you have suggestions as to how to persuade curriculum designers to consider student goals and of the importance of engaging pupils at primary and secondary levels? (Q2)

« 4 » Teachers at primary and secondary levels often feel very constrained by the national syllabus. Mastery of the national syllabus determines success in moving to the next level in the institutional system. In this context, not only pupils but their parents become involved in discussions about innovative educational procedures. Some parents are very focussed on their children's success in ways that demand close adherence to the published curriculum. This leads to criticism of moves that emphasise process and creativity rather than remembering curriculum specifics. How can parents be helped to appreciate constructivist approaches and the need for curriculum conversations (§§13ff) as ways of developing perspectives on the use of the details contained in official curricula? The target article has a very persuasive example in terms of earthing electrical changes (§21). Or, putting this another way, what does it take for parents and teachers who are very focussed on standard curricula to move to the types of processes outlined in (§14)? What other ways could ethical issues (§12) facilitate the epistemological journey (§13ff)? (Q3) Having the students articulate their own goals for the curriculum seems ideal, and achieving this collectively (§17) I am sure adds to its success.

« 5 » The Teachback approach (§§29, 36) that Pask and Scott (Scott 2000) used is based on asking students to teach the teacher so that the student's level of learning can be assessed. It is very similar to an approach taken by John Carroll and Benjamin Bloom in the 1960s called mastery learning (Carroll 1963). In this approach, objectives are set for the students, who are deemed to have mastered the ideas when their peers are satisfied that they understand the concept in discussion. A student might be asked to learn about concepts including conservation of number, assimilation and equilibration in Piaget's theory. While peers could agree that a student understood these concepts, in my experience, an instructor responsible for the course would check some of the concepts students were deemed to have mastered. While this approach was not explicitly based on constructivist ideas, the requirement that the learner demonstrate what has been learned has similarities to asking pupils to talk about their constructions. Using existing and emerging constructions in a conversational context (§29ff) is closely aligned with examples cited in Gash (2014) such as using small group learning in classrooms (Good, Mulryan & McCaslin 1992), and cooperative learning (Dwyer 2010) where responsibility for learning moved from teacher to pupils. There are commonalities too in Jérôme Proulx and Jean-François Maheux's discussion of Francisco Varela's work on mathematics where the questions posed in conversations about pupils' approaches to problems are prioritised (Proulx & Maheux 2018). The way questions are posed reveals how the questioner is constructing the problem. Indeed, Thérèse Dooley (2010) advocated dealing gently with questions posed with uncertainty so that the person asking the question can have the confidence to speak the new idea. I raise these commonalities in approach in my quest to discover how best to advise teachers about using constructivist approaches. My concern is that we are inclined to recommend first what works best for ourselves, a strategy that may lead to leaving aside other more effective approaches.

« 6 » Conversation theory is about teachers negotiating with students to design an engaging curriculum. This requires convinced constructivist teachers. A striking example, in my experience, of a way to persuade teachers to change was illustrated in Deirdre Butler's (2004) thesis, when primary teachers were asked to create a small engine with Lego MindStorms that moved very slowly. This required understanding gears and was very novel, even stressful to some. One teacher woke up in the middle of the night holding onto the bedside lamp. In this case, facing the unknown was what a number of these teachers found enabling. In my commentary I have focussed on ways the target article may inspire teachers to use constructivist methods. I think that when teachers are sympathetic to the cultural and ethical dimensions of student lives, conditions are created that facilitate adopting learner-centred constructivist ways of presenting curricula. Where these issues seem less imperative, the challenge or the shock of facing the unknown may provide a needed epiphany.

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Curricula, Knowledge and Design in the Context of Radical Constructivist Education

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> Upshot • I question the scope of curriculum design as proposed by the target article in relation to radical constructivist learning theory and terminology. In addition, I provide contextualization and clarification regarding the relationships between learning, teaching and design.

What is the scope of ethical curriculum design?

« 1 » Employing a radical constructivist approach to education offers a promising approach to deal with ethical questions implied in curriculum design, in particular in a charged context such as higher education in South Africa. Philip Baron's engaging argument for new approaches to engineering curriculum design is strong in its ethical as well as practical aspects and directly appeals to readers who have experienced typically abstract and inflexible engineering curricula. Still, I find some aspects of Baron's perspective may deserve further clarification and perhaps more linking into related discourse to avoid theoretical as well as practical shortcuts.

