

## **Teacher education and the curriculum**

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## Teacher Education and the Curriculum

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### Abstract

In this chapter we analyse the development of primary teachers' curriculum design capabilities through a case study from England. We examine how teachers, as co-researchers used the Curriculum Design Coherence (CDC) Model to gain insights into professional learning, as well as offering considerations in relation to the further development of the CDC Model itself. We explore the means of developing teachers' relationship with knowledge and agency by cleaving open the intellectual space between lesson planning and curriculum specifications. We make the case that the approach to curriculum design currently predominate in the English context is largely transactional, limiting professionalism. We offer an alternative approach on based on developing teachers' relationship with knowledge, foregrounding teachers as professionals with agency. Furthermore, we show how the systematic process of examining a curriculum can combat the conflation of curriculum and pedagogy, and deepen teachers' understanding of subject knowledge.

Abstract: 144 words

**Keywords:** agency, coherence, curriculum design, expertise, judgement, knowledge.

### Introduction

In this chapter we analyse the development of teachers' curriculum design capabilities, facilitated by a small-scale research project that applied the Curriculum Design Coherence Model (CDC) (Rata, 2019, 2021) as the means to underpin the development of teachers' professional knowledge. The project involved fourteen teachers from across eleven primary schools based in the West Midlands region as co-researchers to explore the applicability of the CDC Model to their context. The schools predominately served areas classified as being socially deprived, according to the indices of multiple deprivation in terms of income, health, and education (McClennan et al., 2019) with multi-generational family unemployment, and below national average achievement in all levels of education. We

focused on two subjects in this study, Physical Education (PE) and Geography, both are deemed to be foundation rather than core subjects in the English context.

Foundation subjects generally enjoy less curriculum attention, for example in the current national curriculum for the primary phase (DfE, 2014), English occupies 76 pages, mathematics 44 pages, science 32 pages and geography and PE, three pages each. Despite this lack of specificity there is recognition that primary aged children deserve a quality curriculum in these subjects (Alexander, 2010). In our project, headteachers expressed concern that curriculum design in PE was being diminished due to the increase use of coaches in schools (AfPE, 2023). Senior colleagues also valued the significance of PE as an enabling curriculum area in relation to pupils' lifestyle choices. Geography was also recognised for its empowering nature, being a subject that inspires in pupils a curiosity and fascination about the world that will remain with them for the rest of their lives' (DfE, 2014: 240).

These schools had found themselves grappling with the oft quoted phrase in England, that the 'curriculum is the progression model' (Ofsted, 2023). His Majesty's Chief Inspector, had stated that: 'Without a curriculum, a building full of teachers, colleagues, leaders and pupils is not a school. Without receiving knowledge, pupils have learned nothing and no progress has been made' (Spielman, 2018). However teacher colleagues struggle to discern how curriculum and progress are related. Progress is a term often associated with individual learner knowledge development, facilitated through pedagogic choices, realised in lessons. Such knowledge is framed by a curriculum which describes the selection of knowledge that is to be prioritised for a group of learners. Curriculum and pedagogy are connected but should not be conflated, and curriculum design knowledge has been identified as being the missing link between them (Rata,2021; Pountney and McPhail, 2019; Swift, 2023). Curriculum design knowledge is sufficiently different from both pedagogy and curriculum to require a particular set of professional capabilities.

We argue that the development of curriculum design knowledge has been either minimised or absent in professional learning in England, and that this lack has resulted in a confusion of difference between curriculum and pedagogy. Such conflation, often results from a lack

of discernment between lesson planning and curriculum design. Both are essential teacher capabilities. However, the rush to produce curriculum materials, such as lesson-plans, rather than first engaging in curriculum design, results in a conflation of pedagogy and curriculum, and a lack of regard for the distinctiveness of each. The CDC Model is an example of a heuristic framework that helps teachers to understand that it is a discipline's conceptual structure that underpins the means for coherence and progression. Consequently the case study schools were ambitious to examine how the CDC Model, translated from its original context in New Zealand schools, can be used to develop teachers' curriculum design capabilities.

