Rethinking models of professional learning as tools: a conceptual analysis to inform research and practice

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Abstract

One approach to designing, researching or evaluating professional learning experiences is to use models of learning processes. Here we analyse and critique five significant contemporary analytical models: three variations on path models, proposed by Guskey Desimone andlarke and Hollingsworth; a model using a systemic conceptualisation of learning by Opfer and Pedder; and a cognitive learning model by Evans. To do this, we develop and illustrate an analytical framework focused on model components, purposes, scope, explicit and implicit theories of learning and change processes, agency and philosophical underpinnings. We identify similarities, differences, inconsistencies and limitations in the models. This provides the basis for reconceptualising models as tools to be deployed alongside other relevant constructs and thus the analytical framework can support a more informed selection of theoretical models by researchers and practitioners.

Keywords

Professional development; professional learning; models of professional learning; evaluation methodology

Introduction

There is a substantial literature that aims to theorise the nature and process of teachers' professional learning and supports the design, analysis and evaluation of professional

development, and within this literature a number of models or analytical frameworks have been proposed. In this paper, we critically analyse five models that have been proposed over the last 15 years.

We firstly consider two influential linear path models that focus on single pathways (Guskey 2002; Desimone 2009), and then a multiple pathway model (Clarke and Hollingsworth 2002), the interconnected model of teacher professional growth. These address, in different ways and to different extents, the relationship between teacher beliefs and practice and the influence of the stimuli for learning. We also discuss a more recent systemic conceptualisation (Opfer and Pedder 2011) - a systems model - and a model that aims to theorise the individual micro-level processes of professional learning (Evans 2014); this particular example being a cognitive learning model. The later models have, to a greater or lesser extent, been influenced by or formulated in relationship to earlier models as we go on to discuss.

These five models can be thought of as general models of professional learning given that they are intended to have wide applicability in contrast to local or specific models that might arise, for example, from the application of a theory of change (Blamey and Mackenzie, 2007) or logic model (Coldwell and Simkins, 2011; Rodgers, 2008) approach or through inductive analysis in relation to specific contexts such as professional learning arising from teachers' uses of mathematics curriculum materials (Remillard and Bryans 2004). General models of professional learning can also be contrasted with the application of social theory or methodologies developed for and through analysis of wider social phenomena and then applied to analysis of professional development, for example the application of cultural historical activity theory to lesson study (Wake et al. 2013) or sociomaterial analyses to

professional learning (Fenwick, Nerland and Jensen, 2012). We also distinguish these types of models from those that categorise or classify the purposes and outcomes of professional learning (for example, Kennedy, 2015, 2014 or Sachs, 2011).

From an initial review of professional learning literature, we selected the five models for more in depth review because they have been, or are potentially, powerful in supporting the research, evaluation and design of professional learning. Four of the five have been widely cited, as shown in Table 1 which records citations as recorded by Google Scholar. The most recent model – Evans (2014) - is based on a model of professionality that has in turn been widely cited (see Evans, 2008, 343 citations). It also represents a paradigmatically distinct approach, as will be discussed.

Table 1: Citations of papers using the models

Model	Guskey 2002	Desimone 2009	Clarke & Hollingsworth 2002	Opfer and Peddar 2011	Evans 2014
Citations	1723	1560	1171	459	22

Source: Google Scholar November 2016

We also identified that they represented possible limitations of different approaches to modelling professional learning. These models have been used to variously inform the design, analysis and evaluation of teacher professional learning and development activities and programmes as well as frameworks for review of literature (for example, Van Driel et al. 2012; Goldsmith et al. 2014). The models are similar in that each attempts to identify patterns of change and interrelationships between different elements or aspects of professional development processes. However, they differ in how these different componential elements are described and delineated, the relationships between them, the

elucidation of mediating processes, and their consideration of the complexity of the change environment.

We recognise that these models refer to professional learning and professional development using different, sometimes implicit, definitions of the terms. Notwithstanding important debates about the terminology used in the research literature (O'Brien and Jones, 2014; Webster-Wright, 2009), in this paper we adopt the terminology used by the authors of the models when discussing the components of their model and the implicit or explicit theory of variously professional learning, development or change. We use the term professional development activity to refer to activities or experiences that may lead to professional learning and/or development.

The proponents of the models discussed do not, in most cases, describe their frameworks or theorisations using the term 'model'. In this paper, we use the term model to mean a non-unique, partial representation of a system, object and event process or idea (Justi and van Driel, 2006; Gilbert, Boulter and Elmer, 2000). Adopting this meaning, we contend that it is reasonable to refer to them as models.

In the next section, we outline each model's origin and intended purpose and then propose an analytical framework to examine the five models. We highlight differences between the models and unresolved issues within them. Through this analysis, we draw attention to the partial nature of the models. Each one taken alone is not adequate as a model of professional development nor provides a complete set of tools to examine professional learning.

By making these issues explicit, we aim to support a more informed selection of models by designers, researchers and facilitators of teacher professional learning and development as

appropriate to their purposes, and to avoid misinterpretation of models. We argue for a flexible approach to the use of models, reconsidering them as tools and propose a set of principles that can inform the choice of models as tools for particular purposes, as well as more generally to inform the design, evaluation and research of professional learning.

The models and their purposes

Guskey's (2002) focus is on supporting teachers and professional developers to understand how changes in teacher attitudes and beliefs occur. Note that this model narrows the focus of his earlier evaluation level model (Guskey, 1999) which took a broader perspective, with student outcomes as a key 'level', which as presented is more akin to Desimone's (2009) model. It has been used across a range of fields and from many perspectives from professional development for experienced Physical Education teachers (Armour and Yelling, 2004) to beliefs about science teaching (Lumpe et al, 2012), and is included in key review papers in the field including those conducted by Desimone and Opfer and Pedder discussed herein.

In contrast, rather than focussing on teachers and developers, Desimone (2009) addresses the research community and within that evaluators, arguing her model should be used in "studies designed to describe trends, associations, or impacts of professional learning on knowledge instruction, and student achievement" (p183). Indeed, the focus on student outcomes as the endpoint fits with a discourse of evaluation of impact and has been cited in range of empirical research studies into professional development impact in areas including - for example - comparing the differences in impact of on-line and face to face professional development (Fishman et al, 2013), the impact of a training programme for new teachers

(Johannes, Fendler and Seidel, 2013) and of primary science professional development (van Aalderen-Smeets and van der Molen, 2015).

Clarke and Hollingsworth's (2002) model is proposed, and widely cited, as an analytical tool for understanding teacher learning and professional development. They also propose that their model is a predictive tool of potential change sequences in newly designed professional development contexts and it has been applied in this regard to coaching and mentoring (for example Hartnett, 2011) and initial teacher education (for example, Rodriguez, 2013). In addition, the model is intended as an interrogatory tool; an example of this form of application is the use of the four domains - personal, external, practice and consequence - as a typology to categorise the aims of professional development programmes in science education (van Driel, et al. 2012).

