



**What really counts next:**  
Action learning project  
with numeracy tutors



**NALA**

National Adult Literacy Agency  
Áisíneacht Náisiúnta Litearthachta do Aosaigh

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The National Adult Literacy Agency (NALA) is an independent member based organisation, working on improving adult literacy and numeracy in Ireland since 1980.

We are:

- the voice of adults wishing to improve their literacy and numeracy skills; and
- committed to raising adult literacy and numeracy levels.

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## Acknowledgements

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# Introduction

In 2013, the National Adult Literacy Agency (NALA) published a set of case studies describing numeracy teaching practice in Ireland. The report, **What really counts: case studies of adult numeracy practice in Ireland**<sup>1</sup>, consisted of five case studies detailing the teaching practice of tutors working with adults around Ireland. The case studies focused largely on the strategies employed by the tutors to teach numeracy to adult learners. It showcased general teaching practices, strategies for teaching mathematical concepts and the use of technology to teach numeracy in the classroom. The published report was welcomed by numeracy tutors, Adult Literacy Organisers (ALOs), educational researchers and international colleagues as a useful, much needed and practical piece of research.

After the report was launched, NALA invited tutors teaching numeracy to adults to take part in a follow on action learning project to measure the impact of **What really counts** by implementing the practice contained in the case studies.

The overall purpose of this follow on project was to:

- gather information about the immediate impact of the **What really counts** case study research;
- provide an opportunity for tutors to develop new knowledge and skills to improve how they teach numeracy; and
- produce further teaching and learning ideas and resources to share with other practitioners.

This report documents the outcomes of the action learning project. These are presented under the following sections:

- Section A: describes the teaching approaches and strategies the tutors chose, used and developed from **What really counts**;
- Section B: showcases examples of innovative practice;
- Section C: makes recommendations on ways to maximise the impact of the project and the original research that inspired it; and
- Section D: collates approaches and teaching strategies of the tutors into two Tables of Practice which detail their experience of developing and applying practice from **What really counts**.

<sup>1</sup><https://www.nala.ie/resources/numeracy-report-what-really-counts-case-studies-adult-numeracy-practice-ireland>

## Background to the Action Learning Project

This project was designed to contribute to NALA's Strategic Plan for 2014-2016, specifically Objective 2 which aims to: 'provide supports to improve the quality of teaching and learning. These [supports] include supplying relevant learning materials and information on new and existing effective teaching and learning approaches.' It was carried out over a three-month period during which a series of meetings took place between the project team and the tutors. The tutors who could not attend all or some meetings, contributed by phone and by email. All tutors were invited to join a specifically designed closed, Facebook group. Here they could share ideas and respond to each other's questions. Six of the thirteen tutors joined the Facebook page.

During the project the tutors were supported to:

- become familiar with the practice described in the original case studies;
- discuss with each other the teaching approaches or strategies that interested them, or that were relevant to their learners' interests and needs;
- identify one or more teaching approach or strategy (from the case studies or inspired by them)<sup>2</sup> and try it out with their learners;
- reflect on the success or challenges of the approaches and/or strategies they had used;
- share any new approaches or strategies they had discovered with each other and with other tutors;
- reflect on what they had learned about teaching numeracy, and about themselves as tutors;
- record their experience using a series of questions designed by the project team; and
- submit a report to the project team answering these questions.

The 13 tutors who completed the project<sup>3</sup> were:

- Mary Bambrick, Colaiste Dhulaigh College of Further Education, Coolock, City of Dublin Education and Training Board;
- Angela Cahill, County Louth Adult Learning Service, Louth, Meath Education and Training Board;
- Clare Campbell, King Street, Drogheda, Louth, Meath Education and Training Board;
- Elaine Clifford, Killarney Adult Literacy and Basic Education Centre, Kerry Education and Training Board;
- Antoinette Delamere, National Learning Network, Arklow;
- Deirdre Fahey, Mayo, Sligo Education and Training Board;

<sup>2</sup>For example, if a tutor was interested in the iPad apps that were used in the case study, they might use the apps described with their own learners, or they might choose completely different apps to try.

<sup>3</sup>One further tutor attended the first meeting but was unable to stay with the project for its full length.

- Clare Hatcher, Altrusa, Mahon and Read Write Now Literacy Schemes, Cork Education and Training Board;
- Deirdre Keogh, Dublin Adult Learning Centre, City of Dublin Education and Training Board;
- Patricia Martin, Cavan Adult Learning Centre, Cavan and Monaghan Education and Training Board;
- Antoinette Murray, Dublin Adult Learning Centre, City of Dublin Education and Training;
- Paula O'Connor, Headford Adult Learning Centre, Galway Roscommon Education and Training Board;
- Jane Savage, Killarney Adult Literacy and Basic Education Centre, Kerry Education and Training Board; and
- Suzanne Smith, Cavan Adult Learning Centre, Cavan and Monaghan Education and Training Board.

Interim findings from the project were presented at the National Numeracy Conference in Dublin on 12th June 2014, where three of the participating tutors ran workshops to share their learning with conference delegates.<sup>4</sup>

<sup>4</sup>Two of the tutors, Antoinette Delamere and Mary Bambrick, produced tips sheets for other tutors based on what they had learnt during the project. These are available here: <https://www.nala.ie/resources/what-really-counts-numeracy-project-additional-tutor-tips> and <https://www.nala.ie/resources/what-really-counts-numeracy-project-tutor-tips>





# Section A:

## Trying out practice from What really counts

This section outlines how the tutors chose the topics they wanted to try out with learners over three months. They chose their topic from a range of teaching approaches and strategies contained in the original case studies. Occasionally they chose topics and/or resources that were not described in the case studies but which were inspired by the practice contained in them. For example, one of the original case studies detailed a tutor's use of iPad applications, and this inspired some of the tutors to explore different iPad applications that were available and to try these out with their learners.

The tutors reported that they were happy to take part in the project. They saw it as a way to become more innovative in their approach to teaching numeracy to adults. Some used strategies and resources that they identified in **What really counts** to teach topics that they knew their learners struggled with. One topic of difficulty that arose repeatedly was algebra. The tutors found that the majority of learners were 'afraid of the word algebra' and had negative experiences of it from school. The tutors counteracted this by introducing algebra using a familiar concept or activity such as playing snooker. Tutors reported that by using new strategies to teach algebra learners were 'not as nervous' about the subject as they were before.

The tutors reported that games and group activities helped to motivate learners in equal part. One tutor wrote that her class 'said they felt 'switched on' after the games.' Another reported:

I noticed that the learners immediately began to discuss the problem and work it out in pairs. In my experience discussion rather than silence indicates learners are getting stuck in to a problem.

Tutors were also keen to innovate and to challenge themselves to experiment in the classroom. They reported that they were always looking for new ways to encourage learners to try different ways of answering a numeracy problem. One tutor said:

In the case study report I found how a tutor used his teaching skills to encourage learners to figure out themselves how best to use measuring tools, a protractor and a compass, it got my interest. The learners had to use their problem solving skills and actively take part in the class. I decided I would like to try out what the tutor did in his class.

The majority of tutors reported that they had successfully used new strategies and or resources. They judged their success based on indicators from feedback from learners and changed learner behaviour. These indicators were often associated with the tasks themselves. Several tutors felt they knew that an activity had been successful by the learners' active and enthusiastic engagement in the activity. One said, 'the group got the concept!'

The tutors suggested that learners value improving their numeracy in ways that went beyond the skills needed to complete a task. Learners were overcoming barriers such as anxiety and a lack of belief in their own abilities. Tutors value active engagement and motivation in the numeracy classroom, believing that this ensures learners will be more open and enthusiastic about mathematics in the future.

The reasons tutors gave for their choices revealed that they had reflected on their own practice and their motives for their choices. It also showed that they were genuinely open to develop their professional practice. This commitment to self-challenge is evident in the remarks from a tutor who was keen to write stronger lesson plans:

The use of questioning, problem-based learning activities, meaningful contexts, technology ... other than technology I had not consciously ensured I looked at building these practices into my lesson plans.

## Reflective practice

The tutors carefully reflected on their activities. They identified ways they could improve their numeracy activities or approach numeracy topics in different ways. One tutor, reflecting on her use of iPads and apps with the learners reported:

I would like to try to introduce a topic using the iPads, because up to now I have only used them at the end of a topic to reinforce learning.