### Introducing the case

Our case study is presented as a means 'to develop an in-depth, holistic understanding of a specific phenomenon within a specified context' (Sibbald et al, 2021: 291/2). Rather than using representations of research findings that 'portray reality as straightforward, linear, cause and effect relations and ignore other forces at work' (Martin and Kamberlelis, 2013: 671), this study seeks to analyse 'the various ways reality might be produced and how different ways of producing reality have different social, economic and political effects' (Martin and Kamberelis, 2013: 672/3). This approach contrasts with the bounded system of 'the case' presented by constructivists (Stake, 1995, Merriam, 1998). Consequently an explanatory and exploratory rather than descriptive position is taken, emphasising the empirical nature of the study whilst also recognising the importance of context to the cases.

Professor Elizabeth Rata, the CDC Model's originator was invited to be an 'agile' evaluator, drawing on agile principles in active and cooperative learning (Stewart et al., 2009). Her role was to respond reflexively to the authors' accounts of the research activities, including the reports on each of the days, video recordings of some sessions, materials created by the participants, and outcomes of the use of the CDC-Model, including completed designs. Her participation was essentially *ex vivo*, in the sense that she was one-step removed from the research and the teachers, but also *in vivo*, in the sense that her insights directly shaped the ongoing activity of the group. Agility was achieved through Elizabeth's engagement with the project from its inception, enabling her to evaluate each phase of the project before we

initiated the next. An agile approach, therefore, enabled us both to consider our fidelity to the CDC-Model and to contribute to its further refinement.

In order to contribute to the development of the CDC-Model, the teachers were invited to be co-researchers within the study. The 'co' aspect recognised 'that each classroom should not be an island' (Stenhouse,1975: 157). The study foregrounded teachers as professionals with intellectual agency (Kuhlee and Winch, 2017) creating a collaborative space for high quality thinking in relation to curriculum design, so that teachers can:

- increase their awareness of different forms of knowledge;
- explore how to draw upon different forms of knowledge in curriculum design;
- grapple with the significance of coherence in their own curriculum thinking;
- better appreciate the inter-relationships between pedagogy, curriculum, assessment, and teaching activities;
- develop familiarity with the CDC Model, in order to apply it effectively to their curriculum planning.

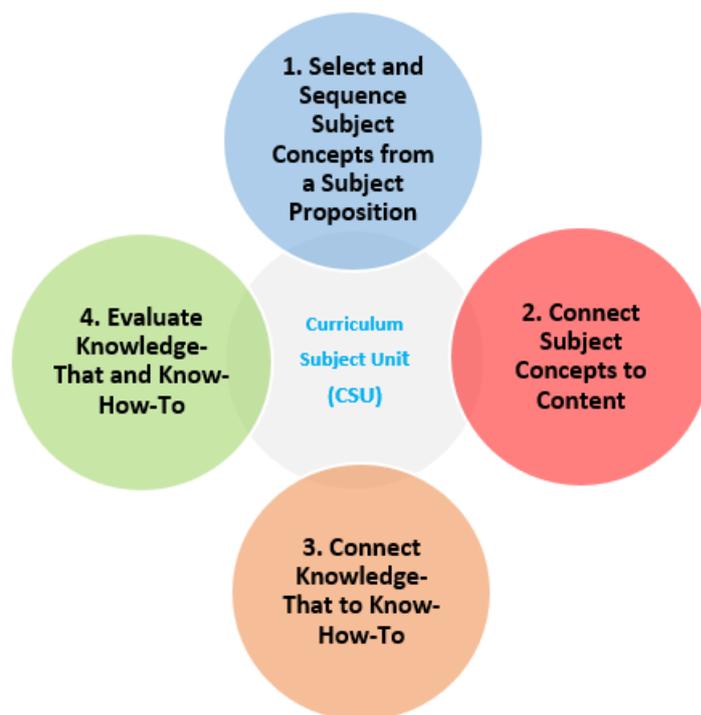
The insights gained in relation to these aims are now shared in four sections. First we discuss the theory of knowledge that underpins the CDC Model and its efficacy to address our concerns for the active involvement of teachers in curriculum design. Then, we analyse the social, professional, and political context for teachers' curriculum making in England. This is developed in section three, where we share how the study enabled the teachers, as co-researchers to engage with the Model. In the final section we discuss our findings and insights and consider how these can inform the future development of both the CDC-Model itself and professional learning in England.