Opfer and Pedder's (2011) model emerged through a review of the literature that included Guskey's, Desimone's and Clarke and Hollingsworth's contributions. This review arose from their concern that a "process-product logic has dominated the literature on teacher learning and that this has limited explanatory ability" (p376). Their primary concern is theoretical and they aim to model the complexity of professional learning processes and argue that professional learning cannot be understood if this is not done.

Evans (2014) presents her model as a tool for those charged with leading or organising professional development in schools, arguing that planning for professional development can be more effective if leaders focus on the necessity for teachers to recognise something as a 'better way' of doing something, and understand the multi-dimensional nature of professional development.

An analytical framework for considering models of professional learning

Following a wider review of literature and identification of models of professional learning, we selected the five analysed in this paper for more in depth review, for reasons outlined above. We then undertook an iterative process of analysing the selected texts, and developing and refining a conceptual framework combining individual and collaborative analysis and discussion. This approach paralleled the process of constant comparative analysis used for interpreting empirical data (Charmaz, 2014) in which the developing analytical categories allowed further interrogation of the models. By comparing across models, similarities and differences as well as absences were highlighted. Many of the categories and concepts that were identified were explicit in the text of the reviewed papers. In other cases, we made inferences. For example, if a paper did not describe or refer to an explicit theory of learning this was inferred. Thus, it should be recognised that the analysis involved interpretation. This is particularly important in the sections below on theories of learning, agency and philosophical underpinnings where, in most cases, we infer the authors' positions.

The analytical framework used in the following sections is represented in Figure 1. The meanings of the various terms are discussed in more detail in the subsequent sections.

Figure 1: Conceptual framework for analysing models of professional learning

Components

- Elements
- Relationships

Scope

- Scale (micro, meso, macro)
- Ambit (aspects of the learning situation considered- outcomes, context, temporality)

Theory of learning (for example, cognitivist or social)

Location of agency (actors that prompt or lead to change)

Philosophical paradigms (ontological and epistemological foundations)

A limitation of our approach is that the conceptual framework is rooted in these five particular models and so does not include other important features of professional development, for example, policy, funder or instigator's purposes (as distinct from the purpose of the model) and the nature or form of outcomes beyond those specified in the model. Other conceptualisations of professional learning address some of these issues whilst being less concerned with modelling specific learning processes, such as those of Kennedy (2005, 2014) and Sachs (2011) which categorise the nature of learning; for example, contrasting retooling with transformative learning. Later we revisit the conceptual framework to suggest ways it could be extended to address these omissions.

Components of the models

In this section, we lay out what we refer to as the **components** of each model - the essential **elements** of the model and the **relationships** between them and so a description of learning processes. We recommend that reference is made to the original texts we cite for fuller accounts. Table 2 summarises the key elements and relationships between them, as we view them. Our use of 'component' differs from that used by Evans (2014), for whom components refer to categories within a root model of professional activity or practice which then underpins a model of professional learning. Across the five models there is variation in the representation of the processes, that is the ways through which professional learning is assumed to take place, and the positioning (or not) of these processes in relation to the wider systems or environment is often somewhat glossed over as 'context'.

Table 2: Components of the models

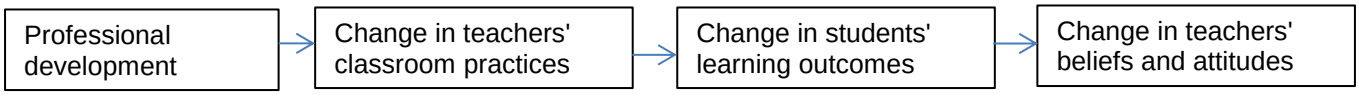
	Elements	Relationship
Guskey	Professional development; change in teachers' classroom practices; change in students' learning outcomes; change in teachers' beliefs and attitudes	Uni-dimensional causall path
Desimone	Core features of professional development; increased teacher knowledge and skills; changes in attitudes and beliefs; change in instruction; improved student learning	Non-recursive, interactive causal path
Clarke and Hollingsworth	Four domains of professional learning: the external domain; the domain of practice; the domain of consequence; the personal domain	Multiple pathways, change occurring via enactment and reflection
Opfer and Pedder	Teacher activity system with three nested subsystems: the teacher, the school; the learning activity system	Teacher change occurs via interaction within a dynamic set of nested systems, strongly influenced by that system
Evans	Three 'components' of professional development: behavioural, attitudinal	Cognitive processes and micro-processes of

	and intellectual development; each with a set of dimensions of change	teacher development occur via a chain of dimensions, across and within development 'components'

Guskey's path model of teacher change

Guskey's (2002) linear path model (Figure 2) is described as a "temporal sequence of events from professional development experiences to enduring change in in teachers' attitudes and perceptions" (p381), hinging on the teacher's responses to student outcomes. So, drawing on a range of empirical evidence, Guskey argues that if teachers change their classroom practice following a professional development activity, and then observe that this leads to positive change in students' learning outcomes, then this can lead to changes in teacher beliefs and attitudes. Thus his model has four elements linked by linear one way or uni-dimensional relationships. He sets this in contrast with earlier models that suggest teacher attitudinal change precedes student outcomes.

Figure 2: Guskey's path model of teacher change



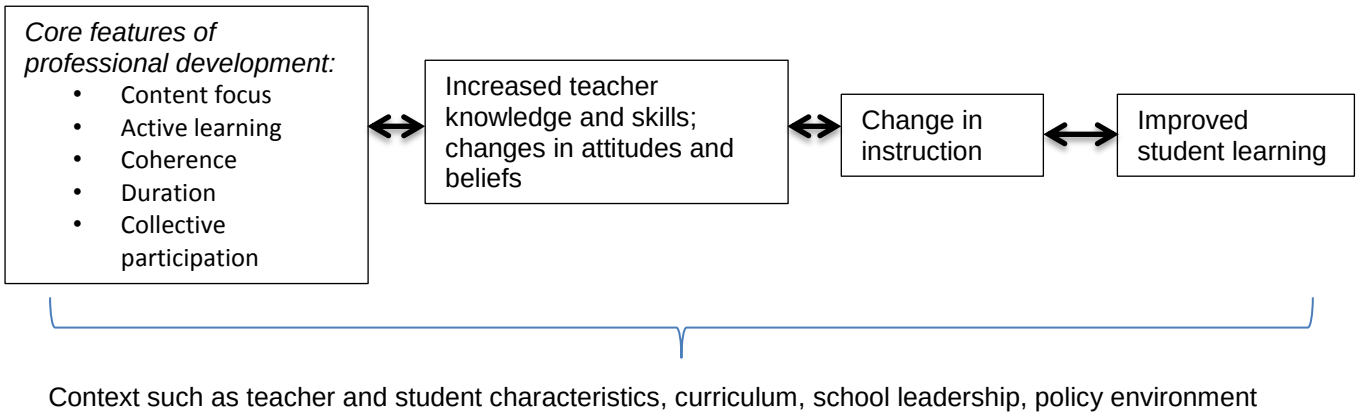
Whilst the model is presented as a simple chain, Guskey recognises professional development is a more complex process. He notes that professional development itself needs to be "seen as a process, not an event" (ibid p388), with continuing support, continuing use of the learning, and continuing challenge.