Another tutor saw potential for using activities with a bigger group:

If I had a big enough group, I would split the group into small groups to discuss and come up with the answers as a group instead of struggling on their own. I think if given the opportunity to ponder the questions and discuss as a group they might understand better. By encouraging group work I would hopefully not have to prompt/help learners.

An issue for some tutors was that they sometimes used an activity that was not at a high enough level for their learners. They reported that they would 'bear this in mind' in the future. They appreciated that they needed to change activities with different groups of learners.

The tutors reported that implementing practice from **What really counts** helped generate new ideas on how to:

- use specific strategies to teach new topics;
- make fundamental changes to approaches to teaching;
- continue to be creative in their practice;
- extend activities or apply strategies to topics other than the one they were designed for;
- develop new resources for use with other groups of learners including ESOL learners;
- change their teaching in more fundamental ways to promote questioning amongst learners and to enhance learning; and
- use more online resources.

As a result of taking part in the project, the tutors reported that they were open to being more innovative in their approach to teaching numeracy in the classroom.

Next year I will definitely try some of the other methodologies. I will use the geometry instruments exercise mentioned on Page 71 [of the original case study publication]. Rather than showing the learners how to use the instruments I will encourage them to just have a go at working it out for themselves.

Use Photostory with learners ... Learners find and take photos of numbers, then assemble in a Photostory adding typed written numbers and record themselves saying the numbers etc.



# Section B:

## Examples of innovative practice

In this section we describe the practice four tutors tried out with learners. These are presented as 'mini' case studies and show the complexity of using one or more strategies to develop a new teaching approach in the classroom. The case studies are in the following areas:

- Teaching numeracy to English to Speakers of other Languages (ESOL) learners;
- Session plans for one-to-one teaching;
- Embedding technology in numeracy; and
- Using reflective discussion with learners.

### Teaching basic number principles to ESOL learners Tutor: Clare Hatcher

Clare worked with ESOL learners with little or no mathematics education. She realized early on that some learners had difficulty carrying out tasks such as drawing a triangle and dealing with basic numbers.

She was keen to find out how useful 'manipulatives' might be in building understanding of basic concepts, such as adding whole numbers and place value. She says, 'I began thinking about how manipulatives might really help basic learners with maths in the same way that cutting writing into phrases, sentences and words helps with literacy.'

Clare tried out the use of manipulatives with learners for four weeks, for two hours a week. She began with a needs assessment. Her two learners could recognise numbers and could do simple addition, but were unsure about signs.

#### Number line and dice

Clare used a number line to check whether the learners could add up two numbers. This worked well after some practice. She then introduced dice. Both learners had seen dice before but were not familiar with them. One of the learners had been tricked out of money with dice and avoided them since. The learners initially struggled to read the dots as numbers. They used the dice for addition up to 12. Clare asked the learners to think of a number between 2 and 12 and roll the dice to see if they could match the number. In this way she was able to check that the learners understood the dots on the dice and could add the dice successfully. She gave the learners a few dice to play with at home with their children.

She then brought out a cardboard place value chart with cardboard numbers to put the dice numbers on. The learners could place the cardboard numbers from 2-12 on the chart correctly but there was conceptual difficulty with placing 1.

Clare wanted to consolidate the learners' ability to recognise dots as numbers, and to write and draw numbers. She used a sheet from **The Numeracy Pack by Coben and Black**<sup>5</sup> to help with this. From the same pack Clare gave both learners a tracing worksheet to practise writing numerals and the numbers as words.

## Language of mathematics

Clare introduced the 'language of maths' so that the learners could understand and use the same language as their children learned in school.

## Using money to build understanding of numbers

Clare gave the learners 5c, 2c and 1c coins and asked them to see how many ways they could make the coins add up to 7. This encouraged them to see how money can be used to practise numeracy. The learners worked easily with the coins. Progress was slower when the tutor asked them to complete a worksheet based on 7, but it became easier as they worked through it. They appeared to have difficulty noticing the emerging pattern that each calculation resulted in 7.

Clare built on the place value chart by asking the learners to place two-digit and then three-digit numbers on the chart. She then gave them three numbers and asked them to make the biggest number possible. She asked them to explain their choice by using the basic place value chart.

The place value chart led one learner to ask about money and specifically what 'the dot' (decimal point) meant and why 'it moved'. The second learner had not heard of the decimal point, but had noticed it.

Clare started working on place value using the full place value chart showing the decimal point, tenths and hundredths.

One learner brought in her son's bank book showing a balance of €100.03. Clare asked the learners to show the balance on the place value chart and they put it at €100. The learners thought that the .03 was the month. Once that was explained, she asked them to put the number on the bank book onto the place value chart. They quickly realised that when they first put down 10003 on the place value chart, this was much more money than the boy had. Both learners then worked together to show the amount of €100.03 on the place value chart.

<sup>5</sup> <http://www.bookdepository.com/Numeracy-Pack-Sandy-Black/9781859903179>

Another misconception arose when the same learner told Clare that her son's favourite crisps cost 99. She had asked an assistant who told her that meant €1. When Clare looked at the signs in the supermarket advertising booklets which the learner had brought in, she realized that it would be possible to misunderstand 99c without the cultural context of understanding what that means. Clare realised that goods are priced at, for example, 49c and €6 and so are frequently written without using the decimal point. She was at a loss to explain this very well. She worked with the learners and reached an understanding about coins (cents) being part of the whole (euro). Clare encouraged the learners to look for the difference in the way amounts under €1 and over €1 are displayed in the shops.

## Cultural differences

Clare realised that one learner had difficulty forming numbers, especially 8 and 9. The learner told her that 'in Benin I didn't have to write, but here you have to sign and write all the time'.

Both learners had difficulty writing some numbers as words especially 'three', 'seven', 'eight' and 'nine'.

They talked about the importance of writing numbers clearly, and how difference between the French 1 and Irish 1 could cause confusion, as the French one (used in Benin) can look like an Irish 7.

## Writing more rounded session plans for one-to-one teaching

### Tutor: Mary Bambrick

Mary was interested in two topic-based strategies:

- teaching learners how to use measuring tools effectively, including explaining how to use a ruler, imperial vs metric on a measuring tape/ruler, and how to hold a ruler; and
- teaching shapes using everyday objects, including relating 2D/3D shapes to real life objects to explain what otherwise would have been abstract words.

Both were topics that Mary was in the process of working on with her learner. Her learner was working on QQI L3 Mathematics, at his own pace and as part of a weekly, two hour, one-to-one session. The session tended to be split between one hour on numeracy and IT and one hour on literacy skills. During the session the learner works at his own pace.

In addition Mary was interested in the general teaching approaches described and discussed in the case studies, including:

- use of questioning;
- use of problem-based learning activities;
- use of meaningful contexts; and
- use of technology.

Mary had used technology in her teaching before but hadn't explicitly built these general approaches into her lesson plans.

## Measurement

Mary introduced the topic of measuring using questioning and a basic worksheet with lines to measure. She quickly sensed that her learner was not confident in this basic task. She didn't probe too much further but instead showed him how she would hold the ruler and pencil to hold and measure the lines, talking through what she was doing as she did so. She says, 'I spoke almost as if we both knew this but were just recapping. After a few measurements my learner had fully grasped the concept.'

Mary then used discussion, fact sheets, worksheets and the **Maths Everywhere** app<sup>6</sup> to flesh out and test the learner's understanding of measuring, including facts such as how many millimetres were in a centimetre, and basic concepts to help him estimate length and distance.

Mary says that the app worked well in helping the learner to visualise measurements, for example understanding that a door is approximately two metres tall.

<https://www.youtube.com/watch?v=NcYg7qh38F4>

The learner enjoyed using the 'Have a Go' section of the **Maths Everywhere** website.

To consolidate the learner's knowledge and understanding, Mary and the learner discussed his plan to renovate his kitchen. She created an exercise around drawing up a kitchen plan which the learner would be able to use to cost out and plan the changes. They used online planning tools from real kitchen companies (for example: <http://www.cashandcarrykitchens.ie/images/planner.pdf>). This approach used a problem-solving approach in a meaningful context. By thinking through the general teaching approaches that were described in **What really counts**, Mary felt that she had created a 'more rounded overall lesson' for her learner.

