Unraveling effective professional development: a rhizomatic inquiry into coaching and the active ingredients of teacher learning

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Abstract

Teacher professional development (PD) is about change. One of the most prominent lines of research on PD addresses what makes it an effective change process. This research produces critical features of effective PD, the seemingly active ingredients of teacher change that are meant to guide professionals in the design, implementation, and evaluation of PD programs. Embedded within this research is a linear, hierarchical, causal mono-logic model that is the hallmark of Western rational thought. Rhizomatic thought (Deleuze and Guattari 1987), with its non-linear perspectives, offers a contrast, highlighting the unpredictable multiplicity of complex systems that embrace the emergent dynamics of becoming and hybridity. In this paper, we look at features of effective PD through a rhizomatic lens, with a focus on PD as mapping and tracing. Drawing on vignettes from two case studies from a year-long pedagogical coaching PD program, we explore how effective features of PD can be unraveled in practice and rewoven into vibrant hybridity within real-world school contexts.

(161 words)

Introduction

Educational research commonly holds the ultimate aim of inquiry to be the identification of what works, whether in reference to student learning, classroom technique, or teacher change. Standards of evidence often require large scale random control trials, pseudo-experimental studies, or meta-analyses, anchored in post-positivist conceptions of what counts as inquiry and what knowledge is legitimate. This is research based on a linear, hierarchical, causal mono-logic model. Such research gets results, and progress moves in a line: Process to product. The products of these endeavors are often best practices, authoritative guidelines, theoretically informed protocols, or taxonomies of essential features of effective approaches. These then inform initiatives, policies, directives, teacher preparation materials, and in-service professional development. In myriad ways, these ideas spread and are embodied in school practices.

Such is the case with teacher professional development (PD). One prominent line of research explores what it is that makes PD work (e.g. Desimone 2009; Darling-Hammond et al. 2017). Examples of effective PD are identified and synthesized, producing lists of features of effective PD. These features, backed by the authority of evidence-based research and professional consensus, are meant to inform the design and implementation of PD in all schools. Though valuable, as synthesized products of research they become abstracted away from the reality of professional learning and growth in which they arose. Excised from the complexity and

multiplicity of the world, refined of contradiction, ambiguity, and nuance, these features can become models against which other realities (instances of PD) can be shaped to produce the desired outcome: effectiveness. Underlying this process is the assumption that effective PD arises from these active ingredients alone or, at least, more than anything else. The rest of the school reality from which they were excised can be dismissed as stage, substrate or incidental. Isolating effective features implies that the rest is, by comparison, inconsequential or inert. These active ingredients can then be reproduced, transplanted into new substrates, where it is presumed they will produce that which, under prior conditions, they produced: Effective PD.

The danger with essential effective features is the possibility that they can become more than reflections of PD effectively carried out in other contexts, but authorities in their own right (Mulcahy 2011), uncritically accepted common sense (Strom and Lupinacci 2019). Employed in techno-rationalist models of training and expertise, PD can manifest as the authoritative dominance of abstract models and regimes of best practice (Hunt 2019).

Yet, context matters, and it matters a great deal (Johnson et al. 2012, Smagorinsky 2018). The success of a reform (such as a PD program) can be judged by many criteria, including fidelity of implementation or adaptability (Cuban 1998). The former criterion tends to be preferred by researchers, administrators, and policy makers, and the latter tends to be preferred by those in the classroom. The adaptation of PD to context and practice is not inevitable and is often actively prevented in service to fidelity. Frameworks of effective PD can act as constraints, dictating the ways change can be leveraged. Yet, we argue that, where implementation of PD is concerned, hybridity should be considered the rule, not the exception. Further, we argue that post-positivist approaches to research are not equipped to explore this hybridity. They are the wrong tools for the job. We need to look elsewhere.

We turn to the non-linear rhizomatic theory of Deleuze and Guattari (1987) to understand how effective features of PD can be not only contextualized but hybridized, and brought from abstraction to vibrant practice. Rhizomatics provides us with tools for thinking, bridging the standard and the unique, and coping with and embracing hybridity (Strom et al. 2018). This study illustrates how these tools, particularly the concepts of mapping and tracing, can help us move beyond dichotomies of context and generalized theory/practice such as critical features of effective PD. We do not advocate for the abandonment of critical features or models of effective PD. Instead, we argue that critical and active features must be employed as movement towards hybridity, not as standard or an endpoint.

