**'Rich Tasks and Contexts' printed from http://nrich.maths.org/**

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*A series of professional development resources designed to support embedding rich tasks into the KS1/2 curriculum can be found* *[here](http://nrich.maths.org/public/viewer.php?obj_id=6089&part=)* .

I have read a number of articles which reference "rich tasks" recently but none of them really seems to tell me what the person writing thinks a "rich task" is. I have found this somewhat frustrating and then it dawned on me that the NRICH website is full of things we would describe as "rich tasks" or problems but, like many other writers, we have not said explicitly what we might mean by "good problems" or "rich tasks". So, what are "rich tasks" and why are they important?

I would describe a rich task as having a range of characteristics that together offer different opportunities to meet the different needs of learners at different times. What is also apparent to me is that much of what it takes to make a rich task "rich" is the environment in which it is presented, which includes the support and questioning that is used by the teacher and the roles that learners are encouraged to adopt. That is, an environment in which learners are not passive recipients of knowledge, accepting what is given, but independent assertive constructors of their own understanding who challenge and reflect. On its own a rich task is not rich - it is only what is made of it that allows it to fulfil its potential. With this in mind it might still be useful to list some of the things I might say when describing a rich task. Rich tasks (or good problems):

* are accessible to a wide range of learners,
* might be set in contexts which draw the learner into the mathematics either because the starting point is intriguing or the mathematics that emerges is intriguing,
* are accessible and offer opportunities for initial success, challenging the learners to think for themselves,
* offer different levels of challenge, but at whatever the learner's level there is a real challenge involved and thus there is also the potential to extend those who need and demand more (low threshold - high ceiling tasks),
* allow for learners to pose their own problems,
* allow for different methods and different responses (different starting points, different middles and different ends),
* offer opportunities to identify elegant or efficient solutions,
* have the potential to broaden students' skills and/or deepen and broaden mathematical content knowledge,
* encourage creativity and imaginative application of knowledge.
* have the potential for revealing patterns or lead to generalisations or unexpected results,
* have the potential to reveal underlying principles or make connections between areas of mathematics,
* encourage collaboration and discussion,
* encourage learners to develop confidence and independence as well as to become critical thinkers.

Not all rich tasks will do all of these things but they will certainly manage a number of them when used in a way which values discussion, difference and critical appraisal. It is for the teacher to look at a task and recognise its potential to meet some or all of the above and present it in a way and in a forum which makes it "rich".

In the guidance document "Mathematics at Key Stage 4: developing a scheme of work", the Secondary National Strategy describes a rich task as:

* accessible and extendable,
* one which allows learners to make decisions,
* involving learners in testing, proving, explaining, reflecting and interpreting,
* promoting discussion and communications,
* encouraging originality and invention,
* encouraging 'what if' and 'what if not' questions,
* enjoyable and contains the opportunity for surprise.

Additionally, page 20 of "Better Mathematics: A Curriculum Development Study", Afzal Ahmed of West Sussex Institute of Higher Education offered the following criteria for identifying a "Rich Mathematical Activity" in 1987:

* must be accessible to everyone at the start
* needs to allow further challenges and be extendible
* should invite children to make decisions
* should involve children in
	+ speculating
	+ hypothesis making and testing
	+ proving or explaining
	+ reflecting
	+ interpreting
* should not restrict children from searching in other directions
* should promote discussion and communication
* should encourage originality/invention
* should encourage "what if?" and "what if not?" questions
* should have an element of surprise
* should be enjoyable.

Both of these are remarkably similar lists to the one I started this article with and, like that first list, the above suggest that a rich task depends not only on the task itself but what is done with it. Rich tasks employed appropriately allow all learners to find something challenging, for their level, to work on.

It is possible for rich tasks to have at their core, the opportunity to develop an understanding of, explore or employ mathematical concepts that are part of the normal curriculum. Rich tasks and curriculum coverage or even testing are not at odds with each other. The nature of rich tasks gives learners the opportunity not only to question and develop their understandings of mathematical ideas but also to gain in confidence that they can apply their knowledge in a range of contexts, even unfamiliar ones. They also have the capacity to meet the needs of a functional mathematics curriculum.

Sometimes though, perhaps a better description would be "rich contexts". The context could be a problem but it could also be a series of related tasks or an open environment that is rich in many of the senses described above. An example of a rich environment on the NRICH site might be the [Geoboard environment](http://nrich.maths.org/public/viewer.php?obj_id=2883&part=2883) . A series of rich tasks might include the game " [square it](http://nrich.maths.org/public/viewer.php?obj_id=2526&part=2526) ", the problems " [square coordinates"](http://nrich.maths.org/public/viewer.php?obj_id=2667&part=2667) and " [tilted squares](http://nrich.maths.org/public/viewer.php?obj_id=2293&part=2293) ". These all consolidate and develop the idea of a square, link this idea with pattern and coordinates and Pythagoras' theorem. Pretty rich, and all based around drawing squares on a dotty grid!

To aid teachers in making decisions about what rich tasks to apply where, the NRICH website offers a number of support mechanisms:

* we publish rich tasks and contexts!
* we give notes and hints to help teachers to see some of the potential of the tasks or problems that we offer,
* we link all our problems to curriculum content themes,
* we are linking some problems directly to curriculum documents so that a "quick match" is possible.

But we are not telling teachers how to use the problems by giving detailed lesson plans and that is because the nature of a rich task involves "letting go" and preparing for the range of needs of your own learners and where they are likely to go. Any suggestion that we can begin to second guess what best serves the needs of the learners in every classroom would be misplaced. However, the following basic ideas may be useful to draw on when you are planning work with your learners :

* try to assess what your learners already know. Having said that, rich tasks offer opportunities to find out what they really do know and reveal the strengths, weaknesses and confidence levels of the learners working on the task. Rich tasks are definitely excellent tools to support assessment.
* have a view of the core requirement of your rich task - what is the minimum outcome you are hoping for? This will also lead you to consider some of the range of possible outcomes you might expect. But be prepared to be surprised - your learners are likely to come up with better ideas and questions than you can think of.
* be prepared to encourage persistence. This will be difficult if your pupils are not used to taking responsibility for their own learning but it will get easier as they become more familiar with the idea and gain in confidence. One way to do this is to respond to a plea for an answer with a question ... "What should I do next?" ... "What have you tried?"
* try not to lead learners down an alternative path because they have begun to explore an area of the topic you had not expected - and this may mean saying "I don't know". Learners can learn more from a task they think they 'own'.
* remember that learners can learn as much, and sometimes more, from their peers as from you.

In essence, rich tasks encourage children to think creatively, work logically, communicate ideas, synthesise their results, analyse different viewpoints, look for commonalities and evaluate findings. However, what we really need are rich classrooms: communities of enquiry and collaboration, promoting communication and imagination.

**References**

Secondary National Strategy, 2007, Mathematics at Key Stage 4: developing your scheme of work, DfES.