

# KEEP CALM – DO MATHS ON AN IPAD

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*Learners' phobia for Mathematics has led to many learners dragging their feet to the Mathematics class and barely passing their Mathematics tests. Research has shown that learners' fear for Mathematics begin when they're still in primary school. Join me in the iSchoolAfrica journey of using iPads to change the way we teach Mathematics and demystify the learners' perception of Mathematics in the classroom.*

## DEMYSTIFYING MATHS – ON AN IPAD

Why is it that the majority of our high school learners don't like Mathematics and opt for Maths literacy in Grade 10 rather than Mathematics as their subject choice? Why is it that most adults will tell you how they hated Maths at school and that they're really not any good at it?

Human beings all have irrational fears and anxieties about everyday objects and situations like spiders, airplanes, enclosed spaces, heights and.... maths. Grown-ups admit to hating maths, or being really bad at it. Scientists say that this dislike of Maths may be disguising a real phobia that probably begins at an early age.

Stanford researchers found proof that Maths anxiety is a real thing, certain people seem prone to feeling real anxiety when it comes to doing Math, and that anxiety in turn hampers their ability to do math in the first place. They got their proof from studying grade 2 and 3 learners and performed MRI's on them while they did simple Maths problems. They found that the grade 2 and 3 learners were faced with simple addition problems, the parts of their brain that feels stress lit up, and the parts that are good at doing math, deactivated.

Interestingly they noticed that the children with math anxiety weren't actually bad at Maths - they got the same number of answers right as their anxiety-free peers, but it took them longer to solve the problems.

The good news according to researchers is that phobias are treatable, which means there may be a way to cure kids' anxiety before they develop a lifelong aversion to Maths.

Vinod Menon, a professor of neurology and psychiatry who led the Stanford study explains:

*"We already have mechanisms that are widely used to treat phobias. If the same brain system is involved with maths anxiety, you should be able to use those mechanisms."*

*What the math field might want to think about is doing this at earlier ages. Once Maths become a strongly learned fear, then it's much more difficult to treat."*

The big question is just: How do we do this?

Hung-Hsi Wu from UC Berkely, professor in Mathematics who has written a book about teaching math to elementary school students explains 'demystifying maths':

*"You're forced to do something over and over again and you know nothing about it - wouldn't you be anxious too? I believe almost all math anxiety would be gone if every one of our teachers in elementary school was capable of looking in the 'black box' of mathematics and telling kids there is no mystery, this is why it works"*

What is this 'black box' he is referring too? Well, keep calm and see how we help teachers to do demystify maths for their learners using an iPad.

In this session we will show you how we use iPads in the classroom to transform the way mathematics is taught in schools and how by implementing the SAMR model (by Ruben R Puentedura) teaching of Maths with iPads transforms learning Maths in ways never conceived before. The following table takes us through the journey of demystifying maths for learners using iPads in their classrooms.

Example of learning progress when doing simple maths functions on an iPad	<b>Substitution</b> <i>iPad acts as a direct substitute for traditional teaching tools</i>	<b>Augmentation</b> <i>iPad acts as a direct tool substitute, while using a technology function/app</i>	<b>Modification</b> <i>iPad allows for creativity and invention using a combination of apps for new outcomes</i>	<b>Redefinition</b> <i>iPad allows for collaborating and learning in ways never imagined before</i>
<b>I</b>  interaction	Learners use iPads to answer maths problems they could've answered on a worksheet or in a workbook e.g. mental maths. No or very little interaction between peers or teacher and learners	Learners are using apps to practice mental math using an app e.g PopMaths.	Learners are able to use productivity apps and/or a combination of apps to explain a maths concept.	Learners use the iPad for all basic learning principals, but move one step further by inviting other participants in his/her learning process e.g. research studies, content apps, productivity apps, podcasts etc.

<p style="text-align: center;"><b>P</b></p> <p style="text-align: center;"><b>Participation</b></p>	<p>No or very little interaction between peers or teacher and learners.</p>	<p>Learners have immediate feedback if an answer is wrong and can correct. Collaboration between peers is evident when learners help each other to find answers to problems. Apps are also fun to use and the learners' engagement becomes significant in the process.</p>	<p>Learners collaborate and use each other's efforts to build a project where new and different ways of finding the answers to problems are sought. Learners rely on each other to find the why's in their journey to solving problems.</p>	<p>Collaboration happens between the learner and his/her peers, teachers and any other resources available. The learner now takes the lead in his learning process, but makes use of all other resources to find the why's in his journey to solving problems.</p>
<p style="text-align: center;"><b>A</b></p> <p style="text-align: center;"><b>Advancement</b></p>	<p>Learners might improve their mental math much, but they are learning to answer problems in a different context</p>	<p>Because of the immediate feedback, learners are able to assess their own progression. They have the ability to improve their marks though being positively engaged with the content on the iPad.</p>	<p>Learners are not given the formulae and steps, but are expected to understand the process followed by intuitively working together. The iPad allows learners to be creative and actively take part in their own learning process.</p>	<p>Learners are purposefully finding their own steps to solve problems by looking at other sources and using their own intuition and creativity. They are able to use their strong base of mathematical knowledge to be inventive</p>
<p style="text-align: center;"><b>D</b></p> <p style="text-align: center;"><b>Demystifying</b></p>	<p>Very little has changed in the learner's mind about the challenge of Maths.</p>	<p>Learners are having fun in a non-threatening environment, which is the first step in overcoming fear and anxiety.</p>	<p>Because learners are engaged and a co-designer of their learning process, they are able to internalise the learning and find the whys behind the hows when purposefully solving problems.</p>	<p>Learners are not only driven to find answers to problems, but because the learning process becomes a journey of discovery that explains real life situations, explained by the language of maths without the mystery</p>

