

Health & Social Care

The Maths Pipeline:

Supporting maths in post-16 vocational provision



Resources created as part of
the Maths Pipeline programme.

Developed by Mathematics in Education and Industry (MEI) and
The National Centre for Excellence in the Teaching of Mathematics (NCETM).
Commissioned and funded by the Education and Training Foundation.

Published September 2015

External references

This guide offers links to external websites and resources. At the time of publication all urls provided were correct; however, website addresses may be updated and changed. For each reference, the full name of the publication / resource has been provided to help you deal with any broken links.

www.et-foundation.co.uk

Health & Social Care

Contents:

About this guide	1
Why should I be concerned about developing my learners' maths skills?	2
Why use a vocational lesson to develop maths skills?	3
Some teaching ideas	4
Picturing the maths in your vocational area	4
Other learning activities related to your vocational area	5
Examples of learning activities that you could use or adapt with learners:	
- Tarsia	6
- Sometimes true, always true, never true	7
- Top Trumps	7
Other resources to help learners understand key mathematical ideas	8
What challenges am I likely to face?	9
Engaging learners	9
Some learners may need to improve their confidence with basic maths	9
Difficult topics	10
Working in the Secure Estate	10
Meeting the challenges	11
Working together with maths practitioners	11
Teaching and learning strategies: embedding and contextualising	11
Teaching and learning strategies: developing deep understanding of key mathematical ideas	12
Initial, diagnostic and formative assessment	12
Track learners' mathematical progress alongside their vocational targets	13
How can I develop my own maths knowledge and skills?	13
References	14

About this guide

This guide is one of a series aimed at practitioners from a wide range of providers, including FE



Why should I be concerned about developing my learners' maths skills?

Here are four good reasons:

Data from the [Department for Education](#) shows that the percentage of learners who pass their maths exam at the end of their vocational course is significantly lower than the percentage who pass their English exam.

When vocational and maths teachers work together, retention and achievement rates for maths and for the vocational subject improve. See [You Wouldn't Expect a Maths Teacher to Teach Plastering.....](#)

"Improving maths skills can help learners to become more employable, regardless of whether they stay with their current vocational area.

Maths skills are highly transferable, and improving them will help a learner to become more employable, regardless of whether they stay with their current vocational area.

Employers are looking for learners who can solve problems and think logically.

Think about the wider consequences if people make mathematical errors whilst working in their chosen area of employment or self-employment. Errors can waste time and resources, can lead to dissatisfied customers, and can undermine health and safety standards.

English and maths are the two most important skills for learners to have.

The [Professional Standards](#) (Statement 16) state that as a professional teacher or trainer you should demonstrate commitment to:

"Address the mathematics and English needs of learners and work creatively to overcome individual barriers to learning."

Why use a vocational lesson to develop maths skills?

Many post-16 learners view their previous learning experiences in maths very negatively.

The prior experiences of many vocational learners mean that they may have little or no maths confidence. Making maths relevant with authentic learning activities that link to real work contexts, and highlighting where learners have used maths in your lessons have real benefits. The desire to make progress in their chosen vocation provides considerable motivation for learners to master relevant mathematical skills and concepts. Success and enjoyment in a vocational lesson means their expectations will be high. They may be more willing to persevere with challenging maths and maths that isn't directly relevant to the vocational area but is relevant to a Functional Skills or GCSE qualification they are aiming for.

In this [film](#) from the Maths Pipeline Programme, practitioners and learners talk about the benefits of embedding maths and some of the approaches they use.

This [clip](#) from the Maths Pipeline Programme, shows learners using maths as an integral part of a health and social care lesson. It demonstrates how developing mathematical understanding can help learners to engage as well as progress.

This embedding and contextualising approach is underpinned by research:

[‘You Wouldn’t Expect a Maths Teacher to Teach Plastering...’](#), NRDC, Nov 2006.