Desimone's model of professional development

Drawing on Guskey and other theorists, Desimone's (2009) model consists of a set of what she calls "core features" of professional development, and a "core conceptual framework".

The core features, presented as representing a consensus amongst researchers, lead via a causal chain to student learning outcomes as indicated in Figure 3 below. Thus, the elements are similar to those in Guskey's model, though described differently, and it is posited that particular features of professional development are needed for improved student learning to be the outcome.

Figure 3: Desimone's model of professional development

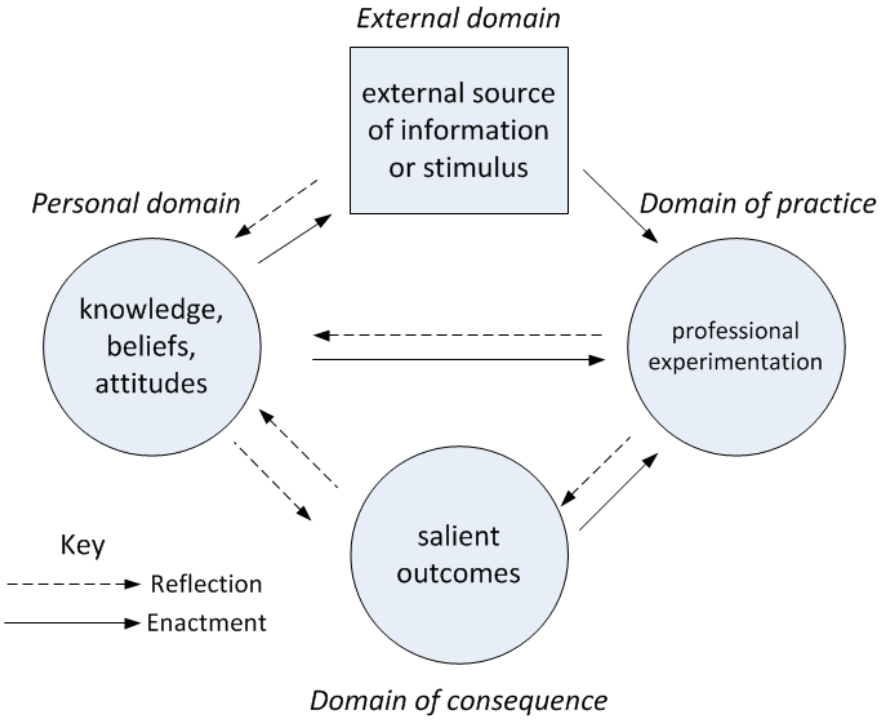


Similarly to Guskey, Desimone suggests that the relationship between elements is a causal chain, yet the ordering of the elements differs from Guskey's: Desimone posits that changes in teachers' knowledge and beliefs precede changes in their practice, although her argument that the model has 'nonrecursive, interactive pathways' indicates that the order is not necessarily fixed and allows for "differential emphases on the basic components" (ibid, p185) and presumably changing the order. The core features proposed by Desimone that need to be included for professional development activity to be effective are content focus, active learning, coherence, duration, and collective participation. However, beyond that, how these lead to professional learning is somewhat opaque.

Clarke and Hollingsworth's interconnected model of teacher professional growth

Clarke and Hollingsworth's (2002) interconnected model of teacher professional growth is a multiple pathways model. It explicitly builds on previous single linear pathway formulations and encompasses them by providing an analytical tool for mapping the different pathways that professional learning can take. Similarly to Guskey's and Desimone's models, it focuses on the relationship between different elements of professional learning, characterised as four domains: the external domain, the domain of practice, the domain of consequence and the personal domain (Figure 4).

Figure 4: Clarke and Hollingsworth's (2002) interconnected model of teacher professional growth (p.951)



Arguably, neither Guskey's nor Desimone's models provides illumination of the processes that link the different components of the model. This is something that Clarke and Hollingsworth seek to do. They posit that learning occurs via the multiple pathways identified through enactment or through reflection. 'Enactment' means putting into practice

the learning or changed belief, or trying new practices. 'Reflection' is understood as active consideration leading to inferences that causes change in beliefs and practice.

There is some similarity in the elements across the three path models. In both the Desimone model and the Clarke and Hollingsworth model, the importance of the change environment is identified, discussed principally as the school context. However, the individual teacher and her agency to influence her own professional learning are more visible in Clarke and Hollingsworth's model (a point we return to below). Furthermore, Clarke and Hollingsworth offer greater consideration of ways that professional learning and growth may occur in response to a wider range of external stimuli including, for example, informal interactions. Guskey and Desimone, in contrast, focus more strongly on responses to formal professional development activities with external stimuli. Further, they seek to identify mediating factors that influence teacher learning.

Opfer and Pedder's complexity model

Opfer and Pedder (2011) seek to account for complexity in the learning process through introducing the notion of a complex teacher activity system. Teacher change, they argue, occurs within a highly dynamic and influencing set of nested systems. These distinct sub systems appear similar to Clarke and Hollingsworth's domains but the orientation between systems is more fluid. For example, Opfer and Pedder highlight the importance of the teacher's orientation to the learning activity system as central to the teacher's relationship to professional learning, suggesting that a teacher may have a personal preference for a 'learning activity' within the professional development activity or programme, such as working collaboratively with colleagues from other departments.

Through the use of a complexity theory framework, they identify three important subsystems: the teacher, the school and the learning activity system. In terms of our analytical framework, these are key elements of their model (see Figure 5). In their paper, the existence of subsystems is supported and illustrated through a synthesis of research findings and the extensive literature on teacher professional development. They propose that this set of nested systems interacts in different ways and in different intensities to influence teacher learning. Of note, they do not attempt to offer a diagrammatic relationship of these subsystems or of any mediating factors and domains.

