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Supporting Mathematics Teachers Two Sample workshops

Mathematical content will be based around a KS3& KS 4 talk Algebra

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- We begin with a warm-up exercise

- For this workshop you have

1) A folder with all the handouts and slides
2) A Learning Journal, with signposts through the workshop. Please complete parts of this as you wish to.

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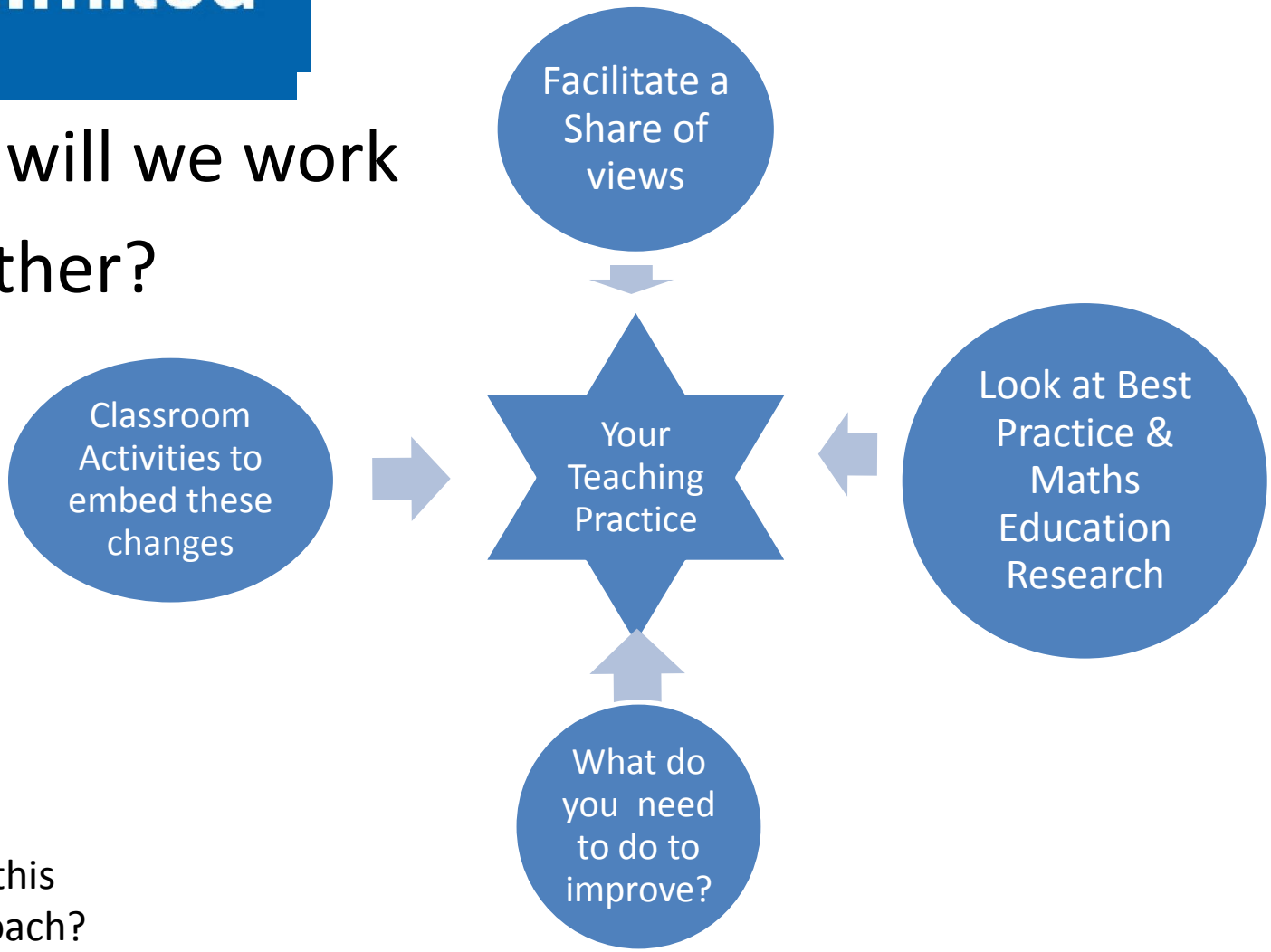
How will we work Together?



