Exploring the influence of professional development on teacher careers : developing a path model approach

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Citation:

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This paper develops a path model of professional development (PD) to explore the relationship between teacher PD and teacher careers and retention. A focussed literature review frames the study, which is based on a survey of 500+ teachers and interviews with 25 teachers. The findings provide evidence of the influence of PD on intermediate outcomes within the model and some evidence of influence on career progression. The paper concludes that a path model can provide a useful frame for examining the influence of PD on career, but the approach is limited given the complex, situated nature of teachers' careers.

Keywords: professional development; careers; retention; path model; evaluation

1. Introduction

Whilst the importance of professional development (PD) in relation to pupil outcomes is (relatively) well established, its relationship to career development and - to a lesser extent - retention has been subject to much less attention. This paper draws on a review of PD and PD evaluation literature to develop a framework - which I refer to as a 'path model' (Desimone, 2009) - to examine the relationship between teacher PD and teacher career outcomes and retention via a chain of intermediate steps in a study of science teacher PD. Drawing on an empirical study of science teacher PD in England, I explore the potential benefits and limitations of using a path model approach to study the relationship between PD and teacher careers, arguing that path models can be useful tools in articulating a theory of change that can frame data collection and analysis and - in particular - draw attention to factors that influence how PD can lead to career and retention outcomes.

2. Teacher professional development and teacher careers

2.1 Clarifying terminology

By professional development (PD) I mean formal and informal support and activities that are designed to help teachers develop as professionals. This includes taught courses and in-school training, as well activities such as coaching, mentoring, self-study and action research. By career progression I mean changes in job roles that often, but not always, involve greater status, responsibility and sometimes pay (such as promotion or subject leadership in a primary school). The term 'career outcomes' is used to cover both career progression and wider career impacts including professional competence and career aspirations. I mean retention to refer to the teaching profession rather than retention in a particular school or other organisation.

2.2 The relationship between career stage and professional development

There is a fairly large international literature (e.g. Richter, Kunter, Klusmann, Lüdtke & Baumert, 2011; Kelchtermans, 1993; Huberman, 1995; Sikes, Measor & Woods, 1985; Day & Gu, 2010) exploring the relationships between career stage and professional development that theorises that career stage influences individuals' take up of, or the effectiveness of different types of, professional development. However, there are fewer studies that relate directly to the causal relationships between professional development itself and career development or retention. An indicator of this is that the 2004 EPPI centre systematic review of literature in relation to the effects of induction (Totterdell, Woodroffe, Bubb, & Hanrahan, 2004) found only two studies worthy of review, indicating the paucity of studies taking strongly experimental or quasi-experimental approaches judged by the EPPI centre to be the gold standard for such reviews (Oakley, Gough, Oliver & Thomas, 2005) and although experimental studies in education are

now becoming more common, such studies in relation to PD tend to focus on teacher knowledge and practice outcomes and of course pupil outcomes (Wayne, Yoon, Zhu, Cronen & Garet, 2008).

2.2 The relationship between professional development and teacher retention

Research largely from the UK, USA and Australia on the factors that influence teachers' retention in the profession indicates that lack of job satisfaction, due to teachers' heavy workload and other pressures, appears to be a more important reason for leaving the profession than a lack of PD (Ladd, 2007; Hobson et al., 2007; De Nobile & McCormick, 2008; DeAngelis & Presley, 2011). There is evidence from research into schools' support for early career teachers' development as classroom practitioners, particularly in relation to mentoring, that professional development can have a positive influence on teachers' intentions to stay in teaching (Cameron, Lovett & Berger, 2007; Day & Gu, 2007; Hobson & Ashby, 2012). However, Opfer and Pedder (2010) suggest that, despite the particular needs of teachers early in their careers, access to more varied types of PD is more likely to be offered to more experienced teachers.

Day and Gu (2007) present UK evidence that, in fact, high quality PD is important throughout the teaching career, arguing that teaching is "emotional work" and therefore requires care, support and access to professional learning to maintain commitment, and other longitudinal studies in the US context such as those of Moore Johnson (2004) and Bullough (2008) provide compelling evidence of the particular importance of the school in allowing access to a range of PD, which these authors are able - through the use of detailed case studies - to relate to retention in the profession.

There is a body of international research that links teacher PD with higher teacher efficacy (Ross & Bruce, 2007 in relation to mathematics; Lakshmanan, Heath,

Perlmutter & Elder, 2011 in relation to science teaching), and a further set of studies that provide limited or weak evidence of a relationship between efficacy and intention to stay in the profession such as Brouwers and Tomic (2000) that showed that higher self efficacy was related to lower levels of teacher 'burn out' on a range of measures, and other reviews link efficacy to teacher retention, again with generally weak relationships found (Tschannen-Moran, Hoy & Hoy, 1998; Klassen, Tze, Betts & Gordon, 2011). However, this research and related reviews do not make the link from PD via increased self-efficacy to retention, in the way that Desimone (2009) provides such a pathway from PD via teacher level changes to student outcomes.