## Understanding shapes

When Mary came to work with her learner on 2D and 3D shapes, she found that the learning environment presented certain barriers. Firstly, she works with her learner on a one-to-one basis

<sup>6</sup><http://www.mathseverywhere.org.uk>



within a bigger group, and she was worried that the learner might feel embarrassed working with shapes that others might think were childish. Secondly, the desk Mary and learner shared was very small; she says, 'bringing in a selection of everyday items and old food containers wasn't a runner.'

Mary decided to use a combination of 10 small 3D shapes and 2D cut outs and linked them to pictures on worksheets. She also sourced a set of mini 3D maths shapes from [www.artandcraft.ie](http://www.artandcraft.ie). The shapes were small and inexpensive and she and the learner could look at the shapes, discuss and sort them at the desk along with homemade laminated 2D shapes. Matching tangible 2D shapes with 3D 'partner' shapes helped to solidify the learner's understanding of the different shapes.

Mary used the **Maths Everywhere** app to help build on the learning and to change the pace of the lesson. She says that the app introduced some more obscure shapes which may have unnecessarily added to the complexity of the subject. She added some of these more complex shapes to the fact sheet as the learner was interested in them, but she explained that they were not shapes you would generally come across in day to day life.

Mary and the learner discussed shapes that the learner encountered in his work to relate the topic to his life.

## Embedding touch-screen technology into numeracy learning

### Tutor: Suzanne Smith

Suzanne wanted to include the use of iPads in her teaching so that her learners could experience a range of learning activities. She also wanted to bring more interactive games and ICT into her maths teaching. The use of apps on the iPads would also allow learners to practise their learning at home on their own iPads or tablets.

She first used the iPads with a group who initially were doing a Maths for Parents course and who then went on to do QQI Level 2 Quantity and Number.

Suzanne mainly used apps to reinforce the learning of a given topic. She found them useful for enabling learners to work at their own level and pace, without anybody else knowing what stage they were at. The group she was working with were mixed ability, and she found the apps worked well to meet their different needs. Another benefit was that the learners were learning IT skills as well as Maths. One learner who had an iPad at home was afraid to turn it on. Now the learner has become much more confident and frequently downloads apps to use for independent learning. The learners also discovered more uses of the iPad (such as the camera, calculator, and access to the internet and YouTube).

Suzanne states that 'one of the downsides' to using iPads was the length of time it took to set them up and then to download apps. This was due to downloading apps one or two at a time. Doing them all together caused the internet connection to be extremely slow. As the classes progressed, the learners became more confident and she encouraged them to choose, download and evaluate apps. This allowed them to see that some apps are fantastic, while others may not be great, and they were able to make a judgement on the quality of the available apps.

Suzanne only used free apps, and found that sometimes it was only a trial version, and that she would have to pay to download the full version. Advertisements tended to pop up on the free apps and the learners found these to be a nuisance with some of the games.

Suzanne noticed that a lot of the Maths apps were child-centred, which was fine for this group as their main aim was to be able to help their children with their homework and learning. It was sometimes difficult to find suitable apps just for adults.

In the future, Suzanne would like to try to introduce a topic using the iPads. In the past she has only used them at the end of a topic to reinforce learning.

Suzanne described some of the apps she and her learners used and how effective they found the apps to be:

### **Squeebles Maths Bingo**

Very popular with the group, mainly involves answering addition, subtraction, multiplication and division questions. It also has a game to it, in which the aim is to win ice cream ingredients and serve customers. Ideal for children but the adults loved it as well!

### **IXL Maths**

Similar to the IXL website. I liked that the questions are put into sections depending on class from Junior Infants right through Second Level. On the free version you have a limit of 20 questions per day.

### **Maths Everywhere**

Has an excellent range of questions, along with video explanations.

### **Number Splat**

Excellent for any activities using the hundred square.

### **Odds or Evens**

Work against the clock to determine if a number is odd or even.

### **Sequences**

Fill in the blanks in the number patterns or sequences. Very good for challenging learners as they can keep progressing to higher levels.

### What's the missing number?

Another sequence/pattern app.

### Number pieces

Deals with hundreds, tens and units. Allows you to represent a number in terms of place value using blocks.

### Digital Abacus

Very good for place value, although the learners have to be given a number to represent on the abacus.

### 5 Dice

A challenging puzzle game dealing with the order of operations – BOMDAS.

### Chicken Vault

A rounding game, where you are asked to round numbers to the nearest ten, hundred or thousand in order to open the safe.

## Using reflective discussion with learners

### Tutor: Angela Cahill

Angela applied the 'spaced learning' idea from **What really counts**. She had already covered circumference and area of a circle with her group and three learners in the group were struggling with these principles and calculations. She hoped this exercise would make the theory more tangible. On this occasion she asked her learners to measure the diameter of car tyres. She split the group into three pairs and left out three different measuring 'tapes' – a sewing tape, a piece of string and a paper tape from 'Safefood' available in chemists for measuring waist size (which measured only in inches).

Angela then asked the learners to go outside to the car park. The learners brought the measurements back and used them to work out each wheel's circumference. They then went back outside and measured the circumference and came back to the classroom and compared the measured circumference to the calculated circumference.

Angela led a discussion following the class and recorded it. The learners made several very interesting comments and lots of questions arose, around:

- the accuracy of the measuring tape (and whether it measured in centimetres or only inches); and
- the method of the person using it, and the reliability of calculators.

Angela believes that for learners who had already grasped the concepts, there had not been any new learning in this exercise. However, the subsequent discussion opened up ideas that were useful for all the learners, particularly, on sources of error when measuring and the fallibility of the calculator. She says, 'Using the Safefood tape I initially thought was a bad idea given it only did inches but it resulted in some interesting insights.' In future Angela says that she would use the exercise earlier in her unit on measurement.

Angela believes that this idea could be extended to other 2D shapes and also volume (for example, by asking learners to measure the dimensions of a milk carton and work out how much milk it held). She also suggests not using measuring tapes with the tyres and asking the group to work out how to measure a curved surface.

As a further exercise, Angela gave each learner a map with a scale and asked them to work out the distance from one place to another. The learners struggled as the scale given resulted in an awkward calculation. Angela decided to change the exercise to plan furniture in a living room. This was to make the concept of scale more real-life-based and authentic. She gave the group  $1\text{cm}^2$  paper and explained to them that they had a living room,  $6\text{m}$  by  $5\text{m}$  in size. She gave them an Argos catalogue and asked them to draw the room to scale and furnish it with scaled representations of the chosen furniture.

The group of five learners worked in two sub-groups and had to choose a scale themselves. At first they had difficulty, so Angela asked them to think about what size the drawing would be if they chose a  $1\text{cm} = 1\text{m}$  scale. Someone suggested a  $1\text{cm} = 3\text{m}$  scale which would have resulted in an even smaller room. By showing what these scales looked like one person realised that they needed to go to fractions of metres, for example  $1\text{cm} = 0.5\text{m}$ . After some thought and discussion the group decided to use a scale where  $1\text{cm} = 0.25\text{m}$ . As they chose furniture the learners realised that they had to scale the measurements for the furniture as well. The learners collaborated and the two sub-groups became mildly competitive as they compared who had chosen the best quality furniture, or the best positioning of the furniture.

Following the session, the learners told Angela that they would have felt lost if they'd had to work on their own, and that they had learned from working together.

The learners also made suggestions for other ways in which the tutor might use this task to teach numeracy. They offered the following ideas:

- asking the learners to price all the furniture;
- asking the group to design the room within a budget;
- adding in sale reductions (%) and furniture delivery charges;
- finding the area of the room to carpet;
- finding the area of the walls for painting/wallpaper; and
- working out curtain measurements.

# Section C:

## Discussion and recommendations

This report describes how NALA's **What really counts** study impacted on and informed the practice of 13 numeracy tutors who took part in the follow on action learning project. The tutors reported that taking part in the action learning project:

- inspired them to integrate numeracy as part of their literacy programmes;
- provided them with creative ideas to use in the classroom;
- made them question their assumptions about learners and their learning needs;
- enabled them to 'rediscover' their learning philosophy;
- encouraged them to reflect on aspects of their practice and on their perception of themselves as professionals; and
- offered them an unexpected opportunity to take part in continuing professional development.