## 1. The CDC Model and its theoretical underpinnings

Starting with the proposition that a key purpose of a curriculum is 'to produce knowledgeable people' (Carlgren, 2020), effective curriculum design can be seen to involve the ability to manage the different types of knowledge in an enabling sequence 'such that the development of expertise is not compromised' (Winch, 2011). In order to develop such

an ability, teachers need to be knowledgeable about knowledge, including the different types of knowledge and their associated consequential impacts in educative environments. The CDC Model was chosen because of the opportunities it provides for teachers to engage in the theorising of knowledge, enabling them to refine their own thinking about the curriculum and its purpose. As illustrated in Figure 1, and discussed further in section three of this chapter, the CDC Model consists of four interconnected Elements. Each Element is reliant on an appreciation of different forms of knowledge and how these forms of knowledge can be utilised differently so as to enable coherence and progression (Pountney and Swift, 2022).

Figure 1: The Curriculum Design Coherence Model (based on Rata, 2019)



The CDC Model supports teachers in sustaining a focus on concepts, as each Element puts concepts to work differently. In Element 1 concepts are made visible in the proposition statement. The teachers grappled with the concept of a subject concept. We found that it was important to always preface the term concept with subject. This helped us to sustain our relationship with the discipline, rather than become distracted by concepts that related

to other aspects of a school's purpose, for example the school's values. In order to engage with the theoretical underpinnings of the Model, we needed to consider what the term subject concept meant. To do this we drew on social realism, a paradigm whose community of scholars recognise that different forms of knowledge have active and different consequential roles. If such differences are under appreciated then the 'power' of knowledge can be limited. It is the 'social reality of unobservable concepts (whether scientific or religious) that gives them power (and claim to objectivity and truth) relative to our common-sense concepts and enables them to transcend the specific instances and circumstances of everyday life' (Young 2008: 43).

Concepts, therefore have the capacity to specialise everyday experiences. Each subject has a set of disciplinary concepts, some of which are shared between subjects, but every subject has its own unique combination. During the study, teachers as co-researchers took time to explore the conceptual architecture of their subject(s), in our case PE and geography, resulting in the recognition that atomised content knowledge, lists of skills, techniques or factual knowledge, operate at a different scale to that of conceptual knowledge. Both scales are significant. These are not either-or forms of knowledge, rather there is power in appreciating how content knowledge and conceptual knowledge can be related in curriculum design. Indeed, the 'concept–content connection gives an intellectual richness to teaching that offers much more than the teaching of lists of information' (Rata, 2021: 39). Furthermore, fragmented content without conceptual integration and progression is incoherent: it confuses skills and concepts, and conflates subject concept with generic concepts, and of subject competencies with generic competencies. What became clear was that previously the teachers had not benefitted from the privilege of (re) engaging with disciplinary knowledge, as one co-researcher commented, 'this has helped us consider how we use concepts more deeply'. This lack of prior opportunity relates to the context of professional learning and professional design in England.

## 2. Exploring the context: Curriculum design in England.

In this section we will focus on two significant elements in relation to the curriculum context in England. The first is the school inspectorate's emphasis on knowledge, (Spielman, 2018,

Ofsted, 2023), and the second involves the pressure on teachers to plan lessons, rather than design the curriculum, resulting in a 'pedagogic imperative' (Pountney, 2020).

The emphasis on curriculum knowledge in teachers' professional learning has not always been evident in the English context. Just over a decade ago, it was claimed that it was 'the muddled language of "subjects", "skills" and "knowledge" which confounds sensible curriculum debate' (Alexander, 2010: 7). These difficulties have pre-occupied teachers in the with colleagues often feeling that they need to be 'on the side of skills' or 'on the side of knowledge'. England's. Consequently, in England, the development of teachers' curriculum design capabilities has been identified as a 'challenge remaining' (DfE, 2022).