We explore this dynamic through cases from educational coaching. As educational coaching has been identified as displaying Desimone's (2009) characteristics of effective PD (Desimone and Pak 2017), we focus on Desimone's framework. We provide narrative fragments drawn from case studies of coach/teacher partnerships to illustrate what hybridity of these effective features can look like in practice. Our aim is not to disprove or contradict these features, but to unravel them, finding effectiveness between aspects of coaching that relate to these features and the needs of specific teachers in context.

Literature Review

Features of Effective Professional Development

Research on teacher PD has been prolific. This work has allowed scholars going back to the eighties (Sparks & Loucks-Horsley, 1989) to aggregate and synthesize findings, presenting consensus-based recommendations of what makes PD effective. Recently, a number of reviews

employed strict post-positivist evidentiary criteria to identify a relatively small number of studies of effective PD (defined in terms of student outcomes) that were evaluated for their features. Notable examples include Yoon et al. (2007), Kennedy (2016) and Darling-Hammond et al. (2017). Features have also been identified through teacher self-reported experiences, using both large-scale US teacher surveys (Garet et al. 2001) and multi-state longitudinal survey studies (Desimone et al. 2002).

Desimone (2009) presented one of the most prominent frameworks of critical features of effective PD. Taking a post-positivist perspective and reviewing available research to establish professional consensus, Desimone proposed a (non-exhaustive) framework of five critical features of effectiveness that are meant to apply across different PD types and approaches, as presented in Table 1.

Content focus	PD emphasizes teacher content knowledge (e.g. science, mathematics, literacy) and content-specific teacher learning.
Active learning	PD uses hands-on, performance project, and practice-based activities rather than passive lecture transmission approaches.
Coherence	PD is consistent with, or at least not contradictory to, conditions, culture, needs, and goals of teacher/student micro- and macro-contexts.
Sustained duration	PD is stretched throughout the school year (or longer), totaling at least 20 hours.
Collective participation	PD is collaborative, based in groups or school communities, rather than individual.

Table 1. Five Critical Features of Effective Professional Development (Desimone, 2009)

Desimone (2009) further proposed a sequence model of effective PD. In this model, PD based on critical features changes teacher knowledge, skills, attitudes, and beliefs, which in turn changes instruction, which then improves student outcomes. This framework (features and model) is intended to guide the design, assessment, and research of PD as a focal phenomena.

Educational Coaching as Professional Development

Desimone and Pak (2017) applied the critical features framework to one approach to PD in particular: educational coaching. Broadly, this approach involves a dedicated PD specialist working with teachers either individually or in small groups over an extended period of time, supporting their professional learning in a non-evaluative manner. Desimone and Pak (2017) found, in theory, that coaching is consistent with each of the five critical features. It is, by definition, active, collaborative and sustained. It has potential to be content focused. Further, coaches can build coherence within schools (Mangin and Dunsmore 2015) or can adapt their coaching to fit a school's context (Coburn and Woulfin 2012). In this way, the consistency of coaching with these critical features would anticipate its effectiveness as PD. Indeed, evidence of the effectiveness of coaching has been emerging, recently captured in a meta-analysis of 37 empirical studies (Kraft et al. 2018). The coaching approach considered for this paper has been found effective in terms of teacher practices and student achievement (Teemant 2014, Teemant and Hausman 2013, Teemant et al. 2011). Yet, considering educational coaching in this way raises an important question: Are these five features alone the 'active ingredients' of effective coaching?

Critiques of Critical Features

The gold standard of evidence for effective PD is improved student outcomes (Kennedy, 2016), a standard that presumes a linear process-product relationship between PD and outcomes (Opfer and Pedder 2011; Viesca et al. 2019). A number of scholars have represented a more complicated relationship between PD and student learning. Timperley et al. (2007) identified 84 characteristics of learning environments that could impact student outcomes, including, but hardly limited to, characteristics of available PD. Given such complexity, some have expressed skepticism about the possibility of isolating critical features of effective PD. Guskey (2003) reviewed 13 lists of such features, ultimately doubting that ‘a single list of characteristics leading to broad-brush policies and guidelines for effective professional development will ever emerge’ (p. 750). Wayne et al. (2008) note that the empirical evidence for critical features was thin, did not address programs scaled up across multiple contexts provided by multiple specialists and did not provide PD staff with adequate specificity.