### Teaching strategies and resources

The tutors considered their use of teaching strategies and resources and made commitments to utilise these more effectively to improve their practice. For example they committed to:

- focus on resources as a starting point in covering a topic rather than looking at the topic and what needs to be covered and in what depth and working from there;
- to check out equipment, especially computers and laptops before class;
- incorporate technology into classes (technology has become a very important part of everyday life so it is useful for learners to become familiar with this);
- bring more variation into the classes, in terms of teaching methods. There are huge benefits to having a good way of differentiating work for learners in terms of their different ability levels;
- use probing questions to encourage critical thinking by the learners and wait for answers;
- not give too much assistance to learners and prompt learners towards the answer; instead encourage group discussion and hopefully learners will solve problems for themselves;
- continually encourage questioning and critical thinking; and
- use a warm up or introduction exercise at the start of the class and especially before an assessment.

## Reflective practice

The tutors reflected on how assumptions they made about learners impacts on and informs their practice. Assumptions such as, what learners already know, what do learners understand and what can learners do. One tutor reflected on assumptions she made when teaching ESOL learners:

Although I was aware of needing not to make assumptions, I still made assumptions about how money is represented in numbers ... I had not thought about how different countries in Africa might have different numbering systems. I also assumed that because the learners could recognise the numbers easily that they would be able to form the numbers easily too.

Where tutors reflected on their perception of themselves as tutors, they identified where their strengths, interests, enthusiasm and enjoyment lay and how this informed their approach to teaching. For example one tutor explained how she teaches numeracy using a constructivist approach. This approach encourages learners to ask questions and work in a collaborative way with each other. She reported that this way of teaching numeracy is very different to how she was taught mathematics in formal education.

When reflecting on their approach to teaching numeracy to adult learners many of the tutors realised that while they had 'enjoyed learning maths' this experience was unlikely to tally with that of their learners.

## Continuing professional development

Some of the tutors reported that they were more confident teaching literacy than numeracy. They reported that they have less experience as numeracy tutors and would like to avail of CPD to increase their confidence and competence in this area. According to the tutors the areas they gained the most from in terms of professional development were the use of 'teachable moments', the use of questioning and the importance of meaningful contexts, and the specific teaching strategies relating to individual numeracy topics. They also cited the importance of taking time to read relevant up to date materials such as the **What really counts** case studies published by NALA. One tutor commented that she felt that, for her, the real value of the **What really counts** case studies was not the practice table at the back of the report, but the in-depth case studies themselves, which enabled her to understand the practice in context.

They reported that before participating in the action learning project they rarely used real life examples or situations in the classroom. However, while taking part they began to realise that some had struggled with making 'maths seem real' or indeed simplifying it. As a result they will continue to work on ways to introduce new ideas into the way they teach numeracy to adult learners.

## The importance of networking

Interestingly, the tutors repeatedly commented on the importance and value of networking with other tutors. They reported that they would welcome more opportunities to meet other tutors, share ideas and resources, ask for advice and support one another in their practice.

In order to facilitate 'networking' among the group of tutors the project team set up a Facebook 'closed group', which is a private online social media group. Six of the tutors joined up however, the majority of the tutors felt uncomfortable setting up a profile on Facebook. They reported that they would have preferred an online group away from Facebook, for example, a dedicated Moodle page, or a forum on NALA's Tutors Corner webpage.

## Recommendations

There is valuable continuing professional development in place for tutors to enhance their professionalism. However, this study identified the need for more and improved development opportunities. These opportunities would be structured and provide increased support for tutors to attend professional development events and take part in training.

We present these opportunities as the following recommendations:

1. Employers should continue their commitment to allowing tutors the time and opportunities to reflect on their practice, on their own and with other fellow tutors. Tutors should be encouraged to reflect on:
  - their relationship with numeracy and mathematics and how this relationship affects their work with adult learners;
  - assumptions that they make about learners' relationships with numeracy and mathematics, and assumptions about what learners already understand and can do;
  - their philosophy of teaching, in general and as it relates to the teaching of numeracy; and
  - their professional development needs.
2. Employers should continue to encourage and support tutors to try out new learning and teaching approaches, to reflect on their effectiveness and to share their findings with other tutors.
3. National organisations and employers of tutors should continue to:
  - explore ways of encouraging and supporting tutors to network with their peers to promote professional development through practice sharing, collaborative learning and reflection on professional practice; and
  - this networking should take place through face-to-face events and through social media, online forums and web tools, such as webinars.





# Section C:

## Tables of Practice

### Table A: Topic-based approaches

The following table contains descriptions of individual topics that tutors used to teach specific topics:

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<b>Ordering numbers</b>	<p>The learners chose random numbers (whole number and numbers with two decimal places). The tutor wrote the numbers on the interactive white board and the learners' task was to put them in ascending order.</p> <p>The tutor was able to use red and blue pens on the interactive white board to distinguish between whole numbers and decimals.</p> <p>The tutor wrote the numbers as money (for example, 2.17 as €2.17) to help learners to understand decimals.</p>	Antoinette Delamere
<b>Money - best value</b>	<p>The tutor used the Cost Comparison section of the new Maths Everywhere website<sup>7</sup>. The Cost Comparison activities involved a number of numeracy skills, including:</p> <ul style="list-style-type: none"><li>● converting cents to Euro (for example, 37c = €0.37) (learners had found this difficult in the past so it was good to revise this);</li><li>● rounding off to 2 decimal places;</li><li>● using the calculator;</li><li>● estimation (the tutor asked learners to estimate which item was cheapest before checking with a calculator);</li><li>● problem-solving (the tutor led a brainstorm about ways to compare prices; and</li><li>● group work.</li></ul> <p>The learners enjoyed the session. At the end the group looked at other exercises and some of the tutorials on Maths Everywhere. They asked to use the site again the next week and those with laptops said they would use it at home.</p>	Deirdre Keogh

<sup>7</sup><http://maths.fbapphouse.com/www/#/tools/costComparison>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<b>Data Handling</b>	<p>The tutor began her class by using the Maths Is Fun website<sup>8</sup> to introduce her group to the topic of data and to show examples of how to create different graphs and charts. The group, who were of mixed ability, made a graph together with the tutor on an interactive white board.</p> <p>The tutor asked her learners to carry out a survey using their own questions. The learners then used this information to create graphs to display their results. The learners used Excel to create graphs on the computer and then practised making graphs on paper. During the process the learners also learned how different graphs and charts suit different types of information. Even though the group was of mixed ability everyone was able to take part in this activity. Some learners were not involved in making graphs but asked survey questions and collected answers.</p> <p>The tutor returned to the Maths is Fun website at the end of the class and the group did quizzes together from these pages: <a href="http://www.mathsisfun.com/data/bar-graphs.html">http://www.mathsisfun.com/data/bar-graphs.html</a> and <a href="http://www.mathsisfun.com/data/pie-charts.html">http://www.mathsisfun.com/data/pie-charts.html</a></p>	Antoinette Delamere
<b>Measurement - length</b>	<p>The tutor asked a small group of learners to use a measuring tape to measure the sofa in the Centre. She showed the learners how to hold and read a measuring tape. The learners were very active during the task and moved around helping one another.</p> <p>The learners then wrote their measurements on the interactive whiteboard. Then the tutor demonstrated how she would do it and the tutor and the group compared their answers.</p> <p>Following the task the tutor asked the learners to choose a sofa from the Argos catalogue and the group compared its dimensions with the dimensions of the sofa in the Centre.</p>	Antoinette Delamere
<b>Measurement - circumference and scale drawing</b>	<p>The tutor applied the 'spaced learning' idea from the Meath case study in the original research. She had already covered circumference and area of a circle with her group in preceding weeks, and three learners in the group were struggling with the principles and calculations for circumference and area of the circle.</p>	Angela Cahill

