " while successful, the process is still complex and may not be the best way to spend instructional time. It is interesting to note that few individuals who are non-disabled count their change before pocketing it when shopping."

The One-More-Than Technique

Many pupils with moderate general learning disabilities will find the academic demands of the above examples too demanding and will require further modifications and adaptations to achieve success. For older students it is more beneficial to start with the 1 euro coin rather than the cents as more purchases can be made with euro coins than the cents. The one-more-than technique is useful in this regard. This technique works as follows: Students using the technique are taught to pay one-more-euro than requested. If the cashier says "4.78," then the student would produce 5 euros. Test, Howell, Burkhart, & Beroth (1993) outline two studies looking at the effectiveness of the one-more-than technique as a money counting strategy.

Five students with moderate general learning disabilities participated. All students

mastered the technique but some required modifications which made a significant difference to their performance. For example, one student who was having difficulty counting on one more dollar was encouraged to make a "cents pile" first. Applying this to the euro means that when asked for "4.78," instead of counting on she is taught to put one euro aside for the cents (78), count out the euro amount (4) and then to combine the two amounts. Students could move on to using the technique with 10 euro notes for larger purchases and then combining the tens and ones at a later stage. For example, for an item costing 37.99 the student would count out 4 tens or 3 tens and 8 ones and wait for the change.

Teaching stimulus classes to encourage independent purchasing

Some pupils may find the counting requirements of the one-more-than-technique too difficult to remember and need a different approach. Gardill & Browder (1995) report on a method of teaching puchasing skills to three students with developmental disabilities and severe behaviour disorders who had minimal academic skills. Due to the necessity of bypassing computational skills like counting, the students were taught to discriminate between three stimulus classes of frequent purchases (a vending machine snack, local convenience store snack and lunch). In addition three amounts of money were taught as distinct stimulus classes: 75c – any item in a vending machine; one dollar – any single snack from the convenience store; five dollars – lunch in the school canteen or fast food restaurant. The students understood the concept of exchanging money for an item. They also had learned the chain of responses required to make a purchase with the exception of choosing the correct amount of money.

Teaching Strategies

The students were taught using three teaching strategies: easy- to- hard discrimination through training in three stages of complexity; time delay to facilitate errorless responding; and the use of multiple exemplars. A brief description of the stages of discrimination training will help elucidate the use of these strategies. The first discriminative stimulus was a card with a photograph of the purchase item and a photocopy of the correct money. The teacher asks: "How much do you need to buy a snack?" etc. The pupil faced with three choices has to match the correct money amount to the card with the money amount (photocopy) and item (photograph) on it. A match-to-sample response is required to select the correct money amount from the three choices of 75c, one dollar and five dollars. The second discriminative stimulus was the photograph of the item and the verbal question. The student had to discriminate between money amounts, but had the picture referent of the item as an added stimulus. In the third phase the teacher only gave the verbal question and the student had to select the correct amount of money without a picture prompt.

In each phase progressive time delay was used to facilitate errorless learning. For example, at the beginning of each phase when the teacher asked the student to match the correct amount to each card, a zero time delay of a physical prompt was used whereby the student was immediately guided to place the money on the card.

Following four sessions at the zero time delay, a four seconds constant time delay of the physical prompt was used. Multiple exemplars in the form of photographs were used to teach the stimulus class for each money amount. Ten cards were selected daily from a set of 40 training cards with at least 3 cards for each response class.

Two of the students mastered all stages and could select the correct amount of money for a specific purchase from a wallet with mixed money amounts. They made no errors in generalising these skills in a community context. The third student did not complete the third phase but showed definite progress in the first two phases. Depending on level of achievement teachers, are encouraged to begin with the last phase and work back.

A similar approach is used in the Syracuse Curriculum, where Ford et al. (1989) recommend the use of predetermined amounts of money to simplify money use. Students learn to use, and later to select, a given money envelope. For example, envelopes are coded for the bus fare, vending machine use and lunch purchase. In other cases, the individual learns to offer a set amount of money and wait for change.

Real life application

For older pupils with moderate general learning disabilities, it is important to prioritise the skills they need for real life situations with the ultimate aim of moving towards independence as far as possible, for example, handling money in shopping, buying a bus ticket or paying for entry to the swimming pool. For more able pupils, try to make situations as real and meaningful as possible, e.g. school shop, school lunches, cost of computer games, favourite comics, magazines, book club, school tour, variety of shops, post office, credit union, bank, mail order catalogues, menu in café, savings, pocket money, holidays, bills, ticket prices, bus fares, ESB, gas, telephone, internet charges, gross/net prices, hire purchases. Games and software which reinforce this connection are also appropriate.

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