Kennedy (2016) reviewed quasi-experimental studies of PD using stringent standards regarding sample size, participant selection and study design. She concluded that Desimone’s (2009) critical features did not reliably predict effectiveness. She asserted that ‘We need to replace our current conception of ‘good’ PD as comprising a collection of particular design features with a conception that is based on more nuanced understanding of what teachers do, what motivates them, and how they learn and grow’ (2016, p. 964).

Like many reviews identifying effective features, the reservations cited above come from the post-positivist theoretical perspective currently prominent in educational research, policy, and funding (Martin and Kamberelis 2013). The greatest limitation of this perspective, according to Opfer and Pedder (2011), is the conception of PD as a linear uni-directional process where effective interventions influence teacher learning, thereby influencing student learning in a way that is direct, if one step removed. They offer a complexity theory conception of PD, wherein teacher growth is understood to occur within nested subsystems (school, teacher, and PD activity) that are mutually and recursively influential. Recursive influence means changes in one system can lead to changes in another, in turn leading to changes in the first system, and so on. No system is fixed or isolated, nor are they equally influential or completely in flux. Understood this way, PD activities might influence teacher practices, influencing teacher orientation to PD, further influencing teacher practices. Opfer and Pedder are not necessarily arguing against the identification of features of effective PD, but rather highlighting how these features must be understood within nested systems not in the abstract, as discrete features or in isolation from context.

Take two commonly identified features: Sustained duration and collective participation. Sustained PD, consisting of twenty or more hours spread out over time (Desimone, 2009), can be subject to considerations of intensity and diminishing returns. Time spent on PD could have a curvilinear relationship: After a certain point, more time could be of no more help or even cause harm (Nuthall and Alton-Lee 1993). A focus on quantity of time spent might lead to a disregard for quality of time spent. These considerations, and others, are likely to be highly individual and contextual.

This approach also has bearing on Desimone’s model of teacher growth, in which PD activities influence teacher beliefs, influencing practice, influencing student outcomes. In contrast, Guskey’s (2002) model holds that PD first changes practice, changing student outcomes, and then changing teacher beliefs. A complexity perspective (Opfer and Pedder 2011)

holds that neither model is representative and, in a sense, both are. Teacher growth could happen in either order, and in others, recursively, in many stages, or in a number of sequences.

Complexity theory is one theoretical approach to exploring the role abstract features of effective PD can play within the nonlinear flux of teacher realities. Rhizomatic thought, as another approach, presents an even greater contrast to post-positivist perspectives by offering theoretical tools that help us see the complexity of teacher growth as *multiplicity*, *possibility* and *becoming*. It is to this body of theory we turn.

Theoretical Framework: Key Rhizomatic Ideas

Deriving from the work of Gilles Deleuze and Felix Guattari (1987), rhizomatics presents a radical way of thinking differently about the world, emphasizing becoming over being. It can be thought of as a continuous process of rethinking through key Deleuzoguattarian ideas (Cumming 2015) rather than a systematic approach per se. Within education research, rhizomatic thought has been used to offer new perspectives on teacher learning and practice (Strom and Martin 2017), teacher education (Hordvik et al. 2019), student classroom interaction (Leander and Wells Rowe 2006), curriculum (Eaton and Hendry 2019), equity in special education (Ko and Bal 2019), teacher identity in science education (Wallace 2018), and pedagogical coaching (Sherman et al. 2020). The work of Deleuze and Guattari abounds with powerful ideas, and it will not be possible to think through all of them here. Instead, given our purpose, three ideas are brought to bear: The arborescent and the rhizomatic, assemblage, and mapping and tracing. These ideas, in turn, serve the respective purposes of (a) breaking from traditional research paradigms that seek effective features of PD as an end point; (b) unraveling effective features of PD in practice; and (c) returning to effective features of PD to weave a way forward.

The Arborescent and the Rhizomatic. The figurations at the heart of rhizomatic thought are the tree and the rhizome. Traditional Western techno-rational thought is held to be an arborescent way of thinking: Hierarchical and linear, it grows upward through division, categorization, and distinction. Arborescent thought underlies post-positivist research paradigms. Linear process-product models of teacher change represent arborescent thought, with dualism and dichotomy as its hallmarks.

Rhizomatic ways of thinking, in contrast, emphasize multiplicity, connection, anti-representation/interpretation, emergence and possibility (Deleuze and Guattari 1987). In rhizomes, possibility reigns, hierarchies shift and reorganize, and relationships between things are of far more consequence than the things themselves. Rhizomatic thought does not necessarily present arborescent/rhizomatic as a dichotomy, but as entangled and co-constitutive (Eaton and Hendry 2019), shifting between in constant becoming, with the arborescent containing the possibilities of the rhizome and vice versa. The arborescent ‘engenders its own escapes’ into the rhizomatic, and the rhizome can ‘[give] rise to a despotic channel’ (Deleuze and Guattari 1987, p. 20), and each can arise within the other.

