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Unsolved on Purpose: Reflections on the Rubik's Cube and the Curriculum and Assessment Review for D&T

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This reflection emerges from the dual stimuli of (a) recent conversations with the UK Department for Education (DfE) Curriculum and Assessment Review (CAR) team on design and technology (D&T) in the National Curriculum for England and (b) co-authoring the 'Key Pedagogies' chapter for the next edition of 'Learning to Teach Design and Technology in the Secondary School' (Hardy & Davies, n.d.) with my friend and colleague Sarah Finnigan. In the previous edition of the chapter (McLain, 2021), the chapter that I authored introduced the terms *ideating*, *realising* and *critiquing*, as alternatives to the familiar designing, making and evaluating (Figure 1). In the last edition (Hardy, 2021), I also described two key processes: *communicating* and *knowing*. But since publication I have thought long and hard about these and revised them to: *communicating*, *researching* (formerly knowing) and *satisficing* (Figure 2). The latter being the philosophical idea that in D&T we want learners to be making considered judgements about available options and selecting the optimal response in and for different contexts; in contrast to following a formulaic or predetermined path where there is one answer or solution (McLain & Finnigan, n.d.).

My choice to adopt the terms *ideating*, *realising* and *critiquing* was largely to disrupt and the challenge the overfamiliarity and acceptance of these fundamental yet widely misunderstood and apparently discrete activities – my thesis being that the acts of designing, making and evaluating are not linear and separate activities, which is written about extensively in academia, but conflated with assessment objectives in everyday classroom practice and thinking (both conscious and unconscious). The historic phenomenon is rooted in our current obsession with criterion referenced assessment for qualifications, where assessed items are categorised and awarded marks based on importance. For D&T, this unhelpfully simplifies processes that are inherently complex and nuanced, in the name of validity. Not a bad aim, you might say, but no political act is without its limitations and unintended consequences.

In relation to the recent discissions with the DfE for the D&T CAR, this has got me (along with another good friend and colleague, Dr Alison Hardy from Nottingham Trent University) thinking about theoretical frameworks for understanding D&T, to inform discussions with stakeholders including educators and policymakers on the ideas that underpin the subject; be it curriculum, pedagogy or assessment. (Look out for a future article from us both on this front.) In the midst of these musings, the metaphor of the ubiquitous 20th Century puzzle, the Rubik's Cube™, came into my mind. There was something wonderfully subversive about starting a discussion on curriculum design with a puzzle that most of us have either abandoned in frustration or solved by peeling off the stickers. The unsolved Rubik's Cube™ (Figure 3) as a metaphor for D&T education became just clever linguistic turn of phrase, but a challenge to our instincts as teachers and educators. We like things neat. We like things finished. But deep down we know that real learning, like a scrambled cube, is messy, unpredictable, and full of possibility. And progression does not follow a single, smooth trajectory.

The temptation in D&T has always been to "solve" the curriculum: to line up the colours, standardise the projects, and make the outcomes look good on display boards. The cube says: DON'T! It says that a rich D&T experience should resist uniformity. It should be complex, interconnected and yes, sometimes uncomfortable. That's where the learning lives.

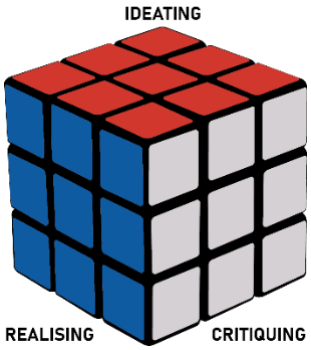

Figure 1. Three Fundamental Activities

Figure 2. Three Key Processes

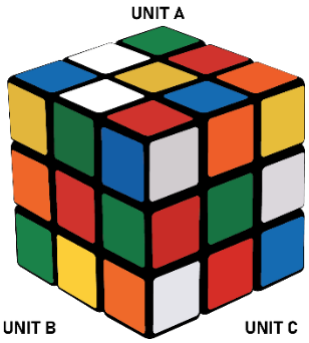

Figure 3. Unsolved Curriculum Model

The cube works because it captures the essence of our subject: interdependence. Twist one face and everything else shifts. Focus too much on "realising" (or *making*, if you prefer) and you risk neglecting "ideating" or "critiquing" (*designing* or *evaluating*). Overemphasise open-ended design and you may leave pupils without the skills to realise their ideas. The model reminds us that curriculum coherence is not about sameness, it's about balance. And let's be honest: balance is hard. The pressures of assessment, timetabling, and resource constraints push us toward the predictable, particularly when following the carousel timetabling that breaks units of learning into rigidly timebound chunks. It is easier to run a series of mainly making (or focused practical tasks) than to orchestrate a messy, iterative design project. But easy rarely equals educationally rich.

Here is the uncomfortable truth: an "unsolved" curriculum demands confidence. It asks teachers to embrace ambiguity, to plan for flexibility, and to trust processes that don't always produce tidy outcomes. For beginning teachers, that can feel terrifying. For experienced ones, it can feel like swimming against the tide of performativity and league tables. But the alternative (overly restrictive, homogenised schemes of work) risks stripping D&T of its soul. If every project looks the same, if every solution is pre-determined, then what are we really teaching? Not design. Not creativity. Just compliance.

In practice, the cube metaphor is not an excuse for chaotic or ad hoc planning. It is a call for intentional diversity. It asks us to plan across the three fundamental activities (ideating, realising, critiquing) and the three key processes (communicating, researching, satisficing), using the full repertoire of signature pedagogies: from designing and making, to mainly making, to mainly designing, to exploring technology and society. It's about sequencing restrictive and expansive approaches so that pupils experience both mastery and autonomy. And yes, that means resisting the seductive simplicity of the pervasive "skills first, creativity later" dogma. Learners can ideate, critique, and make from the earliest stages, if we scaffold intelligently. I think that Lev Vygotsky, the theorist who developed social constructivism and the zone of proximal development (ZPD), would approve.

The Rubik's Cube metaphor is more than a gimmick. It's a provocation. It asks us to stop chasing the illusion of a "solved" curriculum and start celebrating the productive tension of an unsolved one. Letting learners solve the 'problem' D&T learning in their own time and way. Because in D&T, the goal isn't to line up the colours, it is to keep turning the cube, exploring new configurations, and helping pupils see that complexity is not a problem to be eliminated but a reality to be embraced. To expose them to transformative ideas that apply on all walks of life (learning and work). So, the next time someone asks if your curriculum is "sorted," smile and say: *I hope not!*

References

Hardy A. & Davies, S. (in press), *Learning to teach design and technology in the secondary school: a companion to school experience* (5th Edition). Routledge.

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