<sup>8</sup><http://www.mathsisfun.com>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Measurement - circumference and scale drawing</b></p>	<p>She hoped this exercise would make the theory more tangible. On this occasion she asked her learners to measure the diameter of their car tyres. She split the group into three pairs and left out three different measuring 'tapes' – a sewing tape, a piece of string and a paper tape from 'Safefood' available in chemists for measuring waist size (which measured only in inches).</p> <p>The tutor then asked the learners to go downstairs and outside to the car park. The learners brought the measurements back and used them to work out each wheel's circumference. They then went back outside and measured the circumference and came back to the classroom and compared the measured circumference to the calculated circumference.</p> <p>It was interesting to see how the group tackled the measuring task. The pair using the string found it the easiest to measure around the curve of the tyre. The other two tapes were a bit thick according to the group and they concluded that this would affect the accuracy.</p> <p>The tutor led a discussion following the class and recorded it. The learners made several very interesting comments and lots of questions arose, particularly around the accuracy of the measuring tape (and whether it measured in centimetres or only inches), the method of the person using it, and the reliability of calculators. The tutor believes that for those learners who had already grasped the concepts, there had not perhaps been any new learning in the tyre-measuring exercise, but that the subsequent discussion opened up ideas that were useful for all the learners.</p> <p>In future the tutor would use the exercise earlier in her unit on measurement. She is not sure how many of the learners who had already grasped the concepts gained from this activity. However, she believes there was learning for everyone in the discussion on sources of error when measuring and the fallibility of the calculator. She says, 'Using the Safefood tape I initially thought was a bad idea given it only did inches but it resulted in some interesting insights.' The tutor believes that this idea could be extended to other 2D shapes and also volume (for example, by asking learners to measure the dimensions of a milk carton and work out how much milk it held).</p>	<p>Angela Cahill</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Measurement - circumference and scale drawing</b></p>	<p>She also suggests not using measuring tapes with the tyres and asking the group to work out how to measure a curved surface.</p> <p>She gave the group 1cm<sup>2</sup> paper and explained to them that they had a living room, 6m by 5m in size. She gave them an Argos catalogue and asked them to draw the room to scale and furnish it with scaled representations of the chosen furniture.</p> <p>The group of five learners worked in two sub-groups and had to choose a scale themselves. At first they had difficulty, so the tutor asked them to think about what size the drawing would be if they chose a 1cm = 1m scale. Someone suggested a 1cm = 3m scale which would have resulted in an even smaller room. By showing what these scales looked like one person realised that they needed to go to fractions of metres, for example 1cm = 0.5m. After some thought and discussion the group decided to use with a scale where 1cm = 0.25m. As they chose furniture the learners realised that they had to scale the measurements for the furniture as well. The learners collaborated and the two sub-groups became mildly competitive as they compared who had chosen the best quality furniture, or the best positioning of the furniture.</p> <p>Following the session, the learners told the tutor that they would have felt lost if they'd had to work on their own, and that they had learned from working together. The learners also made suggestions for other ways in which the tutor might use this task to teach maths. They offered the following ideas:</p> <ul style="list-style-type: none"> <li>● Asking the learners to price all the furniture;</li> <li>● Asking the group to design the room within a budget;</li> <li>● Adding in sale reductions (%) and furniture delivery charges;</li> <li>● Finding the area of the room to carpet;</li> <li>● Finding the area of the walls for painting/wallpaper; and</li> <li>● Working out curtain measurements.</li> </ul>	

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Measurement – using tools (also, using games as energisers)</b></p>	<p>The tutor was particularly interested in encouraging her learners to become more active in the classroom, wanting them 'to question, to give it a go, to try different ways of answering a math problem ... Lots more learning could be achieved in class if learners felt more at ease to question more.'</p> <p>The tutor was inspired by a number of teaching ideas and resources that she found in the original case study research. She decided to combine some of the ideas into one session, getting her learners thinking, working together and asking questions by playing board games before asking them to work together to use compasses to draw circles. The circles were required for the learners' QQI certificates.</p> <p>The tutor asked the learners to play games that required strategic thinking, including: Four in a Row, Battleships and Tic Tac Toe. She let the learners work in pairs for ten minutes they were then asked them 'what if?' questions, such as, 'what if you went first?', 'what would happen then?', 'what about pattern?', and 'what if you started in the middle square, would it make a difference to the outcome?' The learners then played for a further twenty minutes. The tutor noticed that during the session the learners began to think differently, to think more strategically, to see patterns, to question and replay outcomes. They seemed to her to be very involved in the class.</p> <p>The tutor then handed out the measuring tools, and followed the South Tipperary case study by letting the learners figure out the workings of the measuring tools themselves.</p> <p>Straightaway the learners began to try to work out how the compasses worked, putting in smaller pencils, bigger pencils, holding them with two hands, then with one. They helped each other to make a circle, moving the compass then trying only moving the paper. The tutor saw real problem solving skills at work in the room. Again, all the learners were involved in the class. She says, 'no learner said of the compasses, 'I can't use this'. Everyone was looking for a solution.'</p> <p>Afterwards the tutor discussed the tasks with the learners. She asked them if they thought the games helped, and they said they felt 'switched on' after playing the games.</p>	<p>Antoinette Murray</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Measurement – using tools (also, using games as energisers)</b></p>	<p>Some said that they thought it would be a good idea always to start a mathematics class with games. All of the learners reported that they had achieved something in figuring out the use of the measuring tools themselves.</p> <p>In the future, the tutor says that she will try out alternative board games, such as draughts, Ludo or dominoes (not all the learners liked all the games, and others found them tricky to get the hang of). As well, the tutor says that, in the future, she will devote more time to allowing the learners to figure out as much as possible for themselves, enhancing their learning by encouraging them to question each other.</p>	<p>Antoinette Murray</p>
<p><b>Measurement - Area and volume of circles, cones and cylinders</b></p>	<p>The tutor wanted to concentrate on ensuring her learners understood area and volume, specifically the formulas for the area of a circle, the volume of cylinders and of cones.</p> <p>She had covered the formulas for area and volume in one class, but during the following class it became apparent that the learners did not have a full understanding of area and volume as concepts. For example, they were not clear as to why the area answer was units squared and the volume answer was units cubed.</p> <p>The tutor wanted the learners to understand the concepts so that they would remember them when required, rather than having them just 'learn off' the area and volume formulas.</p> <p>She bought a box of plastic centimetre cubes and then got graph paper, a cube box, cylinder and a cone of the same dimensions.</p> <p>The lesson involved group discussions, input from the tutor, activities to allow the learners to apply the theories, and exercises to expose the relationships between area and volume.</p> <p>A teachable moment arose when one learner was counting the squares on the graph paper of the circle, and squared off the circle and then announced she thought she was 'wrong'. The tutor says, 'This led to a most interesting discussion on how correct she may be. The formula for the circle used the radius squared, which was a quarter of her squared-off circle. The Pi formula multiplies this by 3.14. If we multiplied by four we would get area of her squared off circle. We then deduced that by multiplying it by (4 – 3.14), that is 0.86, we would have the area of the four corner sections.' This helped the learners to really understand how Pi worked.</p>	<p>Paula O'Connor</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<b>Measurement - Area and volume of circles, cones and cylinders</b>	<p>The tutor identified a problem in her resources, when she used square paper copied from a Leaving Cert. Maths paper. While each square was supposed to be <math>1\text{cm}^2</math>, it was not accurate and ten squares measured about <math>10.2\text{cm}</math> instead of <math>10\text{cm}</math>. She then switched to using graph paper which she finds 'a little busier, with so many lines'.</p> <p>The tutor had found it very useful to talk about the problems she was teaching with her family. She says her husband has 'good Maths eyes', and her six-year-old son uses the centimetre cubes in school so he tested out the steps at home.</p>	Paula O'Connor
<b>Algebra - snooker example</b>	<p>In the past the tutor has used a number of different approaches to introducing algebra at Level 3 and Junior Cert level. She says that she has always been looking for an approach that is different to methods outlined in school books and that will introduce learners to algebra in an everyday 'context'. The tutor tried out the snooker and algebra teaching idea from the original case studies. (She had learned about this idea from a workshop she had attended some years ago at one of NALA's numeracy conferences, run by Mark Prendergast of DIT.)</p> <p>The tutor used the method with a group of parents of secondary school learners. She laid out a problem on the whiteboard and they immediately began to discuss what to do and how to work out the problem. The tutor observed that the learners immediately began to discuss the problem and work it out in pairs. To her, discussion rather than silence indicates that learners are getting stuck in to a problem. She says, 'an exercise that results in talking, thinking and trying, even if they don't find an answer, is always a successful exercise in my eyes.'</p> <p>They found the results very quickly but said that they enjoyed the problem being laid out as a snooker game. They were able to work out the problem and they enjoyed the process but it did not appear to create enough of a challenge for this group as they all had a high ability in maths and had been working on algebra for a number of weeks.</p>	Clare Campbell