Figure 5: Components of Opfer and Pedder's complexity perspective

Elements: nested systems and subsystems

- learning activity system
- teacher
- school system

Relationships: Orientations between and to systems

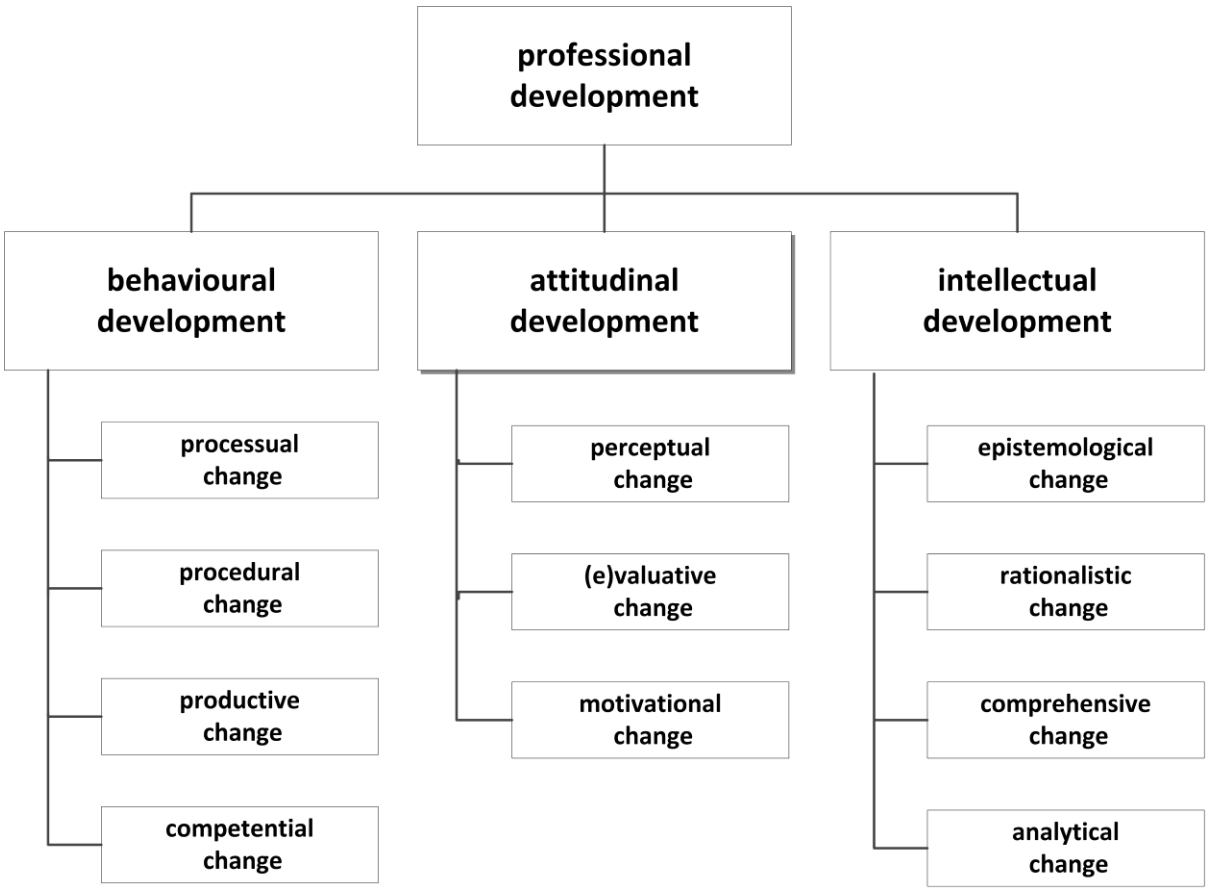
Opfer and Pedder claim their perspective allows us to foresee causal chains, relationships and potential pathways of teacher learning and also to explain why teacher learning may or may not occur. This systems model suggests that connections between orientation, learning, and nested subsystems already exist and constantly influence teachers' learning (whether formal professional development activity is taking place or not). So, like Clarke and Hollingsworth's interconnected model, it has the potential to account for both formal and informal professional learning. Unlike the other four models, Opfer and Pedder omit any explicit reference to the relationships between teacher learning and student outcomes except in discussion of prior models. Whilst wider systemic influences are acknowledged, for

example educational policy and ideology, this is, in our view, underexplored, perhaps reflecting that the basis for the model is a review of literature within which, in turn, these factors are relatively neglected.

Evans's model of professional development

In contrast to the models discussed so far, Evans's (2014) model of professional development is located at the micro-level of the individual cognitive processes when teachers engage in a single professional development ‘episode’, such as finding a better way of teaching apostrophes (an example that Evans cites). The underlying premise is that professional development occurs when an individual recognises a 'better way' of doing something. The multi-dimensional model (Figure 6) is made up of three components of professional development: behavioural, attitudinal and intellectual development. As noted above Evans uses the term components within her model and it differs from our use in the paper, as we also consider relationships as components. Evans's components of professional development are derived from a general model of components of professional activity (Evans, 2008), which from Evans’s perspective can be equated with professionality. Each developmental component is further broken down into dimensions of change; so, for example, attitudinal development comprises perceptual change, evaluative change and motivational change. Evans argues that when a teacher recognises a 'better way' of doing something, change occurs in one or more of the dimensions, often across more than one development component. However, it is not necessary for change to occur in all the dimensions for professional development to occur.

Figure 6: The componential structure of professional development (adapted from Evans, 2014, p.191)



Evans describes two types of relationships that are focused on cognitive micro-processes of teacher development that lead to change in these components (elements). For Evans, the first is when a 'better way' of doing something presents itself without being deliberately sought out or even the teacher recognising a previous deficiency - and so Evans's model accounts for informal as well as formal learning. Whether or not an individual recognises a 'better way' of doing something, and hence whether professional learning takes place will depend upon which of the change dimensions are at play. A second mode of teacher change, also recognised by Evans, occurs when behavioural changes are imposed upon teachers. However, she considers that in such cases there are unlikely to be changes in the attitudinal

and intellectual components, so whilst this might be considered to be professional development it is arguably not professional learning.

Evans identifies some overlaps between her model and the interconnected model: "we appear to be thinking along the same lines; Clarke and Hollingsworth's 'change sequences' approximate to my 'micro-level development'" (ibid p. 864). However, Evans suggests that the concepts of enactment and reflection do not account for 'the mental internalisation process' that is central to professional development. Thus, this internalisation is taken as key to change in the components/elements.

The scope of the models

The notion of **scope** utilised in this paper includes two key aspects. Firstly, we examine the ***scale*** of focus using the notions of micro, meso and macro. The micro/meso/macro terminology has not often been previously applied to professional development and these are, of course, relative terms. Here, we use micro to refer to the moment-to-moment learning experience and meso to refer to the teacher in the context of a professional development programme or experience and in the context of their school or setting. Macro refers to the wider structural consideration such as the wider educational context, or the ideological or policy motivations for a professional development programme. All three terms are used as heuristics for analytical purposes, rather than ontological categories that reflect levels of social processes and structures that exist independently from interpretation.

Related to this is, what we refer to as, the ***ambit*** of the model: that is, the different aspects of the learning situation that are included, taken into account or given attention to, as well as the extent or depth to which different aspects are considered. The ambit includes the outcomes that are highlighted as being important, the environment or context, the extent

to which outcomes and environment are theorised, and the temporal dimension - whether the theory/model addresses learning episodes or moments of learning or changes that take place over a longer time span. Table 3 summarises a comparison between the models in relation to scope.