Table 1: Using the SAMR model to explain the process of using iPads in the Maths class

**REFERENCE:**

Blog: <http://hippasus.com/rrpweblog/>

<http://www.sfgate.com/education/article/Demystifying-math-could-ease-anxiety-3466413>.

<http://med.stanford.edu/ism/2012/march/math.html>

# **HOW I TEACH FRACTIONS IN THE INTERMEDIATE PHASE WHEN THE LANGUAGE OF LEARNING AND TEACHING (LOLT) IS ENGLISH AND THE LEARNERS' HOME LANGUAGE IS NOT ENGLISH**

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*In 2004, Myburgh et al. reported that where learners do not speak the language of instruction, authentic teaching and learning cannot take place. The Department of Basic Education agrees and states that such a situation largely accounts for the school ineffectiveness and low academic achievement experienced by students in Africa (DBE, 2010). We feel that since the LOLT in Intermediate Phase Mathematics is English in many schools in South Africa, it is important that teachers have the necessary tools to support and assist their learners in this crucial phase.*

## **INTRODUCTION**

In this lesson we focus on fractions. We believe that introducing English terminology on fractions in Grade 4 should be done slowly, with plenty of repetition and with the use as many interesting visual resources as possible.

## **SIX THINGS TO CONSIDER BEFORE YOU START A LESSON**

1. Make sure you explain to learners why it is important to learn about fractions. Use pictures or props wherever possible. For example:
  - Fractions are important because we encounter them in our everyday lives:
    - Fractions are used in time, such as quarter past, half past, half a day, quarter of a year. Show them a clock face to illustrate some of these times.
    - When cooking and baking we measure ingredients using words like: half a dozen eggs, half of a tablespoon, a quarter of a cup.
    - In shops we often see signs that say 'Half price sale!'
2. Reinforce vocabulary in order to boost their language development. For example, go through these words one at a time explaining each one and illustrating each word using pictures or drawings wherever possible:

whole number, half, double, quarter, third, tenth, divide, share, equal parts, denominator, numerator, common fraction, proper fraction, mixed fraction, equivalent fraction
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3. Use visual resources that will make it easier for the learners to understand the concepts you are trying to explain. For example:
  - laminated fraction strips
  - different coloured shapes cut into fractions and labelled
  - fraction walls and number lines
  - flash cards with fraction notation and words
  - pictures of everyday objects that can be divided into fractions.
4. Explicitly teach thinking skills rather than have learners rote learn the subject. Remember that learners should be exposed to different types of questions that will make them think creatively, even if they haven't yet mastered the language. For example:
  - '54 ÷ 6 = 9' **or** '54 sweets shared between 6 children'.
  - '54 ÷ 2 = 27' **or** 'Halve 54' **or** 'What is half of 54?'
  - Ask learners: 'Why are  $\frac{1}{2}$  and  $\frac{5}{10}$  the same?' Instead of asking them 'Which fraction is equivalent to  $\frac{5}{10}$ ?'
5. Construct a multiple meaning bank that will help learners know a question whichever way it is been posed. For example:
  - 'What is one fourth of twelve?' **or** 'What is a quarter of twelve?'
6. Use collaborative learning strategies to help learners to learn from each other. For example:
  - The way your learners sit in class should be determined by the kind of activity you will be doing. If you have been teaching a lesson that is difficult for some learners to grasp, mix those who struggle with those who have understood the lesson well and let them help each other.

## THE LESSON

### Lesson objectives

*NB: You may not get through all of these objectives in one lesson. Be aware of whether learners are keeping up and teach at the correct pace for your learners.*

At the end of the lesson learners will be able to:

- understand prerequisite knowledge using new terminology in English, i.e. sharing and fractions

- define fraction, numerator and denominator (in English)
- identify the number of shaded parts and the number of equal parts in a shape
- recognise and write a fraction using mathematical notation and using words
- determine if two fractions are equivalent using shapes
- add fractions with the same denominators.

### **Starting off**

Show learners a bar of chocolate (or any other physical resource that can be divided in different ways) and ask them: ‘If I have one bar of chocolate and I want to give it to two children, what should I do to make sure that each child gets an equal share?’ Illustrate these using two learners in the class, or using pictures or drawings.

Then discuss: ‘If I want to give the same bar of chocolate to three children, how will I make sure that each child gets an equal share?’

And lastly: ‘If I want to give the same bar of chocolate to four children, how will I make sure that each one gets an equal share?’