The Assemblage. Another key term is that of the assemblage. Recalling the nested systems of complexity theory, an assemblage is a shifting entangled network of human and non-human, tangible and intangible, material and discursive elements that co-function in unity to produce something, such as force from a military (DeLanda 2016) or student learning from a classroom (de Freitas 2012). Assemblages can be nested and can share elements. Assemblages are not things so much as events occurring over time. Each is unique. The territories of

assemblages can shift as new elements are incorporated, others are lost, or relationships between elements realign. This last dynamic highlights a seemingly esoteric but crucial point of the assemblage, and of rhizomatic thinking: Elements only become what they are in relation to other elements within the assemblage. A distinction can be made between an element's capacities (or potentials) and properties, with its capacities only made real through relations in assemblage (DeLanda 2016). Assemblages are not the sum of their parts, cannot be reduced to essential components, and cannot be added to without changes to both existing and new elements. In other words, elements in isolation don't have real capacities, only potentials. These points are more than merely philosophical. They highlight the powerful shift of thinking rhizomatically, moving beyond individualistic and linear conceptions of causality. These shifts are key for thinking about critical features of effective PD in entirely new ways.

Tracing and Mapping. In rhizomatic thought, representation is a process of uncovering essential, deep, underlying structures or patterns in the world and transferring them, deprived of context, into another medium. It is finding the important and essential part that 'matters,' and having it stand, in some sense for the whole (i.e., as a synecdoche). Deleuze and Guattari (1987) call this tracing, referring to a process of transferring an image from one medium to another. Tracing represents the articulation of arborescent thought: The identification of essential dynamics, natural laws, general patterns, or critical features that can be generalized, or imposed (or over-coded) upon multiple contexts in the world. Tracings isolate, organize, stabilize and neutralize (Deleuze and Guattari 1987). Representations/tracings are difficult to escape. Even the words printed here can be considered tracings.

Rhizomes, on the other hand, are resistant to representation, and resistant to over-coding. Rather than tracing, the rhizomatic endeavor is mapping, open ended 'experimentation in contact with the real' (Deleuze and Guattari 1987, p. 12). Whereas tracings are meant to be closed, finished and authoritatively final, maps are living, shifting, ongoing endeavors that are an active part (along with the mapper) of the focal phenomenon, part of its assemblage. Tracings de-contextualize. It is not enough to say that maps contextualize. They absorb, and in doing so are transformed.

Though this would seem to set up yet another arborescent dichotomy, tracing and mapping are not so discrete. They are modes of understanding that can be used recursively. Deleuze and Guattari (1987) do not call for the abolition of tracing, but exhort that 'the tracing should always be put back on the map' (p. 13). In educational environments, 'tracing can provide rudimentary understandings of teaching/learning processes, [and] mapping is required to understand how the various structures and forces of schooling experiences function together to manufacture particular kinds of citizen subjects and particular kinds of social-political learning spaces' (Martin and Kamberelis 2013, p. 672). We will explore next how this tandem use of mapping and tracing is applicable to PD informed by frameworks of critical features but also responsive to the conditions in which it is employed.

Critical Features of Professional Development as Tracings

Thinking through these key rhizomatic concepts, we now return to features of effective PD. Opfer and Pedder (2011) caution that much of the research on effective PD relies on binary absence/presence measurements that abstract away details (such as scale and intensity). In rhizomatic terms, this produces theoretically derived tracings. They further note that much of the research on PD is built on an epistemological fallacy in that it confuses relationships between

and among elements of PD (e.g. forms, structure, and context) and measures of change with teacher learning itself. In other words, it takes the tracing to be the map. Strom et al. (2019), reviewing literature relating to the concept of teacher dispositions, drew on rhizomatics to problematize these findings as static, essentializing, abstract, and removed from practice. They offered an alternative view of teacher dispositions as non-linear, complex, multiple, and relational. The distinction has implications for teacher assessment, preparation, and professional learning. At its heart is the idea that our representations of phenomena, our tracings, when made into standards and policy, become influential in their own right, helping to shape reality (Mulcahy 2011). When researchers search for and operationalize best practices, essential features, and theories, they create tracings that not only reflect the world, but influence it. These ideas can have a life of their own.

