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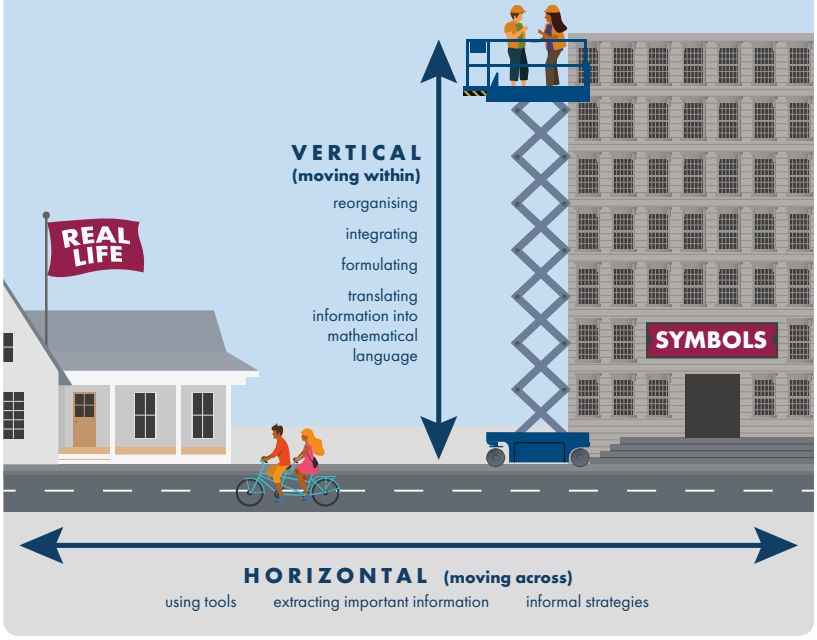
TALKING POINT:

WHAT ARE THE ISSUES SURROUNDING THE USE OF REALISTIC CONTEXTS IN THE MATHEMATICS CLASSROOM?

IN SUMMARY

- The Dutch approach of Realistic Mathematics Education (RME) suggests that in order for students to grasp mathematics it must be connected to their life experiences
- Cross-cultural evidence suggests positive effects of RME on both learners and teachers, including: greater interest in and valuing of maths; development of mathematical competence; improved informal strategies and problem solving skills; enhanced performance in number; increased class discussion and meaning-making; and using context as a tool to motivate students
- Appropriate professional development opportunities should be available to teachers in order to increase awareness of and support for RME strategies
- There is a need to investigate whether RME-type problems are aligned with certain types of assessment, such as GCSE maths
- Evidence suggests RME is best used as a long-term approach rather than a series of one-off lessons or activities

Horizontal and vertical mathematising



Adapted from Tressler (1978), Freudenthal (1991) & Barnes (2005)

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The question of how we can help students understand formal mathematics has challenged many teachers and academics[1]. Putting problems into 'real' contexts is an important part of Realistic Mathematics Education (RME)[1]. First developed by Freudenthal and colleagues in the early 1970s, RME suggests that to have value, mathematics learning should be connected to individuals' real life experience[2]. Students should learn mathematics from contexts they have experienced, as this allows them to build their own understanding of problem situations rather than beginning with algorithms and formulae[3]. For example, if working with percentages, students could shade in a proportion of a rectangle to represent the percentage of occupied seats in a school theatre[4] or use everyday items to demonstrate volume[6]. There are two ways that learners mathematise (grasp mathematics): horizontal mathematisation and vertical mathematisation (see infographic)[5]. As part of this approach, emphasis is placed on making sense and gradually refining students' informal procedures rather than teaching formal mathematics early on[6].

IMPLICATIONS: Using real life examples situated in students' own experiences can help students to engage with mathematical ideas

Students should have opportunities to grasp mathematics from real-life to symbolic thinking (horizontally) and within symbolic thinking (vertically)

Students may start with informal ways of solving maths problems and gradually transition to more formal mathematics

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Although the majority of research into RME comes from the Netherlands, there is some evidence of its impact from other countries. A study in Turkey showed that RME can increase students' interest in and valuing of mathematics[7]. Research in Greece indicated that RME can contribute to the development of mathematical competence in 4 and 6 year-old students[7]. A UK study on older (11-13 year-old) students found evidence of RME approaches empowering students to develop informal strategies, and helping to improve mathematical problem solving skills[8]. Another report found that GCSE resit students were responsive to RME, performed better in a unit on number, and engaged in more class discussion and meaning-making than the control group[9]. Teachers involved in a UK project exploring RME generally agreed that students were more positive about maths when taught using RME strategies compared to those taught with more traditional methods[10]. Furthermore, a UK-based study of fourteen teachers involved in a trial of RME from 2010 to 2013 found that teachers were very positive about using context as a motivational tool and as a memorable point of reference after a module was completed. Interviewed teachers described both themselves and their students as using the language of context to create imagery related to tasks[11].

IMPLICATIONS: Research across different countries has found that RME can: increase students' interest in mathematics; encourage class discussion; develop mathematical competence; and encourage more positive attitudes towards maths

Evidence suggests that the use of context can act as a motivational tool and a memorable point of reference at the end of a module

3

In the UK, some concern has been expressed over whether RME-type problems are compatible with questions in public examinations[6]. Whilst problem solving is emphasised in the new national curriculum in England, no evidence yet exists to demonstrate whether RME prepares students well for problem solving-type questions[6] and schools may need guidance on how to tackle such examination questions[12]. RME aims to build a deeper comprehension of mathematics and therefore may take longer than more traditional methods. UK teachers have expressed concern about using RME methods particularly in the GCSE resit course, which is usually only 8 months long[9]. There is a need for professional development to raise teachers' awareness of RME and its benefits and to encourage teachers to think about how to incorporate RME methods into lessons effectively[9].

IMPLICATIONS: RME-type problems may not be well aligned with some types of assessment

Appropriate training opportunities should be available to teachers in order to increase awareness of and support for RME strategies

RME methods aim to build a deeper comprehension of mathematics, therefore can take longer than more traditional methods, which may be a challenge especially in short courses

'What humans have to learn is not mathematics as a closed system, but rather as an activity, the process of mathematizing reality and if possible even that of mathematizing mathematics'

Freudenthal, 1968

'The maths is all "out there", it just needs presenting to the pupils carefully and thoughtfully'

Dickinson & Hough, 2012

Dominika Majewska, 2019

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