Table 3: Scale and ambit of the models

	Scale	**Ambit**
Guskey	Meso - teacher in relation to professional learning arising from specific events/moments in school/setting context.	PD process towards teacher change in discrete PD episodes; limited focus on context.
Desimone		PD process towards student and teacher outcomes in discrete PD episodes; contextual factors included in static form.
Clarke and Hollingsworth		PD process leading towards student and teacher outcomes in discrete PD episodes; recognition of contextual factors with some recognition of dynamic interrelationships.
Opfer and Pedder	Micro - teacher orientation to learning activity system; meso - the learning activity system and recognises macro wider system though limited consideration.	Focus on nested systems and subsystems; context treated as active part of wider system; orientation towards learning systems rather than only a discrete PD episode.
Evans	Micro - personal/cognitive experiences of the individual teacher.	Cognitive aspects of PD process leading towards teacher outcomes; teacher agency in relation to experimentation; no focus on context; focus on discrete PD episodes.

The different models focus to different extents on the micro, meso or macro aspects of professional learning situations, although they acknowledge that an understanding of professional development needs to take account of all these different scales. The three path models (those of Guskey, Desimone and Clarke and Hollingsworth) are meso models that consider individual teachers in the context of a particular professional development programme or stimulus that has a relatively bounded range of potential outcomes. Evans focuses on the micro, including the personal and cognitive experiences that both lead to

learning and can be considered to be learning, attending to the components of professional learning of the individual teacher. Opfer and Pedder widen the gaze to consider interactions between different systems. Thus, their conceptualisation moves in the direction of taking account of the macro, although the discussion of the wider system is limited. The focus on systems also means that an important aspect of the micro arena - the teacher orientation to the learning activity system - is conceptualised. More generally, the dynamic relationship between the micro, meso and macro aspects, informed by complexity theory, could potentially be considered in applications of this perspective.

In relation to ambit, Guskey and Clarke and Hollingsworth specify four aspects of the professional learning process: the professional development stimuli, teacher beliefs, knowledge and attitudes, teacher practices, and student outcomes. Desimone considers similar categories whilst adding an analytical frame consisting of a set of core features of effective professional development as laid out in Figure 3 (content focus, active learning, coherence; duration, and collective participation). The different path models do, however, stress different degrees of relatedness between these aspects with the interconnected model, as the name indicates, stressing interconnectivity. Opfer and Pedder's complexity theorisation takes this further by positing the existence of nested systems and sub-systems.

A general omission in all five models is the important issue of the purposes of professional learning programmes and how this relates to the policy context. Kennedy's typology of types of professional learning (2005, 2014) and the work of Sachs (2011) both posit a continuum of purposes of professional development. Here we use 'purpose' to refer to policy purposes and variation in the form or type of professional learning that results from professional development. The purposes identified in these papers range from training, with

a focus on skills developed, through to transformative professional development that leads not only to a change in practice but change in identity. Further, the influence of wider social forces and ideologies are not addressed in the five models. At the time of writing the influence of neo-liberalism and discourses of performativity are prevalent in many jurisdictions and influence the construction of professional development activity, teachers' engagement in such activity and its outcomes (Day and Sachs, 2004). Given the pervasiveness of these phenomena and their influence on professional learning it is important that such issues are accounted for in professional development models.

Theories of learning

In this section, we discuss how the models vary in their underpinning theories of learning (see Table 4) and the extent to which this theory is made explicit. This is related to variations in the account of learning processes and relationships between elements discussed above as components of the models.

Evans's focus is on micro-level processes that take place within the mind of the teacher: the intra-psychological processes. Indeed, Evans criticises other models of professional learning for their lack of focus on cognitive processes. There is, however, only limited consideration of how the trigger of a teacher recognising 'a better way' of doing something is to be understood theoretically. Further, there is little consideration of the relationship between this theory of professional learning and development and cognitive learning theories that provide a fuller account of the internal psychological process involved in learning.

All the other models in our review include some consideration of the social context in their underpinning theories of professional learning, and to that extent can be seen to be located as social learning theories. Guskey and Desimone focus on the experiential nature of

professional development with learning being embedded within the process of change. For example Guskey (2002 p384) asserts “change is primarily an experientially based learning process for teachers”. There do, however, appear to be differences between the models in the assumptions they make about how learning takes place within the social context. The single path models present learning as primarily constructed by the individual in response to professional development experience influenced by their school context. In contrast, the interconnected model and the systems model appear to be positioned within social learning theories that assume a stronger integration of the individual and their context.

As noted above, Clarke and Hollingsworth claim that their model is compatible with both a cognitive perspective of learning (concerned with the individual construction of knowledge) and with a situative perspective (concerned with the development of practice), appearing to underpin the model with a social-constructivist theory of learning. While Opfer and Pedder refer to the situated nature of professional learning, they do not make their theory of learning explicit. However, their conceptualisation of 'learning orientations' which are constructed from participation within a dynamic complex nested system implies that learning is integral to the situation.

Table 4: Underpinning theories of learning

Model	Theory of learning
Guskey's	Socially situated experiential learning
Desimone's	Socially situated experiential learning
Clarke and Hollingsworth's	Social constructivist
Opfer and Pedder's	Social learning in complex systems
Evans's	Cognitive

Agency

We now turn to the issue of agency or more broadly the account of agents that instigate or produce change processes. It is noteworthy, and, in our view, an omission, that explicit discussion of agency is not included within the models. Where we refer below and in Table 5 to models taking a particular view of agency, it is important to note that this is implied. Within the limits of this paper, a full discussion of theories of agency and their relationship to professional learning is not possible. However, two different approaches to theorising agency are potentially relevant to the models under consideration. The first approach utilises sociological theories of agency (see for example, Biesta and Tedder, 2007), which focus on agency as individual action within social contexts. The second approach utilises sociomaterial and sociocultural theories (e.g. Fenwick and Edwards, 2010; Fenwick, Nerland, & Jensen, 2012).

Although they do not use the term agency, Clarke and Hollingsworth (2002) emphasise teachers' role, as "active learners shaping their professional growth through reflective participation in professional development programs and practice" (p. 948). The positioning of the teacher at the centre of this model is emphasised by the assertion that what constitutes a salient outcome is subjective and dependent on teacher beliefs and orientation. So, for example, depending on prior beliefs, more student-to-student talk

focused on the content of intended learning may be viewed positively as increased student autonomy and 'on task' or negatively, for example as a loss of control ,or 'cheating') or 'off task'. Note that this is not an issue of the nature of talk but rather how the same type of talk is perceived.