[Effective Practices in Post-16 Vocational Maths](#), ETF, Dec 2014

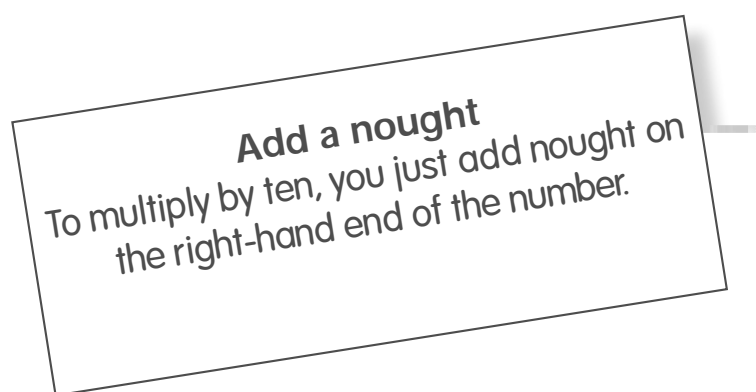
The [Cre8ate Maths](#) website includes resources on Childcare and Early Years (03.), and Health and Social Care (08.). (You will need to register with Cre8ate to be able to download them, but registration is free.)

[Google Earth](#) provides a free download that allows you to get a plan view of almost anywhere in the world. As a project you could ask learners to design a playground. The learners could get an image of somewhere local that could be converted to a play



Sometimes true, always true, never true

This kind of activity challenges learners to think deeply about a topic, and also requires them to articulate their thinking. As they are working on the activity, listen to the arguments they are creating, and encourage them to express themselves clearly verbally and on paper; this formative assessment aspect will help identify and resolve any misconceptions.



The idea is that the learners have a collection of statements which they are asked to sort into three columns. Learners may think that this is always true, but if prompted to think further they will discover that it is not true for decimals. This activity can be adapted to cover a wide range of statements.



Top Trumps

This is an adaptation of the popular card game where players compare data on a collection of themed cards. Learners explore a range of mathematical ideas, e.g. small and large numbers, the use of ratio to create statistics like death rate and birth rate, and how statistics like death rate, population and GDP might / might not correlate; teachers can choose which ideas to emphasise. Group discussion and peer support helps learners identify and resolve any mathematical misconceptions.

In the example below the theme is countries, which learners may see as relevant to their everyday life;



Find a space large enough for all the learners to line up facing you. Give each learner one of the cards. Ask the group to select one of the statistics from the cards, e.g. total population. Now ask the learners to line up in order of total population, from the smallest at one end to the largest at the other end. When they have done this, ask them to read out their population statistic. Get the whole group involved in checking that everyone is in the right place in the line.



Many Top Trump sets are available as free downloads from the [TES](#) website. (Search for 'Top Trump maths'.)

Other resources to help learners understand key mathematical ideas



The [WisWeb](#) website has some excellent apps to help learners to explore maths topics including ratio, angles, and other aspects of shape. These are maths apps rather than specific vocational apps.



The [Virtual Maths](#) website provides lots of interactive activities that link maths to real life problems, including number; algebra; shapes, space and measure; and data handling.

The following sections of this Guide describe and respond to some challenges you might face, expand on the principles and research underpinning these teaching approaches, and offer many more teaching ideas.

What challenges am I likely to face?

Incorporating the development of maths skills as part of your vocational teaching is not without its challenges.

Engaging learners

Your learners may feel quite negative about the prospect of continuing to study maths as part of their

Difficult topics

There may be specific mathematical topics which, from experience, you know learners will find difficult. Below are some suggestions of resources to support learners in some of these areas.



[Maths4life](#) is a series of booklets providing teaching materials for a variety of topics, including number, time and money, fractions, measurements. (You will need to register with NCETM and set up a free account.)



[Maths Everywhere](#) has some excellent short clips to help learners develop their maths skills. The site has three sections; some tools to help with everyday maths (e.g. currency conversion and planning journeys); a set of 'how to do's short clips; and some interactive questions to try. It is also available as an app.