« 2 » The first of these aspects is the notion of curriculum design itself. Baron employs a broad definition of the term *curriculum* that includes "course content (or syllabus), pedagogy, and all the facets that are part of the teaching and learning pro-

cess" (§6). This does not seem to be too helpful when questions about the design process need to be answered: even though students in conversations with teachers can jointly determine the delivery style as well as some of the contents of the curriculum, they may not get to set the contents at the very basic level. Decision-making at the level of governments, professional bodies, schools and other decision-makers would need to be taken into account for a thorough discussion of how the core contents of curricula are determined. Without their involvement in an ethically aware curriculum design process, innovative pedagogy at the classroom level only (§17) may too easily be qualified as a nice way of merely "colouring" (§31) unchanged bodies of thought. Baron acknowledges this constraint (§35) and argues that the delivery of the predetermined content itself offers a sufficiently flexible platform for teachers to support students in contextualizing "knowledge."

« 3 » In this context it would be great to differentiate more clearly how ethically aware radical constructivist learning and teaching is achieved. Ernst von Glasersfeld (2001) distinguishes two types of teaching: "training," which describes learning through the unreflected memorisation of socially and politically determined bodies of thought, and learning through "understanding," which involves individual construction of knowledge that arises from perturbation of previously constructed explanatory models. Interestingly, Baron describes the *teacher's* learning (§§21–23) as construction of new understanding when interacting with the class. While students will likely connect much better to illustrations and examples taken from their daily lives, it is not clear whether this is merely a matter of contextualization only, rather than a specific quality of the learning process. A question arising in this context is how far the learning and teaching settings created by Baron can support students in their individual construction of understanding in a radical constructivist sense? (Q1)

Knowledge in constructivist education

« 4 » In multiple passages, Baron describes education as a provision of "knowledge" or "information" (§§2, 7, 10). Baron does not seem to clearly distinguish between socially or politically decided content that can merely be trained (in von Glasersfeld's sense), and types of content that students should be able to learn by constructing their own understanding. Baron characterises decolonised knowledge as "viable" (§§30, 35), which provides an opportunity to link to von Glasersfeld's central radical constructivist notion of viability. In both authors' use of the term, "viability" relates to the immediate usefulness of constructed understanding for the learner. The notion "viable" as an assessment of the value of individually constructed understanding replaces notions of correctness or truth.

« 5 » This implies that learning and teaching approaches aiming to foster students' construction of viable understanding in the constructivist sense should provide a context in which students can experiment with their assumptions and experience failure or perturbations of their previously held understandings. In this context, students should be able to create their own understandings without being corrected by the teacher. Instead, the teacher's role is one of setting up an environment that allows for individual construction of understanding. Given the applied nature of engineering, I wonder if a more experimental and applied learning context could be integrated into Baron's learning and teaching approach, building on previous work in radical constructivist education? And perhaps some form of conceptual analysis (Steffe 2007) could be pursued to substantiate decision-making in teaching? (Q2)

Putting the design back into curricula design

« 6 » Another aspect of Baron's target article that deserves further examination is the design aspect of curriculum design. Understanding design not so much as a noun but as a verb (as explained in detail by Ranulph Glanville 2007), I would like to extend the narrow way in which Donald Schön's (1983) "reflective practice" is interpreted in the target article (§32). In Schön's sense, reflection is understood as a step in a cyclic *process* consisting of three different yet linked activities: framing, moving and reflecting. Designers (or practitioners) working in an applied, explorative manner first form their view of a situation and develop intentions or goals in response (framing), then act on these intentions (moving) and subsequently evaluate the outcomes of the preceding action (reflection). Reflection merely indicates a designer's consideration of what has happened and does not qualify how this consideration should take place or what it should take into account. Reflection will then lead to new opinions or perspectives formed, which then generate new approaches to action and so forth.

« 7 » Glanville's (2007) design cybernetics features a similar cyclic process, but places stronger emphasis on the interactive in-between of conversations compared to Schön's (1983) focus on the designer's perspective. This allows a description of the new arising from the conversational in-between (Herr 2015) and links to Baron's grounding in conversation theory (§4). In the context of curriculum design as proposed by Baron, I would suggest that Glanville's characterisation is probably the more fruitful connection to make to design cybernetics.

« 8 » I agree with the target article in that teaching can be thought of as a form of learning. Learning, in turn, in particular in the radical constructivist sense, can be thought of as a form of designing (Herr 2015). This perspective shows there are at least two coupled learning processes, the teacher's and the students' – and more if higher-level institutional decision-making is taken into account. My final question then asks which forms of rigour could be applied to each of these processes to make sure they proceed in the best way possible? (Q3)

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