Why this approach?

Workshop A (Sample)

Review of the Art of *Effective* Mathematics Teaching – with Learning and Raising Attainment Levels at its Heart

- Discussion topics – we'll deliver this talk using Algebra as a topic to focus on.

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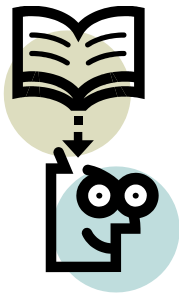
Workshop A

- **Discussion topics – in pairs/small groups** – we'll draw this together at the end (decide which one of you will report back – one of your members: please make a few notes.) Our icon for "Discuss & take notes"



1. What makes an effective Mathematics teacher?
2. What hinders a teacher from teaching Mathematics effectively?
3. What are your strengths and weaknesses as a Maths Teacher?
4. Your introductory Questionnaire.
5. Give us an example of a recent class/topic that you're very proud of – explain why.

   REVIEW - is there a consensus in your school of what effective teaching is? Record this in your Learning Journal

   This will help to give us a focus and direction for the workshop, tailored to where your department and you are at the moment.

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Workshop A

Research feedback

Research Comment 1 : Clarke (1997) identified 12 factors that appeared to influence the change process in Mathematical Teaching

(a) the reform movement in teaching in general;
(b) the School Principal/Head and school community;
(c) internal support staff;
(d) the spirit of collegiality, collaboration, and experimentation;
(e) the grade/level team of teachers;
(f) innovative curriculum materials;
(g) the in-service training program;
(h) external support personnel;
(i) the researcher acting as a participant observer and critical friend;
(j) outcomes valued by the teacher;
(k) day-to-day conditions under which teachers work; and
(l) teacher knowledge.

Any Comments?

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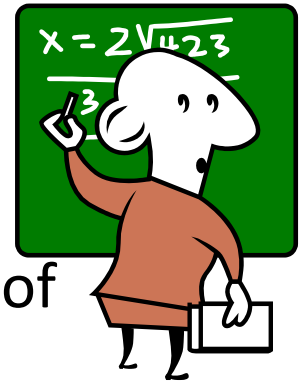
Research feedback



Research Comment 2 :

There are 3 principle elements that lie at the heart of **Effective Mathematics Teaching**

- Teacher's Mathematical knowledge;
- Teacher's belief about mathematics (and how it's learnt)
- What a teacher understands about teaching and learning

These 3 elements are critical and form the basis of what influence's how effective a teacher is in the classroom. (Anthony & Walshaw 2007).

With this is mind, in this workshop we look at

1. Mathematical Knowledge –Algebra as a language and at the core of understanding & learning mathematics.
- 2. Pedagogical Style – Co-operative & Collaborative Learning in Mathematics – and how this can raise attainment levels

(See Webb et al (2008), Gillies & Khan (2008).)

- Algebra at the Heart of Understanding & Learning Mathematics
  - We'll look at the hierarchy of how algebra develops – see notes accompany this workshop – and related classroom activities.
- Why Algebra? - 3 major reasons
  - A) The language of mathematics, may help weaker students see maths differently, to reassess their view of it. (cf Watson 2010)…..

Pedagogical Style : Co-operative & Collaborative Learning in Mathematics ….new lessons for the classroom

Teachers tend to offer two types of help :

Product Help &

Process Help

- The research studies looked at what the effect was on their outcomes (attainments).
- The pertinent question was, using Pre and post tests to evaluate this, did these students raise their level of attainment? YES!!!

Pijls & Dekker, (2011)

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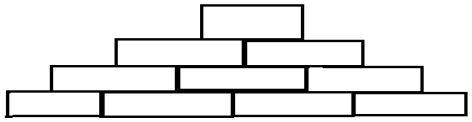
Sample Classroom Activity 1 Castles KS3



- Enter numbers in the bottom row boxes.
- Add 2 adjacent boxes to find the number in the box above.....continue to the top.
- What's the relationship between the bottom row and the top?
- With the **same numbers**, make more castles.....find the **highest & lowest castle**.
- Make some castles with a **new set of numbers**.....find highest & lowest. Use some positive and some negative numbers.
- Is there **a Rule** to give the highest / lowest?
- Try castles with 3 numbers, 5 numbers, etc