Under arborescent thought, examples of effective PD are used to produce tracings, abstracted away from the map of PD reality. If we stop with tracings, such features may be employed in the service of efficiency, one-size-fits-all standardization, routine, and procedure: a techno-rationalist model of PD (Hunt 2019). Rhizomatic ways of thinking help us explore how the tracings of effective features of PD can be translated into vibrant practice. We must ‘plug the tracings back into the map, connect the roots or the trees back up to the rhizome’ (Deleuze and Guattari 1987, p. 14). Seen rhizomatically, the features of effective PD mean nothing in isolation, produce nothing in abstraction, but function as elements in assemblages, on maps, in and through their relation to everything else. In this way, rhizomatic thought is of value in understanding professional learning (Strom & Martin 2017).

Method – The Research Assemblage

One implication of drawing on rhizomatic theory is that data is not merely studied, but that research is produced by the assemblage of data, context, methodology, and researchers, i.e. a research assemblage (Fox and Aldred 2015). The following is a description of that assemblage. This paper draws on data from a study of pedagogical coaching in an urban midwestern US elementary school. The study followed the cases of nine teachers, each of whom attended a one-week, 30-hour summer workshop on principles of effective pedagogy (Teemant et al. 2014, Tharp et al. 2000), and were supported by a pedagogical coach with 15 years coaching experience in implementing these principles over a school year.

The focal phenomena were teacher/coach conferences, conducted across seven cycles, with each cycle composed of a pre-observation conference, a classroom observation, and a post-observation conference. These conferences were video-recorded with a fixed camera controlled by the coach, producing around 7 hours of footage for each teacher. Teachers also participated in exit interviews in which they reflected on their experience. Classroom footage and audio recordings were also collected prior to and following the PD coaching experience.

Previous studies of this data employed thematic analysis to explore coaching interactions from dialogic, sociocultural, and narrative identity perspectives¹ (Haneda et al. 2017; Haneda et al. 2019b). Guided by Desimone and Pak’s (2017) critical features of effective PD, we revisited analyses from these coaching conversations in previous studies to identify relevant episodes, guiding a return to the original video and transcription data. These data represented teacher and coach articulations of classroom events rather than the events themselves, making them representations of representations. Nonetheless, they stand as illustrations of the critical features

¹ Manuscript currently unpublished.

of effective PD in practice. Furthermore, they are entry points into the assemblages of coach-mediated teacher growth (Sherman 2019).

Rhizomatic Analysis

Arborescent approaches to analysis call for systematic and rigid protocols that aim for transparency and reproducibility. Coding, in the qualitative analysis sense, is a way of imposing systematic organization on meaning (Handsfield 2007) creating new, fixed systems of meaning or, in rhizomatic terms, overcoding the world (DeLanda 2016). This approach is useful for producing tracings, but is less helpful for returning to the map (Martin and Kamberelis 2013). For mapping, we employ rhizomatic analysis, a sort of anti-method of reading data-assemblages through key Deleuzoguattarian concepts discussed above (Masny 2016). The goal is not to produce authoritative representations (i.e. findings, conclusions, theories) but to attempt to create possibilities for new becoming as readers are drawn into the practice/data/theory assemblage. With research that is grounded in anti-representational theory, there is a tension in establishing the validity or trustworthiness of the work (Strom and Martin 2017). Though the initial analysis was carried out with a systematic thematic analysis procedure, the researchers returned to the data guided by MacLure's (2013) emergent sensing of the data, of finding ways that it 'glows.' We used a rhizomatically informed heuristic and inductive process to find narratives within the data that open these possibilities. This involved reviewing the cases with Desimone's framework in mind, putting them into assemblage with the key ideas (together with us as researchers). Episodes that 'glowed' with each of the critical features were found, across different cases. Specific episodes were selected and developed into vignettes that illustrate critical features unraveled and brought into hybridity. Owing to limitations of space, two of these vignettes are presented below in detail.

Researcher Reflexivity

The two researchers both had distinct yet complimentary relations to the study. Annela designed the initial study and organized the data collection. She had firsthand familiarity with the school and teachers. Brandon came to the study at more of a remove, having designed and carried out the initial thematic analyses of the video data years after it was collected. In this way, Annela had a wholistic view of the data, connected to its larger context, while Brandon had a more focused view circumscribed by the limits of the data itself.

