

Challenge: Always a good thing?

Fiona Curtis
University of Reading

The importance of providing students with challenge has become entrenched in our understanding of learning, set down as the first teaching standard and sought by Ofsted. But what do we mean by challenge? Challenge implies a testing task, a result of struggle. While struggle may be a path to learning for some, reproducing Piaget's idea of cognitive conflict as the precursor of change, I would argue that for many children mathematical struggle is not stimulating but threatening, and leads to the phenomenon of mathematics anxiety. This paper uses my doctoral research of six intervention sessions with each of four small groups to illustrate the reaction of low-attaining students to challenge. I find that the learning of algebraic concepts is hampered by feelings of panic and low self-esteem, and that the more challenging the material, the less appropriate the response. Improved results were achieved by reinforcing and developing students' understanding of unchallenging material, corresponding to Bryant's belief that confirming evidence is better for learning. The significance of this for teachers is to recognize that challenge is not universally positive, but developing unchallenging material by stealth can be preferable.

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Introduction

The notion of challenge is entrenched in our understanding of what it is to learn: the teaching standards require that teachers "set high expectations which inspire, motivate and challenge pupils" (DfE, 2011, standard 1); Ofsted investigate whether: "teaching engages and includes all pupils with work that is challenging enough" (Ofsted, 2015, p.58); and the government promotes assessments that: "provide greater challenge for the most able" (Gove, 2013, para 3).

Yet the word 'challenge' often does not have positive connotations: it can refer to a competitive tournament, in which there are winners and losers (e.g. University Challenge); it can be a euphemism for problem (e.g. challenging behaviour); and it implies the utilisation of significant personal effort, skill and determination. Clearly the challenge we wish to see in the classroom is not of monumental proportions – Applebaum & Leikin (2014) suggest challenge refers to activities that are "not too easy or too difficult" (p.389), a Goldilocks definition with which it would be hard to argue.

This paper investigates the justification for challenging work, by looking at how children learn and what causes them to adopt new learning. The factors contributing to challenge are discussed and I give illustrations of reactions to these factors made by low attaining students from my doctoral research. I conclude by suggesting that what is a positive motivational spur for some constitutes a distressing and unhelpful roadblock for others.

Literature review

What makes work that is ‘too easy’ or ‘too difficult’ unsuitable? If we borrow an image from Constructivism, we can see learning in terms of building blocks constructing knowledge from foundations upwards. Setting work that is too easy is seen as being a waste of classroom time, a duplication of foundation stones that are already in place. It is demotivating as there is no need for the duplicated information, so it fails to appeal to curiosity (Lumsden, 1994). Setting work that is too difficult is unsuccessful as the supporting building blocks are not in place, so understanding is impossible. This is demotivating because there is no chance of success. In contrast, setting “challenging, but achievable” tasks (ibid., p.4) fosters curiosity, allows students to see that effort will be rewarded with success, and provides a justification for the activity.

Piaget (1952) argued that this moderately difficult work enables learning by causing cognitive disequilibrium. The learner is surprised that an experience does not generate the expected results and this confusion is uncomfortable, causing her to either assimilate the experience with previous understanding, or accommodate the experience by developing new understanding (Goswami, 1998).

Yet learning is not as simple as this suggests. In learning from an unexpected outcome the learner has to be able to make sense of it, and this is not automatic. Chinn and Brewer (1993) give seven possible responses to anomalous data, including a child ignoring it, believing the exception is a special case, or making peripheral changes. In order to learn from an error the learner needs to be confident in the identification of incorrectness and have a viable alternative that provides a credible answer that corresponds with other beliefs, and have the capacity and confidence to analyse and process. She will also be affected by how entrenched the previous belief was, and how interconnected with other beliefs.

Social constructivism focuses less on the experience that causes disequilibrium and more on the input of social others. Vygotsky (1978a) believed that learning could only occur through discussion, and that what occurred between people inter-psychologically then occurred within the mind intra-psychologically. Vygotsky’s idea of the zone of proximal development – learners’ abilities should be assessed not just by what they can do unaided but also what they can do in discussion with, and assisted by, another (Vygotsky, 1978b) – has been utilised as justification for presenting learners with moderately difficult work. It is argued that learners should be given work that is beyond their current ability, scaffolded and assisted by the teacher, in order to make progress.

Learning occurs when dissatisfaction with an old strategy occurs at the same time as satisfaction with a new strategy, although new strategy use is inconsistent (Siegler, 1995), when the learner can anticipate results, not just perform correctly (Tzur, 2007) and when motivational factors are in place – a child needs to want to get it right, and needs to be tolerant of the sensation of ambiguity while grappling with the period of uncertainty (Merenluoto & Lehtinen, 2004).

What makes something ‘challenging’?

Ascent through the curriculum

A common means of offering challenge in lessons is to differentiate learning outcomes in terms of ‘all ..., most..., some...’ or the equivalent, identifying three

related topics that are deemed to be in a hierarchy of difficulty. But this could instead be read as ‘none will fail to do...’, ‘some will fail to do...’ and ‘many will fail to do...’: the ever-moving goalposts of these multiple objectives mean that children work until they reach the point of failure – not a very good experience with which to leave the classroom.