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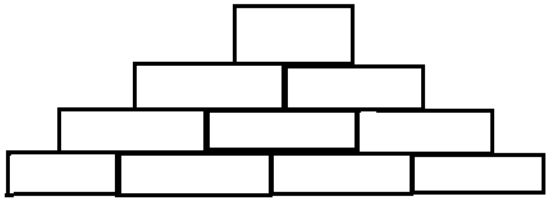
Workshop A&B



Activity 1 Castles KS4

- Enter numbers in the bottom row boxes.
- Add 2 adjacent boxes to find the number in the box above.....continue to the top.
- What's the relationship between the sum of the bottom row and the peak?
- Now enter a, b , c and d in the bottom row. Complete the rest of the boxes.
- **We say this castle has 4 base boxes and is 4 levels high.**
- Repeat this for castles with 3, and 5 base boxes.
- Put your results into the table below. What do you notice?

Number Base Boxes	Number of Levels	Base Total	Peak box
2	2	a+b	a+b
3			
4			
5			

Sample Workshop B

Switching On Students to engage and learn mathematics – looking at setting mathematics into every day contexts

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Workshop B

- **Part 1 : Adolescent behaviour :**

= Development of identity, understanding themselves & the world, belonging, being heard, being supported, feeling powerful, being able to argue in ways which makes adults listen.

Acted out through : Engagement with peers, beginning to self-analysis and analysis of situations, internalisation of social consciousness,

- May give impression of "don't care" ….why?
- Emotional investment in success, will lead to low self-esteem if they fail, so to avoid being upset,….
- (See Watson (2010).)

Part 2 : Adolescent engagement :

Studies point to the importance of basing teaching strategies which aim at increasing motivational effort of the KS3/4 group on providing a classroom climate in which the following 4 characteristics are evident :

a) teacher is highly supportive,
b) the work is both challenging and enjoyable,
C) there is a high level of cooperation among the pupils,
d) all the pupils feel equally valued by the teacher.

(See Kyriacou and Goulding, 2006).

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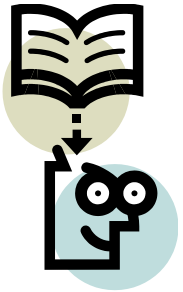
Workshop B



Adolescent Engagement in the classroom :

Task

- What practical steps can you do to focus on these aspects in your teaching?
- Feedback to the group
- In light of this how might this affect the following:

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Part 3. Recap of Teaching Theory – how do pupils learn Mathematics and how to engage pupils -

Recap of RICH Tasks - why?

A) Creating a stimulating learning environment

B) Motivation

- Intrinsic motivation[2] – including personal factors that make pupils want to learn – 5 levels [3][See ch 3.]
- Extrinsic motivation[2]
- C) Learning Theories (including Bloom)
- D) Learning Styles – recap, link to Maths teaching

(eg. Hinchliff, & Clausen-May)

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Part 4. Setting Mathematics in an everyday context

- Strategies to do this

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5. Follow up

We will review with you how progress with implementing these ideas are going

- half a term after the workshop
- 2 terms after the workshop

To ensure your success.

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References

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11. C. Kyriacou & M. Goulding , *A systematic review of strategies to raise pupil's motivational effort in Key Stage 4 Mathematics,* 2006, EPPI Social Science Research unit, Institute of Education, University of London.
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13. Jeremy Hodgen & KCL's Research project "Increasing Competence and Confidence in Algebra & Multiplicative structures (ICCAMS)" see www.kcl.ac.uk/sspp/deapartments/education/research/crestem/merg/currentresearch/iccams.apx 2012
14. C. Morgan, A. Watson and C Tickly ***Mathematics (Teaching School Subjects 11-19)*, 2004, Routledge Falmour.**

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Sample References

Useful Mathematics Web Resources

http://www.cmtp.co.uk/ *KS3 Maths project*

http://www.atm.org.uk/ Association of Mathematics Teachers

http://www.ncetm.org.uk/ National Centre for Excellence in Teaching Mathematics

http://www-history.mcs.st-andrews.ac.uk/history/ History of Mathematics Archive

http://www.lms.ac.uk/ London Mathematical Society