Engaging your VCAL students in maths and numeracy

Dave Tout, ACER
Chris Tully, Kangan Batman TAFE

For starters

Questions on your back activity

Rules:

- You are not to read the question on your back.
- You are to ask five different people to give you an answer to the question on your back.
- Record the person’s name and their answer.
- When you have five answers you can sit down and take the question off your back.
- Find the other people with the same question. Together make sure you have collected the answers to your question from everyone in the room. Collate the responses and represent the results ready for presentation back to the whole group.
Why is maths vital?
Why is maths vital?

The square root of 9 is 3.

A) True.
B) False.
C) Who cares?
Is there a problem?

- Yes – e.g. Peter Sullivan last week
- And other research – ALLS, PISA, MYNP, TIMSS

For example - TIMSS

Trends in International Mathematics and Science Study (TIMSS) (Hollingsworth, Lokan & McCrae, 2003), an international study based on videos of mathematics classroom practice. As reported in this study, McIntosh describes a typical Australian Year 8 mathematics lesson as:

The teacher talks a lot, the students mainly reply with very few words, most of the time the students work, using only paper and pencil, on a repetitive set of low level problems, most presented via the board or textbooks or worksheets; discussion of solutions is mainly limited to giving the right answer or going through the one procedure taught. There is little or no opportunity for students to explain their thinking, to have a choice of solution methods or to realise that alternative solution methods are possible, and very few connections are drawn out between mathematical ideas, facts and procedures.

(McIntosh, 2003, p. 108).

So we (should) know what NOT to do!
VCAL students

- At the top of the list of those disengaged from maths
- Negative - assume failure
- Lacking in confidence
- Have not experienced much hands on maths or undertaking projects/investigations
- Need to show them how maths can be useful (and fun?)
- But need to change their attitudes about what maths is or can be.

Teaching numeracy/mathematics

But do we know what we should do to have more success and engage more learners?

Yes, for example, Jo Boaler’s research. The main benefits for the students (aged 13 to 16) that came from the “non-text book” school included:

- Positive attitudes to maths—lack of mathematics anxiety, and students enjoyed their maths.
- Transferability of mathematics skills. These students understood and could apply their mathematics inside and outside the classroom.
- Skills remained with them.
- Little or no underachievement or anxiety for girls.
- Still successful academically on tests.
The results of their review (for secondary school maths ages 12-18) show that:

- the most successful programmes focus on **changing daily teaching practices**, particularly the use of **co-operative learning methods**
- the most successful programmes **encourage student interaction**.

But do we know what we should do?

**Grouws & Cebulla (2000) research-based principles:**
1. Opportunity to learn
2. Focus on meaning
3. Learning new concepts and skills while solving problems
4. Opportunities for both invention and practice
5. Openness to student solution methods and student interaction
6. Small-group learning
7. Whole-class discussion
8. Number sense
9. Concrete materials
10. Students’ use of calculators
Teaching numeracy

- Teach in context – connect to the real world – use real texts and real situations – use relevant and interesting topics and themes (the world is rich in maths) to engage students
- Teach the meaning of the maths – why and how it works
- Use a problem solving, investigative, open-ended approach (can utilise the value of the internet)
- Use different strategies and activities – cater for different learning styles – support and encourage students’ ways of doing
- Use individual, small and whole group activities

Teaching numeracy

- Make the maths skills explicit – including to teach how to excavate them from the text/context
- Scaffold and model – support the learners
- Assess appropriately using the above approaches – use technology: blogs, digital photos, movies & stories, webpages, posters, project materials and outcomes, journals & diaries
- Connect language and maths – talk maths - crucial
- Build confidence – have fun and success!
What maths is out there?
Numeracy counts too

Baby Drops Colourfree

<table>
<thead>
<tr>
<th>Age</th>
<th>Average Weight</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3 month</td>
<td>4 - 6 kg</td>
<td>0.6 - 0.9 ml</td>
</tr>
<tr>
<td>3 - 6 month</td>
<td>6 - 8 kg</td>
<td>0.9 - 1.2 ml</td>
</tr>
<tr>
<td>6 - 12 month</td>
<td>8 - 10 kg</td>
<td>1.2 - 1.5 ml</td>
</tr>
<tr>
<td>1 - 2 years</td>
<td>10 - 12 kg</td>
<td>1.5 - 1.8 ml</td>
</tr>
</tbody>
</table>

Elixir & Colourfree Suspension 1-5 Yrs

<table>
<thead>
<tr>
<th>Age</th>
<th>Average Weight</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2 years</td>
<td>10 - 12 kg</td>
<td>6 - 8 ml</td>
</tr>
<tr>
<td>2 - 3 years</td>
<td>12 - 14 kg</td>
<td>8 - 9 ml</td>
</tr>
<tr>
<td>3 - 4 years</td>
<td>14 - 16 kg</td>
<td>9 - 10 ml</td>
</tr>
<tr>
<td>4 - 5 years</td>
<td>16 - 18 kg</td>
<td>10 - 11 ml</td>
</tr>
<tr>
<td>5 years</td>
<td>18 - 20 kg</td>
<td>11 - 13 ml</td>
</tr>
</tbody>
</table>

Elixir & Colourfree Suspension 5-12 Yrs

<table>
<thead>
<tr>
<th>Age</th>
<th>Average Weight</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 6 years</td>
<td>18 - 20 kg</td>
<td>6 ml</td>
</tr>
<tr>
<td>6 - 7 years</td>
<td>20 - 22 kg</td>
<td>6 - 7 ml</td>
</tr>
<tr>
<td>7 - 8 years</td>
<td>22 - 24 kg</td>
<td>7 - 8 ml</td>
</tr>
<tr>
<td>8 - 9 years</td>
<td>24 - 26 kg</td>
<td>8 - 9 ml</td>
</tr>
<tr>
<td>9 - 10 years</td>
<td>26 - 28 kg</td>
<td>9 - 10 ml</td>
</tr>
<tr>
<td>10 - 11 years</td>
<td>28 - 30 kg</td>
<td>10 - 11 ml</td>
</tr>
<tr>
<td>11 - 12 years</td>
<td>32 - 35 kg</td>
<td>11 - 13 ml</td>
</tr>
</tbody>
</table>

Numeracy counts in the workplace

And in workplaces they use:
- Measurement, including of areas and volumes
- Numbers in all forms – whole, fractions, decimals, percentages
- Quantities – rates, $/m, $/m³ etc
- Statistics – tables, graphs, averages
- Geometry and shapes
- And yes, they do use algebra!!