The solution to this challenge posited in the recent White Paper, 'Opportunity for all: strong schools with great teachers for your child' (DfE, 2022) is to promote the use of 'The Oak National Academy', an online platform that had its genesis as a response to lesson sharing during the COVID-19 pandemic. It is now a publicly funded body whose aim is to 'put the best curriculum thinking, the deepest subject expertise and the smartest learning design at your fingertips' (Oak National Academy, online, 2023). Arguably such an approach restricts the development curriculum design capabilities to a few selected teachers, further diminishing the appreciation of this capability an essential element in teachers' professionalism. Furthermore, research in England, examining teachers' agency in curriculum making finds that 'teachers are sixteen percentage points less likely than similar professionals to report having "a lot" of influence over how they do their job' (Worth and Van den Brande for NFER, 2020: 4). This has been cited as a factor as to why teachers are leaving the profession early in their careers.

In terms of teachers' continuing professional development (CPD) in England, the link between their expressions of satisfaction with their teaching role and the perceived impact of in-service training received is strong according to a recent large-scale survey of teachers' working lives (DfE, 2023). Relating this to the confidence levels of primary teachers' subject knowledge, the same study ( DfE, 2023: 117) found this to be high for the core subjects of English and Mathematics (90%), but lower confidence in the two subjects which are the focus in this case study, Geography (70%) and Physical Education (56%), and even lower in

schools rated lower by Ofsted. Of the topics included in formal CPD activities, only 25% of teachers reported taking part in activities that focused on curriculum design and planning (DfE, 2023: 133) and yet these are key capabilities. The DfE stated that ‘curriculum design is an expert skill, yet too many teachers reinvent the wheel and design new lessons... as with other top professions-we must do more to support new teachers to succeed’ (DfE, 2022: 26)

We are in agreement with the notion that curriculum design is an expert skill, and that teaching is a top profession and the need to do more to help all teachers succeed in developing their curriculum design capabilities. However our engagement with the study leads us to question the assumption here that curriculum design and lesson planning are one in the same thing and so can be evaluated in the same way. We argue that both curriculum design and lesson planning capabilities are essential, but different. Lesson planning is a specific activity which references learning materials and particular lesson objectives achievable within a short period ( Lambert and Morgan 2010). We argue that lesson planning should be informed by curriculum design which is different as it involves engagement a curriculum which specifies knowledge, in our case subject knowledge, and through this undertaking a coherent, challenging, engaging and enjoyable scheme of work results. Indeed one of the teachers recognised that by using the CDC Model they have become more ‘effective in making the relationship to learning sequences much clearer’. In this study we find that engagement with the CDC-Model has much to offer in terms of ameliorating the lack of CPD in relation to curriculum design.

### 3. A case study of teachers’ professional learning in curriculum design

The study took place over an academic year, with four days off timetable and off-site for the teachers to work together collaboratively. These sessions were spread across the academic year (November, January, March and May) with gap tasks in between. An approximation of each teacher’s time spent, including the gap tasks, is 40 hours. It is notable that the extended nature of this CPD, including the time spent, is greater than the 20 hours reported by teachers more generally (DfE, 2023). The first two days were spent grappling with the CDC’s Model’s theoretical grounding (see above). Whilst this endeavour was intellectually

challenging, it was an element that the teachers appreciated. One co-researcher commented that ‘you’ve got to get through the storm to get to better weather’ and another stated that ‘I like that the project was split over a number of sessions, this allowed me to process the information’.

Engagement with the model was facilitated by a template to aid the teacher’s application of the Model based around the model (see figure 1) and each of the elements, outlined below. The teacher’s completion of the template (see a section of this in Table 1) in turn became a shared resource that enabled their own reasoned connections in the ways in which they sequenced their curriculum design to be evaluated and examined. By use of the template the model was introduced, emphasising how the model enables teachers to use their subject knowledge and pedagogical expertise to design subject knowledge for an age/phase focus as well as a whole-school programme of study. This set out the aim to strengthen the coherence in curriculum design between subject concepts, content, and subject competencies, so as to improve the durability of knowledge in a child’s learning by developing the schema for this to endure.