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Algebra - snooker example</b></p>	<p>If she was to try this activity again the tutor says that she would try it with a Level 3 Maths group. She would use it as the initial introduction to algebra. Depending on the group I may even bring in a prop, such as a mini snooker table. It could then be built on in terms of simplifying algebraic expression by using different ball colours to represent the variables.</p>	<p>Clare Campbell</p>
<p><b>Algebra: snooker and real life situations</b></p>	<p>The tutor had a Level 3 Mathematics group and the last section they would be looking at was algebra. She took the opportunity of the action research project to try out two ways of teaching algebra. The first was to use the 'algebra and snooker' example. The second was to use algebra to describe real life situations.</p> <p><b>Algebra and snooker</b></p> <p>The tutor used seven different coloured balls, each representing a letter and a number of points. She asked learners to write algebraic expressions and secondly to solve them.</p> <p>The first time she used the example the learners got mixed up with the different letters. They therefore wrote incorrect expressions which then led them to incorrect answers. She feels that the learners were possibly over-confident, having almost reached the end of their course, and that they launched straight into the exercise without really trying to fully understand the concept.</p> <p>The second time the tutor used the example it was much more successful. She re-enforced learners' understanding of the unknown letters and encouraged them to ask questions, which they did. All in all, she feels that the exercise was a very good introduction to the algebra section of the course.</p>	<p>Patricia Martin</p>



Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Algebra: snooker and real life situations</b></p>	<p><b>Real Life Situations</b></p> <p>For the second teaching idea, the tutor gave her learners real life everyday situations in text/sentence form. She asked them to form algebraic expressions from these sentences, for example:</p> <ul style="list-style-type: none"> <li>● <i>There are 12 tennis balls in a bag. There are <math>x</math> white tennis balls and 5 green tennis balls.</i></li> <li>● <i>Jack has €<math>X</math>. He spends €3 on an ice-cream. Jack has €8 left.</i></li> <li>● <i>A group of <math>Y</math> singers are spilt into 3 equal groups. There are 4 singers in each group.</i></li> <li>● <i>5 work friends go for dinner. If the bill comes to €120 how much will each person pay? (Assume the bill is being spilt evenly).</i></li> <li>● <i>The cost of a holiday to Spain for a family of 2 children and 2 adults is as follows: €350 per child, €550 per adult. Find the total cost <math>X</math> = cost of child, <math>Y</math> = cost of adult and <math>T</math> = total cost.</i></li> <li>● <i>The total number of people who took part in a charity walk was 1,017. 656 of these were male, how many were female? <math>M</math>=Male, <math>F</math>=Female, <math>T</math>=Total</i></li> </ul> <p>If an expression was a simple calculation then many of the learners were able to solve it in their head. They could state the correct answer, but to write it as an algebraic expression and solve it that way took practice.</p> <p>In addition to these two approaches to teaching algebra, the tutor gave her learners a list of algebra sums to calculate. They appeared to find this method boring, as there was no content or meaning to the learning.</p> <p>The tutor says that if she had a big enough group she would spilt the group into small groups to discuss and come up with the answers instead of working on their own. She believes that, if given the opportunity to ponder the questions and discuss as a group they might understand better. She also thinks that group work might mean she would not have to prompt or help learners as much.</p> <p>In the future, the tutor would like to use other ideas from the case studies with a new group from the start of the course.</p>	<p>Patricia Martin</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Algebra: snooker example</b></p>	<p>The tutor had found in the past that a lot of learners were afraid of the mere word 'algebra' or had very negative memories of it from their past education. She felt that introducing it through something that they were familiar with in their everyday lives would ease them into the area. She decided to try out the 'algebra and snooker' example from the original case studies with a group of Level 3 Mathematics learners.</p> <p>The tutor found that the example worked well for this group, probably because they all watched or played snooker, so could quickly understand the concept. The example allowed them to see that in algebra the letters just represent a value, and it also helped them to understand the concept of variables. She could see straight away that the group were not as nervous about algebra as they had been.</p> <p>Although the snooker example worked well with this group, the tutor says that she is conscious that it could be a distraction to learners who are not familiar with snooker.</p> <p>If she used the snooker example in the future, she says that she would try and get some mini snooker tables, to bring the practical element into it as well.</p>	<p>Suzanne Smith</p>
<p><b>Algebra: like and unlike terms</b></p>	<p>The tutor created a practical example to help her learners understand an aspect of algebra more effectively. She calls it the 'pocket example'.</p> <p>She filled her pockets with pens, coins and keys. Then she took them out one by one and asked learners what each one was.</p> <p><i>'I held up, for example, a pen and a pen and asked 'what do I have here?' (the answer was, one pen and one pen). 'Can these be added together?' (Yes, now we have two pens). Next I held up maybe a coin and a key, and asked 'what do I have now?' (A coin and a key). 'Can these be added together in any way?' (No).'</i></p>	<p>Suzanne Smith</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<b>Algebra: like and unlike terms</b>	<p>The tutor found that this example worked really well for introducing like and unlike terms, and the idea that like terms can be added together, while unlike terms cannot. She found it useful to be able to refer back to the pocket example when needed, to remind learners of like and unlike terms over the weeks that followed.</p>	Suzanne Smith
<b>iPad apps</b>	<p>The tutor wanted to include the use of iPads in her teaching so that her learners could experience a range of learning activities. She also wanted to bring more interactive games and ICT into her maths teaching. The use of apps on the iPads would also allow learners to practise their learning at home on their own iPads or tablets.</p> <p>She used the iPads with a group who initially were doing a Maths for Parents course and who then went on to do FETAC Level 2 Quantity and Number.</p> <p>She mainly used apps to reinforce the learning of a given topic. She found them useful for enabling learners to work at their own level and pace, without anybody else knowing what stage they were at. The group the tutor was working with varied in ability, and she found the use of apps was excellent for differentiation. Another benefit was that the learners were learning IT skills as well as Maths. One learner had an iPad at home and was afraid to turn it on, but now has become much more confident using it, and has downloaded and used the apps at home. The learners also discovered more uses of the iPad (such as the camera, calculator, and access to the internet and YouTube).</p> <p>The tutor states that, for her, one of the downsides to using the iPads was the length of time it took to set them up initially and then to download apps every week. This was mainly due to having to do them one or two at a time, because doing them all together caused the internet connection to be extremely slow. As the classes progressed, and the learners got more confident at using them, though, and she was able to get the learners to choose, download and evaluate apps themselves. This allowed them to see that some apps are fantastic, while others may not be great, and they were able to make a judgement on the quality of the available apps.</p>	Suzanne Smith

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
iPad apps	<p>The tutor only used free apps, and found that sometimes it was only a trial version, and that she would have to pay to download the full version. As well, advertisements tended to pop up on the free apps. The learners found these to be a nuisance with some of the games.</p> <p>The tutor also noticed that a lot of the maths apps were very child-centred, which was fine for this group as their main aim was to be able to help their children with their homework and learning. It was sometimes difficult to find suitable apps which were geared towards adults, and were not too childish for them.</p> <p>In the future the tutor would like to try to introduce a topic using the iPads. In the past she has only used them at the end of a topic to reinforce learning.</p> <p>The tutor described some of the apps she and her learners used and how effective they found the apps to be:</p> <p><b>Squeebles Maths Bingo</b> Very popular with the group, mainly involves answering addition, subtraction, multiplication and division questions. It also has a game to it, in which the aim is to win ice cream ingredients and serve customers. Ideal for children but the adults loved it as well!</p> <p><b>IXL Maths</b> Similar to the IXL website. I liked that the questions are put into sections depending on class from Junior Infants right through to Second Level. On the free version you have a limit of 20 questions per day.</p> <p><b>Maths Everywhere</b> Has an excellent range of questions, along with video explanations.</p> <p><b>Number Splat</b> Excellent for any activities using the hundred square.</p> <p><b>Odds or Evens</b> Work against the clock to determine if a number is odd or even.</p>	Suzanne Smith

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
iPad apps	<p><b>Sequences</b> Fill in the blanks in the number patterns or sequences. Very good for challenging learners as they can keep progressing to higher levels.</p> <p><b>What's the missing number?</b> Another sequence/pattern app.</p> <p><b>Number pieces</b> Deals with hundreds, tens and units. Allows you to represent a number in terms of place value using blocks.</p> <p><b>Digital Abacus</b> Very good for place value, although the learners have to be given a number to represent on the abacus.</p> <p><b>5 Dice</b> A challenging puzzle game dealing with the order of operations – BOMDAS.</p> <p><b>Chicken Vault</b> A rounding game, where you are asked to round numbers to the nearest ten, hundred or thousand in order to open the safe.</p>	Suzanne Smith

## Table B: Integrated approaches

The following table describes how tutors either combined topics or used multiple approaches (including, for example, the use of technology to teach particular topics, or a number of approaches including questioning and problem-solving to produce stronger lesson plans).