The [Skills Workshop](#) is a site where practitioners can upload their own resources. It provides a range of lesson ideas covering many aspects of maths and English. The resources can be filtered by vocational area and level. Look out particularly for the resources which use active learning.



The [Excellence Gateway](#) has a large collection of numeracy and vocational learning materials, and the [Maths Exhibition](#) website brings together some of the most effective maths teaching and learning materials from this site.

Working in the Secure Estate

If you are working within the Secure Estate you will have additional challenges such as regime constraints and learners who have additional support needs. The following is an approach taken by one prison:

"At HMP Wakefield, teachers provide contextualised learning within prison industries on a one-to-one basis to help learners who are in the separation unit and/or those who struggle with functional skills or have additional learning needs. This type of support is proven to be less disruptive to the prison day and effective at engaging those furthest away from learning and skills."

[NIACE](#)



This [clip](#) shows ways in which learning has been embedded in many aspects of prison life at HMP Swalesdale, and this [article](#) discussed how literacy and numeracy have been embedded in the gym there. Similar ideas could work in health and social care.



You might get some further ideas from the report [Fit for Release](#), which discusses ways of helping prisoners prepare for life outside the prison.



This [clip](#) introduces the Offender Teaching and Learning (Vocational Training) Toolkit, and this [clip](#) covers the maths content of the toolkit. Related materials are available on the [Offender Learning Exhibition Site](#).

Meeting the challenges

Working together with maths practitioners

There are benefits to all concerned when vocational and maths practitioners plan work together. Maths specialists can gain an insight into where learners are likely to encounter maths in the world of work, and you get to see how maths is taught to your learners in their maths lessons. You may also be able to get support from the maths specialists in relation to particular maths topics.

Some clips of staff working together are shown in the films which link to this guide:
one from _____

Teaching and learning strategies: developing deep understanding of key mathematical ideas

One place to start is [Thinking Through Mathematics](#), which emphasises the interconnected nature of maths, and supports teachers and learners to use formative assessment strategies to identify and address common conceptual difficulties. The mathematics dealt with here is roughly Entry Level to Level 2.

A related resource, [Improving Learning in Mathematics](#), offers similar approaches for mathematics from Level 1 to Level 3.

Professor Malcolm Swan of Nottingham University, whose research underpinned both *Improving Learning in Mathematics*, and *Thinking Through Mathematics*, identified eight principles for effective teaching of maths.

Teaching is more effective when it ...

- builds on existing knowledge
- exposes and discusses misconceptions
- uses higher-order questions
- uses cooperative small group work
- encourages reasoning not 'answer getting'
- uses rich, collaborative tasks
- creates connections between topics
- uses technology in appropriate ways

Take a look at [Improving Learning in Mathematics](#) and [Thinking Through Mathematics](#) on the NCETM website for more information about these principles and how you can apply them in your own practice.

Initial, diagnostic and formative assessment

Your learners will learn most effectively when you and they develop insights - through initial and formative assessment approaches - into their needs. Maths specialists often carry out initial and diagnostic assessments before learners join a course, and may be able to share the results with you. You can also use informal self-evaluation questionnaires to help you and your learners understand their needs, and often these can be directly related to a topic they are working on. And most of the resources recommended in this guide have strong elements of formative assessment; for example insights often emerge directly from learner-learner or teacher-learner discussions during active learning activities.



Track learners' mathematical progress alongside their vocational targets

This will help you and the learners to see where they are progressing and where they need further support. This tracking could also be linked to a positive incentive scheme. Again, this is an area that your maths specialist may be able to support you with.

