



Using Low Threshold High Ceiling Tasks in Ordinary Primary Classrooms

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We're not sure if we invented it, but here at NRICH the phrase 'Low threshold, high ceiling' (LTHC) has certainly become one of our favourites. We like to think that many of our tasks can be used in this way, and in many of the projects where we work with schools we take LTHC as the title. We thought therefore it would be a good idea to explore what LTHC means, and indicate which activities on the site are particularly good examples.

What does LTHC mean?

Imagine a room. The way in is unproblematic -- a few small steps and you're in. Once inside there are lots of possibilities for activity, many of them unproblematic too, others more challenging. In fact the only limit on your choice of activity is the space in the room, and the height to which you can rise. Well the analogy may be a bit contrived, but that's exactly what LTHC means. A LTHC mathematical activity is one which pretty well everyone in the group can begin, and then work on at their own level of engagement, but which has lots of possibilities for the participants to do much more challenging mathematics.

Why do we like LTHC?

We like LTHC activities because they promote a positive classroom culture -- one where the whole class does maths together. We know that for many learners, and particularly for those at the ends of the attainment spectrum, maths can be a lonely subject. When we visit ordinary classrooms we find, usually, two different types of organisation. The first is where the class is split into groups (often by attainment), each of which is engaged in a different activity. Sometimes all the groups are working on different parts of the same mathematical topic, but not always. It can often be difficult to feel part of a classroom community when you have no idea what the others are doing.

The other format is where everyone does the same, usually closed, activity. This time everyone knows what they are supposed to be doing, but those learners at either end of the spectrum either finish first and are bored, or get left behind and feel excluded. LTHC tasks offer activities which are suitable for pretty well everyone in an ordinary classroom, allowing the high flyers to explore and challenge themselves whilst the less confident can stay close to the original task and consolidate their learning. Everyone has a sense of what is going on, plenaries are much more meaningful and as they hear how others in the classroom have worked on the activity, learners often raise their game.



So another reason we like LTHC tasks is that they allow learners to show what they can do, not what they can't. As teachers it's very easy to predict how well our learners will cope with a particular piece of mathematics, and sometimes that prediction can be a self-fulfilling prophecy. When the ceiling is raised it can be surprising what heights learners can achieve.

The third reason we like LTHC tasks is that they offer many possibilities for learners to focus on more sophisticated process skills rather than more knowledge. It's often mistakenly thought that the only way to challenge learners is to offer them *content* at a higher level; in LTHC tasks the content often remains quite simple but the *level of thinking* required can become very sophisticated. If you don't believe it, try finding a winning strategy for Strike it Out.

We always write our tasks with an eye on the high ceiling. Often these ideas are offered in the task itself, but in the teachers' notes you'll find even more.

Primary classrooms

Strike it Out <http://nrich.maths.org/8016> is a LTHC game. The threshold activity is **number bonds to 20** and some children will stay at this level without engaging much with how you might win. Others will become very involved in **conjecturing** and **testing** possible winning strategies and there is even the possibility of some elegant **proving** that the challenge of crossing off all the numbers 0--20 (and 1--20) is not possible. Others can extend the line to **bigger numbers** or use **more advanced number systems** -- decimal fractions, or directed numbers for example.

Magic Vs <http://nrich.maths.org/6814> is another favourite primary task. The threshold is **counting to 15** as children try to make both sides of the V add up to the same number. Others will start to **recognise patterns** and begin to make **generalisations** about them. The high flyers will make up their own questions (what if ...) and **test their hypotheses**.

We enjoy hearing how teachers use our tasks. Do get in touch if you have ideas about other tasks that you have used in a Low Threshold High Ceiling way.