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Algebra and snooker</b></p> <p><b>Time and money</b></p> <p><b>Fractions</b></p>	<p>The tutor says that maths isn't her 'typical' subject and she was keen to improve her teaching of it.</p> <p>She drew on three of the case studies from the original case study research and tried out a number of teaching ideas.</p> <p>First, she used the algebra and snooker example but found that didn't work for her learners. She did, however, share the idea with colleagues and it worked well for them. Second, she used the 'investing money' idea to explore the topic of time and money and this method really worked well. Third, the tutor used the method of cutting up a pizza or pie to teach fractions.</p> <p>The tutor says that now she has become more familiar with the writeon.ie website she will plan to support her learners to be better prepared for the maths module. Also, she has decided not to mention the word 'algebra' until the learner understands the concept, as she has found the terminology can frighten learners on its own.</p>	<p>Deirdre Fahey</p>
<p><b>Writeon.ie, apps, a numberline and recording learners' work and activity with photography</b></p>	<p>The tutors worked together to trial a number of ideas from the original case study research. These ideas included:</p> <ul style="list-style-type: none"> <li>● the use of numeracy apps and website, including the Maths Eyes website<sup>9</sup> and resources, and the Maths Everywhere website and app, and NALA's writeon.ie distance learning site. They used these websites and apps on PCs and the centre's iPad;</li> <li>● the use of rulers for simple measurement; and</li> <li>● recording learners performing tasks with a camera; the tasks included: using calculators, sorting, matching and ordering numbers, making a numberline and measuring.</li> </ul>	<p>Jane Savage &amp; Elaine Clifford</p>

<sup>9</sup><http://www.haveyougotmathseyes.com>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Writeon.ie, apps, a numberline and recording learners' work and activity with photography</b></p>	<p>The tutors found that all of the ideas worked well and that the learners enjoyed the activities. In particular the apps appeared to engage the learners' attention very effectively.</p> <p>They found that recording learners' activity with a camera makes it very easy to review and revisit the subject, using the photos as a reminder. In the future they might use Photostory<sup>10</sup> with learners, but focus on numeracy. Learners will be able to take photos of numbers, then assemble in a 'photostory', adding typed written numbers and record themselves saying the numbers.</p> <p>The centre has only one iPad and the tutors felt that more would make activities more accessible for learners.</p>	<p>Jane Savage &amp; Elaine Clifford</p>
<p><b>Writing more rounded lesson plans</b></p>	<p>The tutor was interested in two topic-based strategies:</p> <ul style="list-style-type: none"> <li>● teaching learners how to use measuring tools effectively, including explaining how to use a ruler, imperial vs metric on a measuring tape/ruler, and how to hold a ruler; and</li> <li>● teaching shapes using everyday objects, including relating 2D/3D shapes to real life objects to explain what otherwise would have been abstract words.</li> </ul> <p>Both were topics that the tutor was in the process of working on with her learner. Her learner was working on L3 Maths, at his own pace and as part of a weekly, two hour, one-to-one session. The session tended to be split between one hour on numeracy/IT and one hour on literacy skills.</p> <p>In addition the tutor was interested in the general teaching approaches described and discussed in the case studies, including:</p> <ul style="list-style-type: none"> <li>● use of questioning;</li> <li>● use of problem-based learning activities;</li> <li>● use of meaningful contexts; and</li> <li>● use of technology.</li> </ul>	<p>Mary Bambrick</p>

<sup>10</sup><http://www.haveyougotmathseyes.com>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Writing more rounded lesson plans</b></p>	<p>The tutor had used technology in her teaching before but hadn't explicitly built these general approaches into her lesson plans.</p> <p><b>Measurement</b></p> <p>The tutor introduced the topic of measuring using questioning and a basic worksheet which contained lines to measure. She sensed quickly that her learner was not fully confident in this basic task. She didn't probe too much further but instead demonstrated how she would hold the ruler and pencil in order to hold and measure the lines, talking through what she was doing for the learner's benefit. She says, 'I spoke almost as if we both knew this but were just recapping. After a few measurements my learner had fully grasped the concept.'</p> <p>The tutor then used discussion, fact sheets, worksheets and the Maths Everywhere app<sup>11</sup> to flesh out and test the learner's understanding of measuring, including facts such as how many millimetres were in a centimetre, and basic concepts to help him estimate length and distance.</p> <p>The tutor says that the app worked well in helping the learner to visualise measurements, for example understanding that a door is approximately two metres tall. <a href="https://www.youtube.com/watch?v=NcYg7qh38F4">https://www.youtube.com/watch?v=NcYg7qh38F4</a></p> <p>The learner enjoyed using the 'Have a Go' section of the Maths Everywhere website.</p> <p>To consolidate the learner's knowledge and understanding, the tutor and the learner discussed the fact that he was about to renovate his kitchen. The tutor built an exercise around drawing up a kitchen plan which the learner would be able to use to cost out and plan changes to the kitchen. They used online planning tools from real kitchen companies (for example: <a href="http://www.cashandcarrykitchens.ie/images/planner.pdf">http://www.cashandcarrykitchens.ie/images/planner.pdf</a>). This approach used a problem-solving approach in a meaningful context. By thinking through the general teaching approaches that described in the original case study research, the tutor felt that she had created a 'more rounded overall lesson' for her learner.</p>	<p>Mary Bambrick</p>

<sup>11</sup><http://www.mathseverywhere.org.uk>



Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Writing more rounded lesson plans</b></p>	<p><b>Understanding shapes</b></p> <p>When the tutor came to work with her learner on 2D and 3D shapes she found that the learning environment presented certain barriers. First, the tutor works with her learner on a one-to-one basis within a bigger group, and she was worried that the learner might feel embarrassed working with shapes that others might think were childish. Second, the desk the tutor and learner shared was very small; she says, 'bringing in a selection of everyday items and old food containers wasn't a runner.'</p> <p>The tutor decided instead to use a combination of small 3D shapes and 2D cut outs linked them to pictures on worksheets. She also sourced a set of mini 3D maths shapes from <a href="http://www.artandcraft.ie">www.artandcraft.ie</a>. The 10 shapes were small and inexpensive and she and the learner could look at the shapes, discuss and sort them at the desk in conjunction with homemade laminated 2D shapes. Matching tangible 2D shapes with 3D 'partner' shapes seemed to really help solidify the learner's understanding of the different shapes.</p> <p>The tutor used the Maths Everywhere app to help build on the learning and to change the pace of the lesson. The tutor says that the app did introduce some more obscure shapes which may have unnecessarily added to the complexity of the subject. She added some of these more complex shapes to the fact sheet as the learner was interested in them but she explained that, realistically, they were not shapes you would generally come across in day to day life.</p> <p>The tutor and the learner discussed shapes that the learner encountered in his work in order to relate the topic to his life.</p>	<p>Mary Bambrick</p>
<p><b>Teaching basic number to ESOL learners</b></p>	<p>The tutor worked with adults with no, or very basic, prior maths education. She had realised, from working with ESOL learners, that some learners had difficulty carrying out very basic maths-related tasks such as drawing a triangle and dealing with basic numbers.</p> <p>She was keen to find out how useful 'manipulatives', as described in the South Tipperary case study, might be in building understanding of basic concepts, such as adding whole numbers and place value.</p>	<p>Clare Hatcher</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Teaching basic number to ESOL learners</b></p>	<p>She says, 'I began thinking about how manipulatives might really help basic learners with maths in the same way that cutting writing into phrases, sentences and words helps with literacy.'</p> <p>The tutor trialed the use of manipulatives over the space of four weeks, for two hours a week, beginning with a needs assessment. Her two learners had very limited maths education, but could both recognise numbers and could do simple addition, but were unsure about signs.</p> <p><b>Number line and dice</b></p> <p>The tutor used a number line to check whether they could add up two numbers and this worked well after some practice. The tutor then introduced dice. Both learners had seen dice before but were not familiar with them. One of the learners had been tricked out of money with dice and had avoided them since. The learners initially struggled to read the dots as numbers. They used the dice for addition up to 12. The tutor asked the learners to think of a number between 2 and 12 and roll the dice to see if they could match the number. In this way she was able to check that the learners understood the dots on the dice and could add the dice successfully. She gave the learners a few dice to play with at home with their children.</p> <p>She then brought out a cardboard place value chart with cardboard numbers to put the dice numbers on. The learners could place the cardboard numbers from 2-12 on the chart correctly but there was conceptual difficulty with placing 1.</p> <p>The tutor wanted to consolidate the learners' ability to recognise dots as numbers, and to write and draw number so used a sheet from <b>The Numeracy Pack by Coben and Black</b><sup>12</sup>. From the same pack the tutor gave both learners a tracing worksheet to practice writing numerals and the numbers as words.</p>	<p>Clare Hatcher</p>