These complimentary perspectives were of use in establishing the trustworthiness of the vignettes. Brandon, who was familiar with the data, wove the vignettes from analysis guided by Desimone's critical features framework. These were reviewed and revised by Annela, whose familiarity with the broader context as well as the data, helped ensure fidelity to the cases. Aside from the researcher's (unavoidable) interpretations, nothing was added to the vignettes that was not reflected in the data. Quotes were minimally altered for comprehensibility.

Tracings – Two Critical Features

We present vignettes from two participant cases that pertain to two of Desimone's and Pak's (2017) critical features of PD in coaching collaborations: Content/pedagogy focus (emphasizing content knowledge) and Collective participation (rather than individual). We use these vignettes to draw the tracings of critical features from abstraction, illustrating and then unraveling them to highlight how they can be transformed when interwoven into assemblages, with hybridity emerging as they are brought back to the map of professional learning.

Vignette 1: The Content/Pedagogy Feature

In his tenth year of teaching, Drake was a specialist working with 5th grade emergent bilingual learners. Though not of Hispanic descent, he identified as a Spanish speaker and had ties to the Latinx community. An experienced bilingual educator, he was teaching in a school using an English only English as a Second Language (ESL) pull-out approach. Pedagogically, Drake emphasized integrating and celebrating his students' language and cultural heritage in the classroom, learning through authentic tasks and communication, and building a community of learners. He held himself as different than the other ESL specialists in his school, less focused on traditional approaches. He disliked drills and worksheets, asking 'Are we wasting time or are we doing things that are worthwhile?' Yet this was also a source of concern rather than pride for him. He told the coach, 'Everyone else seems to just do worksheets, and I never do worksheets so I always feel like I'm doing it wrong.' Comparing himself to other teachers, he said, 'My weaknesses as an ESL teacher are, I think, the basics... Like teaching vocabulary, teaching spelling. I am not good at that.' This focus on pedagogical content knowledge was not only related to his colleagues, but also student assessment. He told the coach he was '...always second guessing [...] I've never been really one to really freak out for the standardized testing, but then [...] it's a big deal here. I want to make sure that, oh everyone passed except [my] 14 kids.'

Professionally, the coach had years of experience as a bilingual teacher, and was qualified to provide Drake with content-focused support in this area. However, while giving some support in this direction, she mainly focused on helping Drake reflect on his pedagogy. Rather than aiding Drake in becoming more like the teachers against which he compared himself, she helped him develop confidence as a non-traditional teacher in his setting. She reframed his perceived lack of content knowledge by emphasizing his strengths: his rapport with his students, his respect for their culture, and his ability to engage them with literacy and in learning. She told him, 'The work sheets will not give you what you gave your kids yesterday. And the funny thing is the people who are using worksheets are not questioning. Only the man who's not using worksheets is saying "Should I be more like that?" The answer's no. [...] Cause those kids were engaged.' She reframed his relationship to other teachers. Referring to teachers other than the ESL specialists, she tells him 'They highly respect you. It's interesting because many teachers this week have talked to me and said "A lot of kids really respect Drake." A few teachers have said that.'

Unraveling Content Focus

In the above narrative, the coach chose to emphasize Drake's strengths as a teacher rather than develop his content knowledge, reorienting him within his classroom assemblage with a focus on his own pedagogical practices. From a complexity perspective, content knowledge focused PD is not equally effective for every teacher, being more likely to be useful to a teacher with little content knowledge than one that is already well-versed (Opfer and Pedder 2011). A rhizomatic perspective allows us to go further, seeing content knowledge as an element in assemblage, one that takes form and meaning only in relation to other elements. Some of the elements of Drake's teaching assemblage were Spanish language and Latinx culture (both in terms of his own life experience and concerning his students), his ESL specialist co-workers, standardized testing, test scores, and the idea of a legitimate teacher as defined by pedagogical content knowledge (i.e. the basics). Drake believed that improving his basic pedagogical skills

would help his students improve their standardized test scores, an outcome he felt was valued by his school though he did not value it himself.

As an idea, ESL Content knowledge and pedagogy was already entangled with deficit in Drake's teaching assemblage as evidenced in his comparisons to his colleagues, his conception of his own ESL content and pedagogical priorities versus worksheet-focused instruction, and in relation to testing. The coach focused on content knowledge by unraveling it as something not to be added to Drake's practice, but as a thing that already existed there in a particular way. She helped Drake reweave content knowledge into his practice in a way that empowered his pedagogy. As a result, the professional growth produced was more of a reflection of Drake's values as a teacher: culturally responsive and equitable learning for his emergent bilingual students. In this way, content knowledge was hybridized to Drake's practice.