Write down answers as they give them to you.

Once you’ve written all the answers down, ask the learners how they worked out their answers and discuss them together. If learners do not easily come up with the correct answers, make representations of the chocolate using cardboard or paper, cut the drawing up into pieces and share the pieces between the children.

### **Class Activities**

1. Divide your learners into groups and give each group one bar of chocolate (or any other physical resource that can be divided in different ways). Make sure the chocolate can be divided equally amongst the number of children in the group but try to have groups of different sizes (for example, if you have bars of chocolate that have 12 pieces, divide the learners into groups of 2, 3, 4 and 6). See how they share the chocolate you have given them. Make sure that each child in a group gets an equal share of the group’s chocolate.

Then ask them to look at the pieces they have shared and talk in their groups about what fraction each member of the group has. Then ask different groups to compare how the chocolates have been divided

differently. Discuss who got the biggest portion and why. (This will be determined by the number of learners in the group – if there were many learners in a group, each learner will get a smaller fraction of the chocolate.)

Ask one learner from each group to come to the front of the class with their pieces and then ask the rest of the learners to arrange them from most to least (biggest fraction of the whole to smallest fraction of the whole), according to the pieces they have in their hands. Let them discuss which fraction is bigger and which fraction is smaller.

- Write a fraction on the board, or hold up a fraction card for everyone to see and ask them if they know what this is called. (For example:  $\frac{1}{2}$ )

**Expected answer:** Fraction







Then ask them to explain what a fraction is.

**Expected answer:** A fraction is a part of a whole.

Tell learners that in fraction we have two numbers. Ask them if anyone can tell you what these numbers are called.

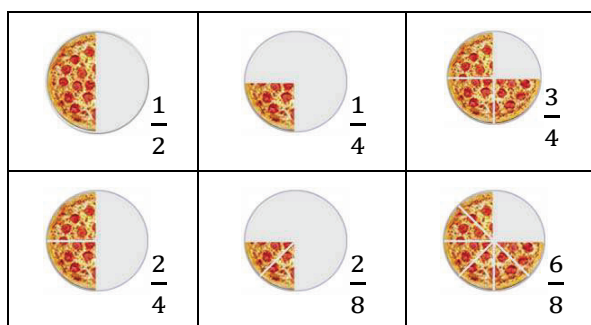
**Expected answer:** The top number is called the numerator and the bottom number is called the denominator.

- Show learners some shapes with shaded parts and ask them to tell you which fractions they represent. Make sure that learners can match the fractions in fraction notation and also in words. For example:

					
$\frac{1}{2}$ one half	$\frac{1}{4}$ one quarter	$\frac{3}{8}$ three eighths	$\frac{2}{4}$ two quarters	$\frac{4}{8}$ four eighths	$\frac{3}{4}$ three quarters



Ask your learners to look at the fractions below and say which ones they think are different but have the same value. Tell them that these fractions are called equivalent fractions. Give them a chance to choose those fractions that are equivalent to each other. For example:



4. Ask your learners if they know how to add fractions together. Go over the difference between the numerator and the denominator of a fraction again. Then explain that they can only add fractions together when the denominators are the same. Show them physical examples or drawings so that they understand why this is the case. Then show them this example:

$$\frac{5}{10} + \frac{3}{10} = ?$$

The denominators are the same, so we can add the numerators.

- Add the top numbers and put the answer over the denominator.

$$= \frac{5 + 3}{10} = \frac{8}{10}$$

Illustrate this by counting fraction pieces, colouring in drawings as you count, or ‘hopping’ in eighths on a number line. Do not expect learners to grasp the notation straight away. Use many examples to show them how to do this.

### ADDITIONAL NOTES AND TIPS

- Explain terms in English using simple language wherever possible.
- Use as many visual resources as you can, including physical resources that learners can manipulate using their hands.
- Use a class test to find out what learners know and what they don’t know, and immediately intervene as soon as you discover problems.
- Talk to the parents of learners who are struggling. The best is to call a group of parents in and show them how to help their children at home. If they are unable to help, advise them to ask trustworthy friends, family members or even an older learner to help their child after school.

- Encourage learners to talk about how they got to their answers so that you can easily find mistakes and misunderstandings they may have.
- Be sensitive and take extra care considering those learners who find fractions difficult and frustrating. Always be patient with these learners. It is much better and easier for you if learners love the subject rather than hate it.
- Praise learners for each little improvement they show and always tell them how great they can be if they practise working with fractions everyday.
- Many learners and teachers think of fractions as the most difficult area to understand in Mathematics. Try to keep your lesson positive and make sure that learners believe that they **can** do it. Always try to make learning fractions fun and easy.
- Try to bring sweets, chocolates, pizzas or biscuits to work with in class, and let learners share them at the end of the lesson.

## **REFERENCES**

Department of Basic Education. 2010. The status of the language of learning and teaching (LOLT) in South African public schools.

Myburgh, O., Poggenpoel, M. and Van Rensburg, W. 2004. Learners' experience of teaching and learning in a second or third language. *Education*, 124(3): 573.