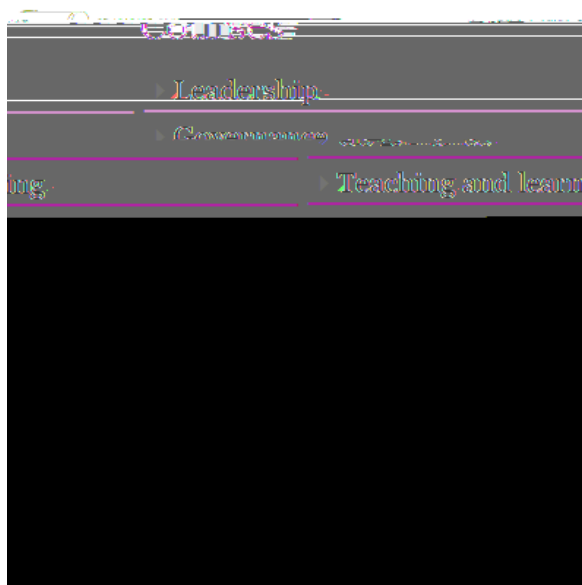
How can I develop my own maths knowledge and skills?

In parallel with developing your teaching strategies, you may wish to develop your personal maths skills.

A quick internet search may yield a good film clip or document which helps. Another approach might be to ask a friend or colleague, maybe someone from your maths department if you work in a college. Some clips of staff working together are shown in the films which link to this guide, and have been referenced earlier:

- [YouTube](#): ETF MPP Health and Social Care: Developing mathematical understanding to help learners progress
- [YouTube](#): ETF MPP Health and Social Care: Embedding maths in Health and Social Care
- [YouTube](#): ETF MPP Health and Social Care: Contextualising maths

A comprehensive approach to your continuing professional development is to start with an assessment of your needs using this ETF Foundation [maths self-evaluation tool](#). You will need to start by creating a free account. Once this is done, you can find the self-evaluation tool by clicking on Maths and English under the Courses heading. The tool provides a framework for you to self-assess both your personal maths skills and your teaching skills, and signposts you to further support.



20. Google Earth - free to download _____

- 44. Excellence Gateway: Exhibitions website - Offender learning <http://offender-learning.excellencegateway.org.uk/>

Meeting the challenges

Working together with maths practitioners

- 45. YouTube - ETF MPP Hospitality and Catering: Vocational and maths practitioners working together <https://youtu.be/rZWiBhXHMk4>
- 46. YouTube - ETF MPP Health and Social Care: Embedding maths in Health and Social Care <https://youtu.be/UTXxNxvsYeo>
- 47. See 4

Teaching and learning strategies: embedding and contextualising

- 48. YouTube - ETF MPP Health and Social Care: Contextualising maths <https://youtu.be/lzydNF9yb3A>
- 49. NCETM - Maths4Life Topic-based teaching Booklet (You will need to register free on the NCETM website) <https://www.ncetm.org.uk/resources/8855>
- 50. MEI Contextualisation Toolkit <http://www.mei.org.uk/contextualisation-toolkit>
- 51. MEI - Maths at Work, A guide for employers offering work experience as part of 16 to 19 Study Programmes http://www.mei.org.uk/files/pdf/Maths_at_Work-A_guide_for_employers_offering_work_experience_for_16-19_SPs.pdf
- 52. HMP Oakwood Starting with a “clean slate”: embedding functional skills in prison work and training - LSIS Case Study <http://repository.excellencegateway.org.uk/fedora/objects/eg:5398/datastreams/DOC/content>

Teaching and learning strategies: developing deep understanding of key mathematical ideas

- 53. NCETM - Thinking Through Mathematics: Principles of effective teaching (You will need to register free on the NCETM website) <https://www.ncetm.org.uk/online-cpd-modules/ttm/principles-for-teaching-mathematics/principles-of-effective-teaching>
- 54. NCETM - Improving Learning in Mathematics (You will need to register free on the NCETM website) <https://www.ncetm.org.uk/resources/1442>
- 55. See 53
- 56. See 52

Initial, diagnostic and formative assessment

- 57. See 18
- 58. See 11
- 59. Excellence Gateway - Approaches to formative and summative assessment of functional skills <http://www.excellencegateway.org.uk/content/etf1324>
- 60. See 18

How can I develop my own maths knowledge and skills?

- 62. _____