### 3.1 Selecting and sequencing subject concepts

The second stage of the study focused on the Curriculum Subject Unit (CSU) to be designed. By CSU we mean a subsection of the subject curriculum. This has an age / phase focus and is bounded as a sequence of lessons over a period of time. However, significantly the design of the CSU is a process that precedes lesson planning. The study emphasised, process rather than product, and recognised that this process was likely to be cyclical rather than linear. This became particularly important to the teachers as they selected the specialising subject unit concepts associated with the CSU. Many of the PE teachers found this part of the process particularly helpful in differentiating between domain knowledge – the knowledge of particular sporting contexts, e.g. football or cricket, and the concepts associated with fundamental movements such as agility, balance, and co-ordination. In geography the focus on concepts such as place, scale and environment helped the teachers to refine their selection in a content rich subject. The CDC-Model helped teachers to strengthen their relationship with knowledge, one co-researcher commented that as a

consequence of the study they had developed a 'better understanding of knowledge sequencing' another acknowledged that 'although we thought that we had thought carefully about our curriculum, this [the CDC Model] has helped us consider this more deeply'.

The teachers were then asked to write the proposition statement for the CSU, in order to put the CSU's content focus and the disciplinary key concepts into one statement. The proposition states what the sequence of learning (lessons) is to be about, and refers to the subject's concepts that have been prioritised. This connecting of the proposition statement to its subject concepts at the beginning of the design process makes visible the CSU's system of meaning and makes clear the teacher's curriculum intentions explicit. The teachers acknowledged that the proposition established the logic in the unit to be designed through a declarative sentence, enabling the teachers to identify and justify their selection of subject concepts more precisely. It was at this point that teachers became aware of the iterative and metacognitive nature of the framework, in which the CDC Model was used as a tool for thinking about the curriculum and its design for learning

One of the teachers who focused on PE thought about creating their proposition as an assertion concerned with 'what is doing something to what'. They generated the proposition that 'Health related exercise is taking part in physical activity that affects your body such as your heart rate, muscles and different aspects of fitness (e.g. cardio-vascular and muscular endurance)' In this example it is the physical activities of health-related exercise that is doing something. The Model helped this teacher to revisit the proposition and develop a clarity about what the subject is and removes redundancies – e.g. The physical activity of health-related exercise affects rate, muscles, and different aspects of fitness (e.g. cardio-vascular and muscular endurance).

We invested significant time in the construction of the proposition statements (days two and three), as any proposition involved several drafts and re-drafts. Indeed a key insight that the teachers asked us to share back with their senior leaders in that they wanted more time for curriculum design work.

### 3.2 Exploring the relationship between subject concepts and subject content

The second Element of the CDC Model directed teachers to examine the content that is best suited to teach the concept. Teachers at this stage were forced to go backwards and forwards between concepts and content to get a 'best fit' between the idea and its expression in content, in order to develop an authentic, purposeful relationship between them that works fluently. Arising from this activity was the understanding that subject content is not just a list of information. The difference is that subject concepts are generalisable to many objects whereas 'content' is not generalisable because it is itself the 'specific object' that the subject concept is being applied to. To complicate matters, sometimes the subject concept and subject content use the same word. For example, the word 'place' is both the word for the concept and also the word for a specific location.

The second Element, also involved the teachers in thinking carefully about how and why the content selected, was important for the learner and their role in society. The question arose, as to whether this subject content is significant for the next generation to know and understand (social and political), and for which we as educators are responsible to wider society. The teachers as co-researchers enjoyed this debate which engaged them in considering the history of intellectual ideas, for example the concept of competition in sport and sustainability in geography.

### 3.3 Connecting 'knowledge-that' to 'know-how-to'

The third Element of the CDC Model required the teachers to examine two subject competencies. The first identifies performance competences, in which the teacher selects techniques and skills to show how to apply the concepts and content. Performance competencies are those that refer to the techniques and skills used to apply the procedural rules in practice and to the degree of performance mastery. The second, judgement competencies require students to know why something is the case (intelligent knowing-why). Here, teachers are asked to consider how pupils' knowledge, understanding and capabilities will be evaluated in relation to the specific unit content. Also, how will connections be made with the organising and specialising concept(s) to enable knowledge

coherence, connection, and accumulation? In other words, what does success look like?

