

# Effectively Teaching Mathematics

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## Learn from the best.

In much of the western world mathematics teaching follows a format: The teacher instructs the students; the teacher solves sample problems with the class; the students practise on their own while the teacher assists individuals.

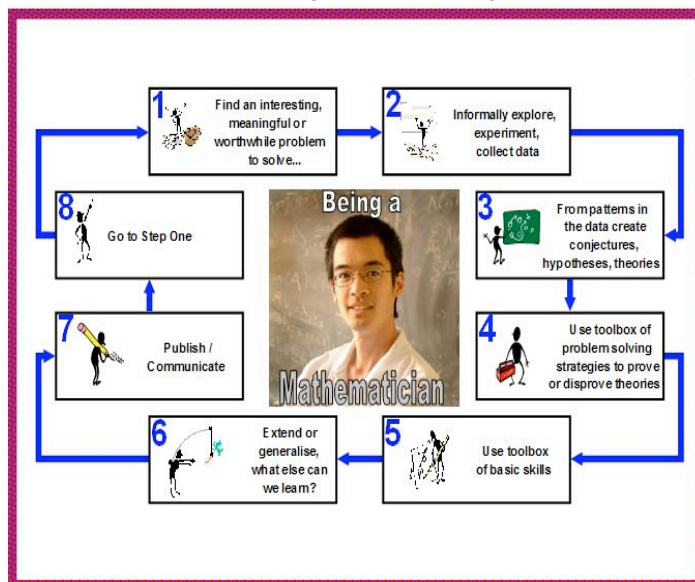
In Asia, a different format is followed: The teacher poses a complex, thought provoking problem; students work together to grapple with the problem; various students explain ideas or solutions to the class; the class discusses the best approaches; the teacher summarises the class conclusions and the students then practise similar problems.

Guess which part of the world leads in mathematics?

## Develop thinking, reasoning and communicating skills.

Develop 'number sense' and 'algebraic reasoning', thinking and reasoning skills rather than rote algorithmic skills. Encourage students to disclose their own understanding of what they have learned and allow them to show connections between the concepts they have learned. Include student explanation of their thinking and reasoning as an integral part of many lessons.

Contain a vision of 'working mathematically'.



## Seven Tips for Highly Effective Mathematics Teachers

1. Identify the big ideas that underpin the concepts you are trying to teach.
2. Build on what students know mathematically and in life, creating and connecting students with stories that contextualize the learning.
3. Use rich, challenging tasks that engage students and provide them with some choice.
4. Employ a full, rich array of assessment strategies to assist the monitoring of student learning.
5. Use teaching methods that encourage understanding, thinking, reasoning and communicating, and use student reporting as a learning opportunity.
6. Interact with the students while they engage in the learning experiences so that you can assist and challenge as necessary.
7. Use strategies to develop fluency – practice, reinforcement and prompting transfer of skills.

**Seek genuine understanding**

Do not provide rules without meaning (Turn it upside down and multiply! Do the same to both sides!, Two minuses make a plus!, Put down a zero! What senses do our students make of these rules? Very little!) Focus on connections, generalisation and transfer.

**Highlight interdisciplinary connections.**

Establish ways in which to transfer learning to other areas of mathematics or connect with another discipline, such as Geography, Science, History, Global/Local/Social issues etc. The numeracy outcomes should be considered to connect mathematical learning to other learning areas.

**Consider mathematical literacy.**

Mathematics contains its own language and just like any new language it needs to be taught to students. Be consistent with the language used and try to relate it back to students' lives by using non-mathematical language to explain new ideas and concepts.

**Use meaningful contexts.**

There are many ways to seek making connections and providing a relevant context for learning. Identify any vocational, recreational, preparatory, local, social issue, cultural, historical, scientific, technological, creative, artistic, aesthetic, macro, micro, personal, humorous, current events or literary aspects that relate to the content. Exploit these opportunities fully. Surround the lesson in a story to ensure the context is interesting and meaningful.

**Develop a toolbox of algorithmic content skills.**

Identify what mathematical content ideas and concepts are evident within the lesson. Develop and practise the skills needed to succeed in the outcomes of the lesson. Encourage fluency of mathematical skills. Consider the background knowledge which students are likely to bring, how to establish this, and likely responses, including the difficulties, students will make.

**Cater for student diversity.**

Design the lesson to cater for the whole of the 'seven-year gap' with multiple entry and exit points, multiple levels of success and challenge. Develop strategies to provide access for all students. Think about what enabling and extension prompts you might use.

**Cater for varied learning styles.**

Think about the possibilities of involving students physically, using a simulation role play, how the visual aspects of the lesson can be exploited, how you can make it personal to the students, whether the lesson could be conducted successfully outside, whether it would be more effective as a cooperative group challenge, whether it can be made concrete or if there is a musical element that could be incorporated.

**Use a variety of teaching strategies.**

Make the tasks open-ended and investigative in nature. Inject choice to allow student self-responsibility and ownership. Ask yourself would the lesson benefit from a cooperative approach or would direct teaching suit this situation? Consider how you might include an estimation component in the lesson.

**Lead towards the notion of 'informed citizenship'.**

Highlight social messages and linkages to real world issues wherever possible. Look for a social/local/global context in which the lesson can be placed. Provide opportunities for students to interpret meaningful data. Consider the numeracy issues in the real world.

**Effectively use ICT support.**

Consider how the use of technology could improve the lesson. Establish how the technology links to the classroom task and student learning. Ask yourself is it good pedagogy, or just electronic wizardry? Examine the possibility of modelling real life situations using technology. Good use of technology is when it does things that essentially cannot be done in other ways.