Similarly, the interconnected model stresses the importance of professional experimentation; again, emphasising teacher agency. In other models, the importance of teacher agency is less emphasised, though for Guskey it is part of the process of learning whereas in Desimone's conception it appear be more of by-product of the professional development. Evans's view of professional learning processes does, it appears, stress the importance of teacher agency in that teachers' experimentation and so learning arises in relation to the needs or concerns identified by teachers themselves.

However, agency can also be considered as a less anthropomorphic concept than is sometimes used and decoupled from a necessary association with a conscious actor. This accords with, for example, theorisations of agency as a product of sociomaterial relationships as in actor network theory (see for example, Fenwick and Edwards, 2010; Fenwick, Nerland, & Jensen, 2012) and so agency is not restricted to individual humans; the term 'actant' is sometimes used to signify this extension. Such theorisations help to highlight that the role of materialities such as texts, tools, technologies, bodies, actions and objects (Fenwick, Nerland, & Jensen, 2012, are under-considered in the models. Examples of such materialities and artefacts are curriculum materials that lead to professional learning (Remillard, & Bryans, 2004) or lesson plans in lesson study (Wake, Foster, & Swan, 2013). Further, such conceptions potentially allow for the role of learners, and others not directly involved such as school leaders or PD facilitators, as agents to be considered. Although not

highlighted by the authors, Clarke and Hollingsworth's model - in a similar way to Guskey - implies that students are also agentic or actants and so are powerful in the change process, given that changes in student outcomes can generate changes in teacher beliefs and practice. However, Evans takes a different view, and explicitly excludes relationship to student outcomes in terms of theorising teachers' attitudinal, behavioural and intellectual change.

Table 5: Agency in professional learning processes

Model	**Agency in the professional learning process**
Guskey	Teacher agency as part of process; students as actants
Desimone	Teacher agency may arise as a by-product of the process of professional learning
Clarke and Hollingsworth	Teacher agency as central to process students as actants
Opfer and Pedder	Teacher agency as part of process; systems and systems features as actants
Evans	Teacher agentic

Opfer and Pedder's conceptualisation does not explicitly discuss agency. However, given the model has its basis in complexity theory, n a more developed account of this issue might conceptualise agency as an emergent property of the system, arising out of relationships rather than a property or quality of individual elements of the system. Their model emphasises teacher orientation towards the learning activity system which goes beyond Clarke and Hollingsworth's recognition that teachers' views of what outcomes are salient influences learning and change processes.

Philosophical foundations

The philosophical foundations of the models differ in relation to their espoused and implicit ontological and epistemological commitments and so they also differ in the extent to which they seek to offer causal accounts or to provide analytical descriptions of change processes.

Guskey's model is presented as a testable model akin to those found in the natural sciences. Its theoretical power comes from being rooted in teachers' classroom practice outlining a change process based on teachers' perceptions of changes in student learning derived from a variety of experiences from classroom responses to examination results.

Guskey draws parallels between his model (in which student outcomes precede teacher attitude change) and another model, the James-Lange psychological theory (in which change in behaviour precedes emotional change). This appears to imply a realist ontological position: that there are enduring, generative mechanisms that produce observable regularities across the social world.

Desimone also argues that the process of professional learning is a causal chain, and so like Guskey's model it ought to be testable in the sense of observing (or not) outcomes that regularly arise from the posited causes. Desimone's pathways attempt to avoid the apparent uni-dimensionality of Guskey's model by describing the links as non-recursive and interactive. However this brings with it some potential epistemological problems. Desimone explicitly describes her model as positivistic, to be used by the 'causal modeller', Desimone's target audience, to uncover the circumstances under which the model's predicted causal path is enacted in practice. However, the added recognition of ontological complexity, introduced by the non-recursive nature of the links in the path, blunts the model's utility: if

the path can operate in a non-linear way, the circumstances under which this can occur need to be made explicit; otherwise the model cannot be used to forecast outcomes.

Clarke and Hollingsworth's model focuses on multiple pathways between four domains, and therefore allows that changes to practice, learning and outcomes can occur in differing orders. Clarke and Hollingsworth claim analytical predictive and interrogative utility for the model, noting that the predictive aspect relates to the model's power as a tool for identifying potential change processes rather than predicting specific changes. Clarke and Hollingsworth assert that their model is compatible with both a situated and cognitive perspective, thus presumably they consider the model is compatible with a variety of ontologies.

Looking across these three path models we would argue that a lack of clarity on their ontological commitments restricts their power. In essence, we are not entirely clear on what basis the claims about analytical or empirical utility are being made, so are unclear about the limits of these claims. Opfer and Pedder's perspective differs by explicitly drawing on complexity theory as an underlying position to contend that learning occurs in nested systems within systems. This viewpoint attempts to avoid linearity, since change occurs simultaneously at different levels and these changes work together to produce outcomes.

Whilst all of the above models can be seen as belonging to a family of broadly sociological models, Evans's model differs quite sharply in two ways. Firstly, rather than utilising a sociological perspective, the model centres on the psychological domain. Secondly, whilst the other models draw to some extent on inductive theorisations of causal processes drawing on empirical research, the Evans model takes a logico-deductive approach, eschewing empirical observation for logical reasoning in the analytical philosophical

tradition. Whilst this is helpful in drawing a logically coherent path, it ignores the potential empirical complexities acknowledged by the other accounts. A summary comparison of philosophical foundations in presented in Table 6.

Table 6: Philosophical foundations

Model	**Philosophical foundations** (in *italic* where made explicit)
Guskey	sociological positivist/realist, empiricist
Desimone	sociological *positivist*, empiricist
Clarke and Hollingsworth	sociological, *social constructivist*
Opfer and Pedder	sociological, *complexity theory*,
Evans	psychological, logico-deductive

Reconsidering the five models of professional learning

In the analysis presented above, we identified a range of issues in the formulation of the models in relation to their scope (scale and ambit), theories of learning, agency and philosophical foundations. In this section, we further develop this discussion by reconsidering the five models of professional learning and focusing on four aspects which are important in the further development of these and similar models of professional learning: their relative under-theorisation of change processes and learning; considering professional learning as situated; he life course and identity as missing constructs; and accounting for collaboration and the social dimension.

Relative under-theorisation of change processes and of learning

In general, as we have argued above, single path models under-theorise change processes as does Opfer and Pedder's complexity perspective. In contrast, Clarke and Hollingsworth provide an account of two processes that enable learning to occur across their domains. However, both processes lack specificity with regard to connections between different

domains. It is not clear, for example, how a change in salient outcomes directly leads to a change in practice unmediated by a change in beliefs. The model supposes only a relationship of reflection between the 'personal domain' and 'domain of consequence' (see Figure 4 above). However, one might suppose that a change in beliefs and attitude may lead to an enactment that in turn changes teachers' views of what are salient outcomes. In addition, the two processes are under-theorised in that the distinction between them is not clear. Reflection, we are advised, leads to change in action, yet this is offered as distinct from action based on changed beliefs, which is categorised as enactment. Moreover, the two mediating process of learning are offered as not only independent from each other and mutually exclusive but as comprehensive. Yet there may be other processes leading to change if these are understood as only focused on 'what works' and in attending only to conscious processes of learning (Evans, 2015). Evans offers a model of change process which focuses on teachers' conscious desire to find 'better ways' or the emergence of what is subjectively believed to be better through happenstance or experimentation. The aim to integrate the psychological into theorisation of professional learning is laudable. However, given the intrinsically social nature of professional learning this omits from consideration social-psychological theory let alone sociocultural psychological perspectives. We concur with Webster-Wright (2009) that there is a general lack of attention paid in research literature to the experience of learning as embodied and embedded in practice and how such learning is conceived by professionals, including teachers.