Table 1 shares two co-researchers' thinking in relation to this Element.

Table 1: Comparison of Subject Teachers' connection of 'knowledge that' and 'know-how-to'

<b>Element 3: Connect 'knowledge-that' to 'know-how-to'</b>		
	<b>PE Example</b>	<b>Geography Example</b>
Proposition Statement	<b>Copying, creating and performing dance movements requires balance and control</b>	<b>Name and locate the capital cities of the four nations in the United Kingdom</b>
Identify <i>performance competences</i> . Select techniques and skills to show how to apply the concepts and content	<p>I know how to :</p> <ul style="list-style-type: none"> <li>- use counts of 8 to stay in time with the stimulus</li> <li>- copy and perform actions using control and balance.</li> <li>- create actions in response to the stimulus.</li> <li>- move in unison/canon with a partner.</li> <li>- how dynamics impact the actions.</li> </ul>	<p>I know how to:</p> <ul style="list-style-type: none"> <li>• use an atlas to find capital cities</li> <li>• differentiate a city from a capital city</li> <li>• represent and name the four capital cities on different maps</li> <li>• place each capital city in each of the four nations on maps.</li> </ul>
Identify <i>judgment competences</i> . Explain the use of the techniques and skills in expressing the subject concepts	<p>I know how to explain why we use counts of 8 to stay in time with the stimulus.</p> <p>I know how to explain why performing actions in dance requires balance and control.</p> <p>I know how to explain my choices of actions/dynamics linked to the stimulus.</p> <p>I know how to provide feedback to others using correct terminology</p>	<p>I know how to explain why each of the four capital cities is located where it is.</p> <p>I know how to explain why some cities are capital cities and others are not.</p> <p>I know how to explain why using an atlas is important in understanding the significance of location.</p>

Notable here is the greater emphasis on content in the proposition for the geography example (e.g., "name and locate), leading to the focus on facts and generic skills (e.g. use an

atlas) whereas in the PE example, the better-defined proposition leads the teacher to more clearly expressed judgement competences. Thus, the model reveals to the teacher, through iteration, the importance of conceptual coherence.

### 3.4 Evaluating 'knowledge-that' and 'know-how-to'

The purpose of the CDC Model's evaluation element (Element Four) is to enable teachers to make explicit the knowledge, skills and understandings that the CSU is prioritising. The CDC Model asks the teachers to differentiate between three forms of evaluation, all of which are significant. These are the evaluation of content recall; the evaluation of skills and techniques and the evaluation of 'intelligent know-how-to' knowledge. The teachers felt immediately comfortable with the first two areas, but needed to grapple with the third, that of 'intelligent know-how-to'. Currently, the emphasis on lesson planning involves teachers in considering how they are to evaluate pupil outcomes. These are often presented as list of know-how (techniques and skills) and / or know that knowledge (content recall) which can be 'tested' in that either a pupil achieves that skill, or not, or can recall that knowledge or not. Importantly the CDC Model required teachers to consider what is different about 'intelligent know-how-to' knowledge. Such knowledge is relational and can only be achieved through careful content-concept connections. It is the relationship of specific content to a specific concept that enables this significant evaluative element.

The CDC Model's emphasis on 'intelligent know-how-to' involved teachers in connecting pupils' know how and know that knowledge, so that their pupils know why. By developing such competencies, pupils will then be able to transfer their knowledge to different contexts because they have understood the purpose of their learning, not just the performance. This was particularly the case in PE, when a teacher co-researcher considered the addition of the following competence to a dance and movement CSU, 'I know how to explain why performing actions in dance requires balance and control'. In geography, a teacher added, 'I know how to explain the location of capital cities using the concept of scale'. The teachers reflected that without the discipline of the CDC-Model they were unlikely to have explicitly facilitated such essential opportunities for their pupils.