Vignette 2: The Collective Participation Feature

Tanya was a 2nd grade teacher with 5 years of teaching experience. As a relatively new teacher in her school, Tanya co-planned with three experienced teachers at her grade level. Early in the year, she told the coach, 'I am very lucky to come into the team I work with,' and noted how, during the previous year, the team had helped her navigate challenges in implementing required curricular materials. That year, she was also working with the coach, collaboratively setting goals, discussing her classroom, and planning activities. Together with the coach, Tanya began to test, explore, and articulate new pedagogical priorities, such as dialogic small group instruction and student independence.

Though the other teachers were not working with the coach, Tanya brought her experiences and values to the grade-level planning sessions. At first, the whole team was excited, and began to change how they taught together. As time passed, however, Tanya expressed frustration, saying that 'they backtracked' and 'The whole idea was, we planned it right after we did the meeting and it's so the students take ownership. And now everyone else has said, "Well, we're not doing that anymore."' Tanya was torn. Her relative inexperience made her doubt herself and wonder if the more experienced teachers new better. Yet, she encountered success in her own classroom that she described in transformative terms. The coach asked, 'Do you want to go back?' 'No. I like it.' Tanya replied. 'Then don't,' said the coach. At another conference, the coach told her 'You can always blame it on me. You can always say, my coach says I need to do this. I'm not kidding.' As the school year progressed, with the coach's support and encouragement, Tanya went on to enact her own classroom practices with little resemblance to, and less regard for, those of her grade-level colleagues.

Unraveling Collective Participation

Though different coaching approaches can be more or less collaborative, in this case the coach made it clear that each teacher's growth was a collaborative and dialogic endeavor (see Haneda et al. 2019a). Yet, Tanya's narrative shows how collaboration can inhibit growth as well as support it. Prior to coaching, the grade-level teaching team loomed large in Tanya's teaching assemblage as a source of support. Further, the difference in experience was, for Tanya, a source of their authority. With the introduction of the coach and new pedagogical priorities and practices, Tanya's relationship with the team shifted, and their collaboration became a source of tension. Though Tanya considered them to have backtracked, from a rhizomatic perspective they did not 'go back' in the sense of reverting back along a linear progression. Such a repetition,

undertaken in a shifting assemblage with new elements (such as the coach), must be understood as something new (Deleuze 2004).

Across the nine participants of the larger study, collaboration between teachers and the coach was a constant. However, teachers' relationships to their colleagues, as related to coaching support, varied widely. In some cases, the coach was able to foster and support a teacher's collaboration with other teachers in the school, drawing connections and passing on names. In the case of Tanya, the coach was able to help her break away from the collaboration (and the authority of the veteran teachers) by unraveling it, making space for Tanya to weave her own authority as an educator. Thus, collective participation itself can be a hybrid practice, one producing learning and growth in, through or against local conditions.

Discussion – Tracings and maps

The preceding narratives and unravelings highlight one pedagogical coach's support as an example of PD hybridized to the teachers' specific needs and demands. Though we focused on two of Desimone's (2009) critical features, the other three (active learning, coherence, and sustained duration) can also be studied in terms of unravelling and hybridity, along with other best practices, guiding principles, and essential features of effective PD. Rhizomatic ideas help us think about critical features in new ways. For example, most² of these features entail an implied or explicit binary dualism: Active learning/passive learning, coherent approaches/incoherent (or inconsistent) approaches, sustained PD/one-off PD, and collaborative participation/isolated participation. The rhizomatic discussion above explores how these binaries can be unraveled, finding space for teachers to grow between these poles. If one takes the inverse of these critical features, it describes many traditional 'sit and get' PD workshops. Such workshops might be considered prime examples of tracings not put back on the map, ideas not given space to come alive and become something new. Though coaching has been our illustrative focus, there is potential to think rhizomatically about other forms of PD and how they can be reconceptualized to better support the hybridity of teacher learning within teachers' classroom assemblages.