We have highlighted above that agency is relatively neglected in the models. One way of addressing this and other gaps in the models is by introducing additional perspectives that draw on other social theory, for example sociological theory in relation to agency (see Biesta and Tedder, 2007). However, this is also problematic given that different ontological

perspectives and commitments are likely to be implied, and it lays to one side the problem that each of the models adds something to our understanding, but some of them appear incompatible with one another.

Professional learning as situated

As discussed in the section on scope, a shared feature of all the models is, in our view, the lack of attention paid to the situated nature of professional learning which is variously limited, partial or absent. Depending on the paradigmatic position this might be considered as context or environment, although paradigms such as complexity theory or sociomaterial theoretical perspectives call for other metaphors than that of situation as container (Fenwick, 2011). For Evans, with her focus on the micro and a concern to develop a universal theory, this is perhaps understandable. However, teachers are presented here as somewhat decontextualised actors. The environment is not explicitly included in Guskey's model, although the paper discusses the influence of 'a range of situational and contextual variables' (p387). Desimone explicitly identifies a range of environmental factors that need to be taken into account - including school, students, curriculum and policy - as context for change (see Figure 2). A similar but more limited approach is followed by Clarke and Hollingsworth, who consider the influence of context in relation to access, participation, experimentation and application and draw out how different school (but not wider policy or local) environments can influence participation and outcomes in practice. However, as in Guskey and Desimone's theorisation, the environment is posited as something in which the professional learning processes take place that may influence the outcomes of the model, rather than producing outcomes or potentially being influenced by professional learning. In other words, the environment is treated as external and static rather than immanent and

active as it is at least partly in some applications of a level model approach such as that offered by Coldwell and Simkins (2011).

Opfer and Pedder's systems-based approach allows the environment to be considered in a more sophisticated way by identifying wider systems as potentially important and interconnected but an account of this is not developed in their paper. As discussed above, a key concept in their model is the notion of a learning activity system. Unlike the path models, this implies that the professional development stimuli (Clarke and Hollingsworth's external domain) cannot be considered as conceptually separate from the teacher situated with a complex system. Opfer and Pedder highlight not only the importance of teacher orientation towards teaching (and specifically the focus of professional learning) but also to the learning activity system itself. This suggests a more complex and recursive set of relationships than that supposed by path models.

Evans's description of learning processes differs from the other models by deliberately omitting context. Evans justifies this by arguing that theories must be universal and independent of context. Evans, like, Opfer and Pedder, does not consider the relationship between teacher learning and student outcomes. However, rather than being an omission, Evans (2014), points to the 'impossibility' (p188) of identifying causal impact of professional learning on student outcomes. This leads to her argument that although students may be secondary beneficiaries of teachers' professional development they should not be integral to the conceptualisation of teacher learning or development.

Beyond discrete episodes: the life course and identity as missing constructs

Each of the models focuses on discrete episodes of professional learning. In identifying teacher beliefs and attitudes as potentially influencing learning outcomes, the historical location of the teacher is acknowledged. However, the various models do not attempt to

take account of professional learning or growth taking place over an extended period of time as conceptualised in stage models that seek to chart progression from novice to expert (see Dall'Alba and Sandberg, 2006) or over the life course (Biesta and Tedder, 2007; Day, 1999).

Further, the conceptualisation of the personal domain, as in Clarke and Hollingsworth's model or parallel conceptions of the role of teacher beliefs and knowledge, does not fit easily with extended understandings of teacher growth and development. Such extended understandings attend to notions of continuous learning that put identity as central (see Beijaard, Meiher and Verloop, 2004; Beauchamp and Thomas, 2009). Considering the importance of identity focuses attention on ways that professional learning may arise or be constituted through a different sort of professional experimentation - experimenting in different ways of being a teacher. Thus, arguably, models of professional learning need to account for this.

Accounting for collaboration and the social dimension

Three of the models seek to theorise professional development activity where professional development stimuli are posited as external (Guskey, Desimone, Clarke and Hollingsworth), with one (Evans) seeing it as generated by the teacher. However, without extension or adaptation, none of the models (taken alone?) seem to be able to account, , for forms of professional development that have grown in popularity such as collaborative modes of professional development including lesson study or the promotion of professional learning communities (Stoll et al. 2008). Here the professional learning environment is co-created by participants. One way of addressing this is to consider the social domain rather than the external domain (to use the language of Clarke and Hollingsworth). Opfer and Pedder's

complexity perspective suggest a more sophisticated view focusing on a learning activity system.

The five models compared

Table 7, below, summarises key aspects of the five models in relation to the categories of the analytical framework and to issues discussed above, specifically omissions and/or aspects to develop that are common to the models.

Table 7: Comparing the five models

Relevant features of the models	Guskey	Desimone	Clarke and Hollingsworth	Opfer and Pedder	Evans	Aspects to develop common to the models
Components of model	Professional development - Change in teachers' classroom practices - Change in students' learning outcomes - Change in teachers' beliefs and attitudes	Core features of professional development - Increased teacher knowledge and skills; changes in attitudes and beliefs - Change in instruction - Improved student learning	Four domains of professional learning: the external domain, the domain of practice, the domain of consequence and the personal domain	Teacher activity system with three nested subsystems - the teacher, the school and the learning activity system	Three components of professional development: behavioural, attitudinal and intellectual development; each with a set of dimensions of change	None of the models address collaborative PD Materialities are under theorised
Relationships between components	Uni-dimensional causal path	Nonrecursive, interactive causal path	Multiple pathways, change occurring via enactment and Reflection	Teacher change occurs via interaction within a dynamic set of nested systems, strongly influenced by that system	Cognitive processes and micro-processes of teacher development occur via a chain of dimensions, across and within development components	Change processes need development in all models
Theory of learning	Socially situated experiential learning	Socially situated experiential learning	Social constructivist	Social learning in complex systems	Cognitive	Social theories of learning largely absent from the models