#### 4. Findings and insights.

Noticeable in the discussion above of each Element is the frequent use of the term 'subject'. This is because a key principle of the CDC Model is that academic subjects, like their parent disciplines, establish the 'boundary' or 'frame' for grouping similar explanatory concepts which create a subject's epistemic structures. A significant reflection for the teacher co-researchers was the importance of prefacing the term concept with subject, so that we always referred to subject-concepts. There were two benefits to this nomenclature. The first was that we could differentiate between subject concepts and the values that schools also importantly engage pupils with. Prior to engaging with the CDC Model, some of our study schools had been using their school values as a way to cohere their curriculum. The CDC Model enabled them to consider that whilst establishing coherence in relation to lived values is vital work in education, the CDC Model aided their thinking in relation to subject's and curriculum design. The framework gave the co-researcher teachers, the means to respond to the school inspectorates recognition that 'schools need to have a strong relationship with knowledge, particularly around what they want their pupils to know and know how to do' (Spielman, 2018).

In terms of the curriculum areas addressed in the study, PE and Geography, the Model helped the co-researchers to recognise the difference between these two curriculum areas, particularly in relation to knowledge differentiation. PE is often a subject that is seen to be dominated by knowledge how with a focus on skills and techniques, at the expense of know that. The use of the CDC-Model was seen to rebalance this understanding, not least in clarifying for teachers what knowledge is required in the development of skills. Meanwhile, the challenge for geography teachers in such a content-rich subject, was the selection of the content concept connection and this proved to be thought provoking. In both cases engagement with the CDC-Model helped the teachers to clarify how concepts evident in the proposition helped them to be more explicit about the supervening purpose of the knowledge that they wanted to develop for their learners.

The teachers valued being metacognitive about their own curriculum design capabilities. The co-researchers reflected that the CDC Model can be both a curriculum design

framework for professional learning as well as a curriculum design framework for curriculum design. The rigour enabled by the CDC-Model avoids the dangers of the ‘tips and tricks’ approach to the development of teacher-knowledge, where the teaching of techniques in professional learning are devoid of the underpinning scholarship that informs the ‘intelligent’ use of different approaches. The CDC- Model in contrast, emphasises coherence by offering a framework to inform professional dialogues about curriculum design. The CDC-Model also avoids the notion of a ‘single solution’ by encouraging iteration of the curriculum design that involves considerable thought before a well-reasoned sequence of lesson plans can be settled upon. In other words, conceptual coherence is a priori content.

The use of the CDC-Model in the English context enabled us to examine more closely the curriculum-pedagogy relationship. The co-researchers valued the slowing down, and the making deliberate, of their pedagogic decision making, and how this is informed by attention to the epistemic nature of knowledge. Furthermore their engagement with the model enabled them to resist the pedagogic imperative (Pountney, 2020), and to develop their skills in designing the curriculum prior to, and separately from, planning lessons.

## 5. Conclusion

The teachers, as co-researchers, valued the intellectual challenge of the study. One teacher commented that they had enjoyed considering some of the dilemmas associated with curriculum design as , ‘previously the curriculum has felt top down, and so I have been unsure where the curriculum statements have come from’. We recognise that we conducted the study immediately post-pandemic and during a recruitment and retention crisis in schools in England, yet all the teachers committed to the study throughout its year long duration. Teachers felt that they gained agency, and an increase in their curriculum authority – the basis of their claim for subject expertise. This is potentially significant as teachers’ lack of epistemic agency and autonomy have been cited as factors in their decision to leave teaching (Perryman and Calvert, 2019).

In relation to the concept of coherence, we have begun to articulate some of the features of what makes for a coherent curriculum, including recognising that coherence is more likely to

be enabled when teachers have time and are willing to attend to the knowledge structure of the discipline. This is an area of work that the teacher co-researchers are eager to develop further and so will be the focus of our future endeavours.

This chapter has located the study within the larger social professional and economic context of the role of curriculum design in England. As a consequence of engaging with the CDC-Model, teachers became explicitly conscious of the role of abstract knowledge in relation to specialising and organising content that would previously have appeared as atomised or disjoined. The CDC- Model energised the previously latent value of abstract conceptual knowledge in empowering both teachers and learners. Involvement in the study transformed teachers' professional understanding of both curriculum design and knowledge differentiation and helped us think about the nature of professional learning in relation to complex elements of a teacher's work. We are looking forward to continuing to develop both these aspects further so as to challenge the transactional approach to curriculum design.

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