<sup>12</sup><http://www.bookdepository.com/Numeracy-Pack-Sandy-Black/9781859903179>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Teaching basic number to ESOL learners</b></p>	<p><b>Language of maths</b></p> <p>The tutor introduced the language of maths so that the learners could understand and use the same language as the children’s school.</p> <p><b>Using money to build understanding of numbers</b></p> <p>The tutor then gave the learners 5c, 2c and 1c coins and asked them to see how many ways they could make the coins add up to 7. This was to encourage them to see how money can be used to practice numeracy. The learners worked easily with the coins. Progress was slower when the tutor asked them to complete a worksheet based on 7, but it became easier as they worked through it. They appeared to have difficulty noticing the emerging pattern that each calculation resulted in 7.</p> <p>The tutor built on the place value chart by asking the learners to place two-digit and then three-digit numbers on the chart. She then gave them three numbers and asked them to make the biggest number possible. She asked them to explain their choice by reference to the basic place value chart.</p> <p>The place value chart led one learner to ask about money and specifically what ‘the dot’ meant and why ‘it moved’. The second learner had not heard of the decimal point, but had noticed it.</p> <p>The tutor started working on place value using the full place value chart showing the decimal point, tenths and hundredths.</p> <p>One learner then produced her son’s bank book showing balance €100.03. The tutor asked the learners to show the balance on the place value chart and they put €100. The learner thought that the .03 was the month. Once that was explained, she asked them to put the number on the bank book onto the place value chart.</p>	<p>Clare Hatcher</p>

Topic	Teaching approach/strategy	Practitioner(s) who adapted/developed it
<p><b>Teaching basic number to ESOL learners</b></p>	<p>They quickly realized that when they first put down 10003 on the place value chart, this was much more money than the boy had. Both learners then worked together to show the amount of €100.03 on the place value chart.</p> <p>Another misconception arose when the same learner told the tutor that her son's favourite crisps cost 99. She had asked an assistant who told her that meant €1. When the tutor looked the signs in the supermarket advertising booklets which I had asked the learners to bring in, she realized that it would be possible to misunderstand 99c without the cultural context of understanding what that means. 'I realised that goods are priced at, for example, 49c and €6 and so are frequently written without using the decimal point. I was then somewhat at a loss to explain this very well. We reached an understanding about coins (cents) being part of the whole (euro).' The tutor encouraged the learners them to look for the difference in the way amounts under €1 and over €1 are displayed in the shops.</p> <p><b>Cultural differences</b></p> <p>The tutor realised that one learner had difficulty forming the numbers, especially 8 and 9. The learner told her that 'in Benin I didn't have to write, but here you have to sign and write all the time'.</p> <p>Both learners had difficulty writing some numbers as words especially 'three', 'seven', 'eight' and 'nine'.</p> <p>They talked about the importance of writing numbers clearly, and how difference between the French 1 and Irish 1 could cause confusion, as the French one (used in Benin) can look like an Irish 7.</p>	<p>Clare Hatcher</p>

## Useful NALA Webpages

[www.nala.ie](http://www.nala.ie)  
[www.nala.ie/tutorscorner](http://www.nala.ie/tutorscorner)  
[www.nala.ie/resources](http://www.nala.ie/resources)  
[www.writeon.ie](http://www.writeon.ie)  
[www.simplyput.ie](http://www.simplyput.ie)  
[www.makingcents.ie](http://www.makingcents.ie)  
[www.healthliteracy.ie](http://www.healthliteracy.ie)  
[www.helpmykidlearn.ie](http://www.helpmykidlearn.ie)  
[www.literacytools.ie](http://www.literacytools.ie)

## Useful NALA resources

### **Read all about it: case studies of teaching reading to adults in Ireland 2014.**

This report presents six case studies on reading practice in adult literacy in Ireland. The purpose of the research was to gain an in-depth insight into specific reading strategies that support adult literacy development. The case studies focus on different aspects of practice including; approaches to teaching and learning, general teaching practices, specific reading strategies and the use of technology as part of a blended learning approach in the classroom.

### **English for Speakers of Other Languages (ESOL): Blended learning project report, 2014.**

This report describes the findings from a research project carried out in 2013 by NALA at the request of the Limerick ESOL Partnership. The focus of the project was the use of NALA's interactive website [www.writeon.ie](http://www.writeon.ie), as part of a blended learning approach with ESOL learners. The ESOL learners who took part in this research confirmed how adopting a blended learning approach using [www.writeon.ie](http://www.writeon.ie) along with face-to-face tutoring has helped to meet their learning and language needs.

### **What really counts: case studies of adult numeracy practice in Ireland, 2013.**

The report illustrates numeracy practice with a focus on the delivery of learning and teaching on a day-to-day basis. It is intended to be a resource to tutors working in the area of adult numeracy in Ireland, providing ideas and inspiration about teaching ideas, learning activities and resources. The research will inform the continuous professional development workshops and seminars that NALA offers to adult numeracy practitioners.

## **Adult literacy and numeracy in action: six case studies of practice work in Ireland, 2013.**

The six case studies presented in this report highlight literacy and numeracy practice as it happens on the ground. Each case study illustrates how the individual programmes are providing a range of courses to meet the varying and specific needs of the learners attending. The case studies included in this report illustrate that there is no definitive way of ensuring 'best practice' on the ground. However, they do demonstrate aspects of the principles of good adult literacy work including learner centred learning, literacy as a social practice and a humanistic approach to adult learning.

## **The Guidelines for Good Adult Literacy Work. NALA, 2012.**

The Guidelines for Good Adult Literacy Work is the main document for those working in the adult literacy and numeracy field and should be used as a key reference for teaching and learning. It provides a clear expression of what adult literacy work is about and where it came from. It also aims to establish the right to develop literacy skills as a fundamental human right for adults who wish to improve their literacy and numeracy.

## **Curriculum development: An evolving model for adult literacy and numeracy education. NALA, 2009.**

This evolving model of curriculum development shows how the principles, values and practices described in NALA's publication Guidelines for Good Adult Literacy Work apply to curriculum development in adult literacy work. This is seen as an evolving model to recognise that the model is likely to change, to evolve, as we all learn more about how curriculum development works in practice in Ireland.

## **Getting Started in Adult Literacy and Numeracy: A Tutor Training Resource Pack. NALA, 2007.**

This pack is designed for trainers who are facilitating the initial tutor training course or other in-service tutor training events. The pack is designed so that trainers can dip in and out of it to suit the needs of their tutors. The material is designed for use in a variety of ways and for a variety of tutors. The pack has been divided into sections, which correspond roughly to the key topics which usually form part of an initial tutor training course for adult literacy tutors. Some of the sections include much more material than can be covered in the average two hour period. It is hoped that trainers can pick and choose sections or parts of sections to be used during the course. Some of the material and sample sessions may also need to be adapted in each case to meet the needs of individual schemes and groups of new tutors.

## **Curriculum Development in Intensive Tuition in Adult Basic Education. A report from on a research project in Ireland 2006-2007. NALA, 2009.**

The report contains examples of everyday numeracy situations, multiple intelligence, community development links with literacy and numeracy, numeracy case studies, numeracy exercises and case studies.

### **Other useful resources**

The apps that were used in the project are all available online:

Squeebles Maths Bingo

IXL Maths

Number Splat

Odds or Evens

Sequences

What's the missing number?

Number pieces

Digital Abacus

5 Dice

Chicken Vault

Tutors made use of these websites throughout the project:

[www.haveyougotmathseyes.com](http://www.haveyougotmathseyes.com)

[www.mathseverywhere.org.uk](http://www.mathseverywhere.org.uk)

A number of numeracy energisers are collected on this website:

<https://sites.google.com/site/leovetmaths/toolkit/energizers>













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[www.nala.ie](http://www.nala.ie)

**Literacy learning websites:**

[www.writeon.ie](http://www.writeon.ie)

[www.helpmykidlearn.ie](http://www.helpmykidlearn.ie)