Rhizomatics can help us think about PD implementation as well. The examples above can be understood as positive illustrations of hybridity. The coach was not restricted to a content focus, to building collaboration, or to a particular timeline. Instead, she adapted her support to the needs of the teachers. In this unraveling of critical features, the coach was able to help teachers navigate past these binaries and grow in their own individual ways, adding to and reorienting the elements of their teaching assemblage. The coach did not just contextualize the tracings of the critical elements into her practice, but unraveled them and wove them into the map of the teachers' assemblages. Recalling Delanda's (2016) distinction between real and potential capacities, she worked with the teachers through their assemblage to realize some capacities and not others. This highlights how critical features of PD can be misleading as absolute standards yet valuable as guides, representing starting points for coaches navigating the complex and shifting assemblage of teacher practice (Martin and Kamberelis 2013). PD specialists can consider what sorts of collaboration are most likely to be of the greatest help, how time can best be spent, whether action or reflection is needed, and whether support should focus on content, pedagogy, or even cultural inclusiveness and equity.

These hybrid approaches have implications for power relations in PD as well. Rather than trying to embody/enforce policies, frameworks, and best practices, PD specialists can work with

² The exception is content focus, for which there is not one but a number of alternatives (See Kennedy, 1998).

teachers to unravel ideas and weave them into practice in a way that reflects teacher and student needs and priorities. Coaching has great potential for working with teachers rhizomatically, as a coach can work in and through conditions, functioning as part of an assemblage to jointly produce teacher learning. The coach is positioned to help weave the tracings back into the map of teacher practice, not just contextualizing but integrating. In joining, understanding, and working through teacher assemblages, coaches can become cartographers of professional learning.

Rhizomatic thinking also has implications for linear sequential models of teacher change, such as that of Desimone's (2009), in which PD first changes teacher beliefs, as well as Guskey's (2002) in which practices are the first to change. In both of these models the causality is unidirectional and the elements are artificially discrete and isolated from other potentially influential elements. They are illustrative of arborescent process-product thinking. PD seen as an assemblage emphasizes that these elements are all connected in multiple, multi-directionally influencing ways, and further, that they are co-constituted with a multiplicity of other elements (consider the 84 features identified by Timperley et al 2007). Rather than committing to one particular leverage point for teacher change (either teacher beliefs or practices in the models noted here), rejecting a process-product framework allows us to recognize that teacher change might come about in myriad ways, through changes in beliefs, practices, conditions, and professional relationships, just to offer a few examples (Opfer & Pedder, 2011). Designers and providers of PD must realize that the imposition of particular models can be harmful in that they can overcode, territorialize, or calcify responsiveness to recursive or emergent change (Hunt 2019, Strom and Martin 2017). Thinking rhizomatically, PD specialists can look for change in multiple places and consider multiple ways of leveraging change to produce more than just effective pedagogy but also just and equitable schooling (Strom and Martin 2015).

Finally, rhizomatics has implications for how we can study PD. It bears repeating that we do not dismiss arborescent ways of knowing and inquiring. The seeking of evidence for the effectiveness of PD practices (or other aspects of education) need not be replaced by rhizomatic or non-linear approaches, but can be complemented by them. Tracings are of value for supporting teacher learning, provided we don't treat them as reality itself, and we always consider how practices are hybridized and brought alive in context. Despite emerging from vastly different paradigms, we argue that this research can be conducted in dialogue rather than conflict. This paper represents steps in this direction.

Conclusion: Always Back to the Map

The narratives presented here are small windows into teachers' experiences with a coach, yet they provide insight into hybridity and critical features of effective PD. They are unavoidably tracings as selective representations. Therefore, we repeat the refrain: The tracings must be put back upon the map. Educational researchers, PD designers, administrators, and policy makers, inasmuch as their work is removed from the classroom assemblages into which PD is ultimately incorporated, are all more likely to work with tracings than maps. They work with abstract ideas, professional consensus, and best practices rather than the fluid multiplicities of classroom realities. For this group, rhizomatic thought serves as a reminder that their work, and their products, should not be considered complete, or ends in themselves: Their tracings must be put back on the map, absorbed into classroom assemblages rather than imposed upon them. Whoever undertakes moving tracings back to the map—be it teachers, coaches, or other PD professionals—must be given a free hand to do the necessary unraveling and reweaving to make

this happen. Reforms can be evaluated in a number of ways, such as fidelity to design or adaptability to context (Cuban, 1998). The former is static, calcified, inert, arborescent. The latter is vital, multiple, rhizomatic. Educational assemblages vivified by vital PD can produce more than just compliance: They can produce inquiry, equity, and justice.

We do not dismiss the body of research, post-positive and otherwise, that has gone before and will follow. We do not dismiss the critical features of PD and other tracings they produce. Rather, we insist that they be understood as static and representative tracings, and we repeat (lest we forget): Tracings must be put back upon the map to remain alive, shifting, and active parts of a vibrant educational assemblage.

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