Memory recall

Recalling from memory will not particularly aid those who were fluent anyway, is unlikely to improve those whose memory is weak, but might introduce fear and anxiety in those whose memory is deficient (Ashcraft & Kirk, 2001).

Tests and competitions

Tests are seen as an opportunity for judgement by teacher and peers. Many (if not all) students are very focussed on identifying their place in the pecking order of the classroom, with those at the bottom feeling like failures and those at the top feeling under pressure to maintain their position (Boaler, 1997).

Quantity of work

Practice is essential for mastering a skill, but endlessly doing the same question with different numbers fosters a belief that mathematics is a subject done in isolation from reality, and encourages students to go into an instrumental mindset that does not require reflection and meaning-making (Skemp, 1976).

Groupwork

While working in a group can be very effective in encouraging a sense-making approach to mathematics, groups can be isolating and allow some to dominate while others absent themselves (Cohen, Lotan, Scarloss & Arellano, 1999).

Speed

The same pressure invoked by a test can be generated by working at speed (Chinn, 2008). Students can make silly mistakes that then cause them to doubt whether their answer was wrong because of deep-rooted misconceptions or because of superficial errors. Students can often take a strategic approach and look for easy answers that do not require much thought, or even random answers on the basis of statistical likelihood of occasionally being correct.

In summary a lesson that was planned to be challenging may encourage students to take an instrumental approach that does not encourage students to make deep connections to other ideas, or cause them anxiety and fear and lead to them mentally withdrawing from the lesson.

Study

My doctoral research with small groups of students looked at different manipulatives intended to help with the learning of algebra. The sample was a convenience sample of low attaining year 10 students from a comprehensive school in the south east of England. The materials were taken from the literature or were of my own devising, but all were intended to address algebraic concepts that I believe were in the students’

zone of proximal development. Sessions were transcribed and the data was coded using a similar process to constant comparative method, except that I worked deductively as well as inductively. This enabled me to find patterns in responses, and in this report I examine the reactions of the students when they found work excessively challenging (students' names have been anonymized).

Emotional impact

The students were acutely aware of their progress, and were reluctant to ask for individual help or draw attention to the fact that they were struggling. They reported their feeling of isolation when they were unsuccessful, especially compared to their peers: "(It) makes you feel really alone, like everyone's flying off and you're left behind" (Charles). The students lost confidence very easily, even when they showed some level of understanding, and their feelings could easily turn to panic: "Umm.. I forgot what I was saying now.. it's just a load of gobbledigook" (Fred) or "All the numbers are flying around in my head, and I'm like whoa, whoa, whoa" (Adam). This describes a situation more destabilising than mere struggle, it is a breakdown in cognitive abilities.

Adolescents do not have the brain capacity to self-regulate the negative emotions that arise from being unable to succeed – the left anterior insula region regulates the heart rate in adults, but is not fully integrated in adolescents (Strang, Pruessner & Pollak, 2011). This means that adolescents faced with excess challenge can respond in an excessively emotional way.

Status repair strategies

The students appeared to experience a dip in their self-esteem because of their lack of success. Leary's (2005) Sociometer theory identifies the purpose of self-esteem as being a gauge used by individuals to measure their degree of acceptability to the social group which anthropologically-speaking is the key to their survival. My study illustrates ways that students sought to repair their status in the eyes of the group using a number of strategies:

- Pretence: David would nod sagely, saying "That would get it, that would get it"
- Scatter gun answers i.e. multiple guesses delivered rapidly one after another
- Alternative routes to status: Gary broke into urban patois, Edward would bring up random items of general knowledge

Avoidance strategies

Another reaction I observed in my study was avoidance. As the students were in such close proximity to me as researcher, they could not take the usual classroom avoidance routes, but I realised that there were other ways to avoid confronting work that they feared would be too hard:

- Frequent toilet requests
- Distraction attempts: Adam brought up events in his home life
- Changing the subject: Adam and Ben often initiated a discussion of superficial aspects of the study

Dweck (1986) identified two orientations towards learning – mastery (in which learners are motivated to understand), and performance (in which learners are motivated by success). Learners who have a performance orientation will view failure as more distressing than those with a mastery orientation, and may display challenge avoidance behaviour.

Conclusion

It seems self-evident that learning requires exposure to ideas that are unfamiliar prior to the lesson, in order for a change to take place – the unknown becomes known. This has been taken further with the idea of ‘challenge’ – the material is not just unknown but requires effort to know. While this may well be effective in providing pace and engagement for some, I argue here that for some learners being presented with material that is a little out of reach has a significant impact on their emotions, self-esteem and behavior, and the cognitive energy that should be used to learn is instead directed to stabilize this impact.

If instead lessons are planned with the aim of providing learners with confirming experiences that allow them to embed what they suspect to be true (Bryant, 1984), children can make progress in a much more positive way. Learners can be allowed to familiarize themselves with stimulating ideas and strategies, harnessing discussion and creativity, the limits of which I believe they will then spontaneously explore. For example, students investigating volume with unifix cubes will often generate hideously complex compound objects to work on, or students learning transformations using their choice of object will regularly draw an elaborate football team’s logo to transform. This deeper exploration of the topic in hand is more valuable to all learners than touching the edges of the topic that is a level above (the ‘some...’ objective), and allows all students to learn and participate without anxiety. I propose removing ‘challenging’ from our lexicon and substituting ‘stimulating’ instead.

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