








## Relational vs Instrumental Understanding of Mathematics: Does it Matter?

Child Teacher	Instrumental Understanding	Relational Understanding
<b>Instrumental Understanding</b>	<p> <b>Short-term effect:</b> All appears well as there is a match between child and teacher goals. Child and teacher 'does' Maths. Child does not know if their answer is correct until the teacher tells them.</p> <p> <b>Long-term effect:</b> The child learns ever more rules, developing shallow understanding of mathematical concepts, causing problems when a question does not fit a 'rule' Child may continue to study Maths to pass a test but drops Maths as soon as they can.</p>	<p> <b>Short Term Effect:</b> Child tries to understand relationally that which is being taught instrumentally... . Child tries to develop deep understanding of concepts that are being taught shallowly</p> <p> <b>Long Term Effect:</b> Child feels that they are not smart enough to understand mathematics... , disengages... , drops Maths as soon as they can... , tells their children they can't do Maths...</p> <p>Current curriculums are designed to teach relational understanding... are they being taught just as instrumentally as the curriculum they replaced?</p>
<b>Relational Understanding</b>	<p> <b>Short-term effect:</b> Frustration for teacher – child doesn't want to know why... Frustration for the child – 'just tell me how to 'do' it!'</p> <p> <b>Long-term effect:</b> Child (and teacher) develop their relational understanding of mathematics. Child continues to study Maths and works in a Mathematics related career</p>	<p> <b>Short Term Effect:</b> Child and teacher develop deep understanding of both what to do and why</p> <p><b>Long Term Effect:</b> Child and teacher develop relational understanding of mathematical concepts. Child continues to study Mathematics, builds a career in a mathematics related field and saves the world!</p>

**Richard R Skemp** believed that children could learn intelligently from a young age. He defined two ways of teaching and learning which he called Instrumental Understanding and Relational Understanding.

**Instrumental Understanding** he described as the possession of a rule and the ability to use it. For example, knowing that  $\text{area} = \text{length} \times \text{breadth}$  means that if you multiply the length of a shape by its width, you will get the area. This is all very well until a child needs to find the area of a shape other than a rectangle. Then a new rule is needed.

**Relational Understanding** he described as knowing both what to do and why. For example, knowing that  $\text{area} = \text{length} \times \text{breadth}$  because the area is made up of an array of squares and to find the total number of squares we can multiply the number of squares in each row (length) by the number of rows (width). Relating area to arrays allows a student to apply this relational understanding to find areas of shapes other than rectangles.

Skemp took his research further, asking the question, does it matter whether children learn Mathematics instrumentally or relationally? This table provides an answer by investigating the effect on learning of the possible combinations of teaching and learning instrumentally or relationally.

Research (and common sense!) says yes, it does matter whether children learn Mathematics instrumentally or relationally!

Relational teaching and learning develop and use higher order thinking! The worldwide shortage of mathematicians (and therefore scientists) is a result of Mathematics being taught instrumentally. Even the majority of students who do well at Mathematics at secondary level, do not take Mathematics at tertiary level! This is a sure sign that they had instrumental, rather than relational understanding. All children want to understand Mathematics (indeed, everyone wants to understand everything they learn!), but if the Mathematics is taught instrumentally this is improbable - if not impossible!