Relevant features of the models	**Guskey**	**Desimone**	**Clarke and Hollingsworth**	**Opfer and Pedder**	**Evans**	**Aspects to develop common to the models**
Scale	Meso - teacher in relation to professional learning arising from specific events/moments in school/setting context			Micro in relation to teacher orientation to learning activity system; meso in relation to the learning activity system and recognises macro wider system thought limited consideration	Micro - personal/cognitive experiences of the individual teacher	Macro scale not strongly conceptualised in the models
Ambit	PD process towards teacher change in discrete PD episodes limited focus on context	PD process towards student and teacher outcomes in discrete PD episodes; contextual factors included in static form	PD process towards student and teacher outcomes in discrete PD episodes ; recognition of contextual factors with some recognition of dynamic interrelationships	Focus on Nested systems and subsystems; context treated as active part of wider system; orientation towards learning systems rather than only a discrete PD episode	Cognitive aspects of PD process towards teacher outcomes; teacher agency in relation to experimentation; no focus on context; focus on discrete PD episodes	Political, moral dimensions, life course and identity, and situated nature of professional learning not well accounted for in the models
Agency in professional learning	Teacher agency as part of process; students as actants	Teacher agency may arise as a by-product of the process of professional learning	Teacher agency as central to process students as actants	Teacher agency as part of process; systems and systems features as actants	Teacher agentic	Role of materialities under-developed; most take a broadly anthropocentric view of agency
Philosophical foundations (in *italic* where made explicit)	sociological positivist/realist, empiricist	sociological *positivist*, empiricist	sociological, *social constructivist*	sociological, *complexity theory*	psychological, logico-deductive/platonic	Philosophical position not explicit in models

Models as tools

At the outset of the paper we adopted a definition of model as a partial representation. This being the case it is not surprising that our analysis indicates that each of the models is limited. However, it may be that in a specific instance there is a good fit with the aims of the potential user. This leads us to invoke the concept of tool as an alternative to attempting a synthesis between what might appear to be incommensurable approaches, given that the models have different paradigmatic foundations. Below we consider philosophical considerations that can support the embrace of all these models as potentially useful. First, however, we address the question of how to choose between them in specific contexts or for particular purposes. The approach we offer here to select between the models draws, in part, on the conceptual framework used to analyse the five models. For simplicity we consider selection for the researcher or evaluator aiming to analyse a professional development programme. However, the same process could be adapted to inform the design of professional learning activities or indeed professional learning policy at network or system levels. This could be at a national level or in clusters of schools, for example, in England, in teaching school alliances that promote networked professional learning(Boylan, 2016). Considering the models as tools draws attention to different system levels that are important to pay attention to in such contexts.

Our proposed approach to selecting a model is to offer a series of interrogatory questions and suggestions of issues to consider in responding to these. These interrelate and could be used iteratively. They are organised by the analytical framework as indicated in Figure 7. To use this framework it is important to recognise a distinction between the components, scope and so on of the professional development programme or activity and those found in the models. We suggest that by posing these questions, the researcher or developer can consider to what extent the models may be helpful. How a researcher or developer responds to these questions may provide greater rationale for their choice of model; at a minimum it makes the fact that a choice is being made a more conscious process.

Figure 7: Choosing between the models: key questions

Components

To what extent do the components of the model map onto the components of the focus PD programme or activity?

Are there important aspects of the PD programme or activity that are not easily accounted for by the model?

What are the change processes that underlie the PD programme or activity? Do these accord with the model?

Scope

Is the programme focussed on the micro, meso or macro scale?

What outcomes are the foci of the development programme or activity?

Is the focus on discrete PD episodes or broader than that?

What is the context of the PD under consideration? Does it require a systemic perspective?

Theory of learning

What theory of learning is espoused by the programme or activity, or is expected to be relevant? How far is the model congruent with this?

Location of agency

How is agency conceived within the programme - is it focussed on individual teacher agency, or does it include broader conceptions?

Philosophical paradigms (ontological and epistemological foundations)

How far is the philosophical basis of the theory of learning and change processes in the programme or activity compatible with that of the models?

The key questions above could be applied to other models. It is also important to note that using a general model is only one possible approach. Alternatively, as we stated at the start of the paper, a local model could be developed or a more generalised social theoretical perspective applied.

One way to address gaps or weaknesses in each of the models is to attempt a synthesis to produce a meta-model that encompasses the different models. Our analysis indicates that this kind of approach is not likely to yield more positive results than each of the models alone given that all the models share important omissions. We suggest that each of these model types can be helpful, in part; but all of them have weaknesses. What is more, their weaknesses - or perhaps more accurately their incompleteness - is not simply a matter of a need for a better defined, better researched model. It is about the complexity of the

social world, which is such - we argue - that no single model, no matter how well defined, can ever be universally applicable.

A further possibility is to use more than one of the five models we have discussed or indeed to combine one of these with additional theoretical perspectives from either other general models or other social theory, for example, on agency or learning.. For simplicity, we focus in the remainder of this section on the first possibility - combining the five models considered in this paper - though similar arguments would apply to the latter.

Using more than one model is to accept that each model provides a different lens on professional learning. Multiple models, each internally coherent in terms of their ontological conceptual and theoretical underpinnings, would be deployed to provide alternate perspectives that provide a richer insight to professional learning than any one individual model. This approach suggests a perspective of existential pragmatism (Boylan, 2004; McLaren, 1994) that considers different epistemologies and ontologies as perspectivally useful; consequently this in turn shifts the focus from considering the models as representations but rather as tools that may need to be used alongside others, an approach which seems to us to provide the most utility for the researcher or developer.

Conclusion

In this paper, we have undertaken a conceptual analysis of five models of professional learning and identified explicit and implicit features of the models as well as areas that are as yet under-theorised in models of professional learning. The models have different purposes and foci and to an extent the models 'speak past' each other, which partially stems from these differing purposes that the models have been designed to address.

We have proposed a conceptual framework that can guide the choice of models by designers, researchers and evaluators of professional learning. The framework can also be extended to other models. Although we have not had the space to develop this here , we believe this framework can also support the

development of specific, inductive models if this is appropriate to a particular professional development programme and can make such specific models more analytically powerful. The framework can also be used as an interrogative tool to inform the design of research and evaluation of professional learning activities.

It is possible to treat each of the five models as incommensurable, following Kuhn (1970), and simply select one and promote it as the 'best', presumably in keeping with a favoured paradigm. Doing this avoids the need to address the paradigmatic issues identified in our analysis. This seems to us to be simply ignoring the issue of differences between the models, rather than addressing it.

An alternative is to seek a synthesis. However, we have argued that the complexities of professional learning mean that seeking *an* answer to theoretical and methodological challenges or an overarching synthesis is unrealistic and instead we need to consider multiple answers. This moves the debate about models of professional learning on from the risk of disagreements, or - worse- a lack of dialogue, between opposing perspectives as each seeks to provide a universal model.

One way to address this methodological complexity is to reconsider the models less as representations but rather as tools to be deployed alongside other relevant constructs. This can support a more informed and effective selection of theoretical models of professional learning by researchers and practitioners.

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