2.3 The relationship between professional development and career outcomes

There is a body of mainly qualitative evidence, largely based on teachers' self report data, which suggests that PD *may* influence career outcomes. The content or focus of PD activity is important here. In particular, studies focussed on either leadership development programmes or providing opportunities for teachers to engage in leadership opportunities (Simkins, Coldwell, Close & Morgan, 2009; Taylor, Yates, Meyer & Kinsella, 2011) suggest positive outcomes in relation to promotion or orientation towards promotion and school leadership capacity, and similarly, some studies with a subject-specific focus suggest that such work is perceived as supporting actual and intended promotion within the subject field (for example, Jones, Harland, Mitchell, Springate & Straw, 2008 in relation to Chemistry).

Within the wider research literature into the impacts of PD, evidence of career outcomes is largely related to what might be termed mediating outcomes - i.e. those characteristics that are important precursors to career progression, but may not necessarily lead to promotion - particularly teacher expertise, self-efficacy (as discussed above in relation

to teacher retention) and confidence, which are rarely explicitly linked to raising horizons towards promotion. So, for example, the major international review studies examining the impact of professional development (such as Guskey, 2002; Desimone, 2009; Opfer & Pedder, 2011) and key studies in relation to science education (such as Fishman, Marx, Best & Tal, 2003; Penuel, Fishman, Yamaguchi & Gallagher, 2007) do not explicitly relate teacher changes to career development or progression.

2.4 Factors influencing the relationship between professional development and career/retention outcomes

The likely impact of professional development on outcomes (including - potentially - retention and career outcomes) is related not just to the quality and type of PD, but also to the individuals involved, and the organisational contexts within which they work. Day and Gu (2007) provide a useful analysis of the varying ways in which professional development at different stages of the teacher's life interacts with other factors to influence teacher resilience and commitment to the profession concluding that "the provision of responsive and differentiated support to meet teachers' professional and personal learning needs at different times in their work and lives can help counter declining commitment trajectories, enhancing the continuity of positive development of teachers' professional commitment" (Day & Gu 2007, p. 439). There is also evidence suggesting that the school culture and organisation is important in setting the context for positive PD outcomes: Bubb, Earley and Hempel-Jorgensen (2008, p. 15) note, for example, that a school's ethos or culture was key to staff development: "it was an overarching factor, from which all else followed" and McIntyre, Hobson and Mitchell (2009) argue that successful PD tends to take place in schools with a culture focussed on the learning of staff as well as pupils.

3. Towards a path model

The review presented in section 2 indicates that whilst there are glimpses of a potential relationship between PD on the one hand and teacher retention and career progression on the other, the connections between the two via a path including teacher outcomes has not been previously articulated. The approach taken in the current study was to draw on this literature to develop such a framework for the empirical study. Following Desimone (2009), I refer to this type of framework as a 'path model': "an operational theory of how professional development works to influence [..] outcomes. Such a theory would identify the key inputs and intermediate and final outcomes that characterize the effects of professional development. It would also identify the variables that mediate (explain) and moderate (interact to influence) professional development's effects." (Desimone, 2009, p. 184). This group of models is widely used in the literature on professional development (PD) in educational contexts to both theorise how PD operates to lead to sought-for outcomes and allow an examination of the assumptions behind the set of steps in the operational theory. The family of such models can be traced back to the work of Kirkpatrick (1998) - work that in fact began in the 1950s - which suggested that training could lead via a set of stages from **reaction** to the training, **learning** from the training and then **changes in participant behaviour** to **desired outcomes** for an organisation. Guskey (2000) developed a particularly influential model with similarities to that of Kirkpatrick moving from **reactions** and **learning** via **organisational support** and change to **use of skills and knowledge** to **student outcomes**, and this work influenced further work on path models - some in relation to leadership development and its impact on pupil outcomes (Leithwood & Levin, 2005; Simkins et al., 2009) - culminating in the work of Desimone (2009) which laid out a model with "nonrecursive, interactive pathways" (allowing for a back and forth and interactive movement between

steps on the path) towards student outcomes.

The more recent work in the path model tradition - from Guskey (2000) onwards - has tended to focus on student learning as the end point, with the practice of teachers, usually in the classroom, presented as a desirable step towards this. However, little of the recent work in this field - with the partial exception of Simkins et al. (2009) and Coldwell and Simkins (2011) - examines teacher career outcomes.

At the outset, then, I synthesised the established literature from the path model tradition in PD research with the work on the relationship between PD and career including retention, reviewed above, to develop an initial path model for the study (Figure 1):

Figure 1: Initial model of impacts of professional development on career
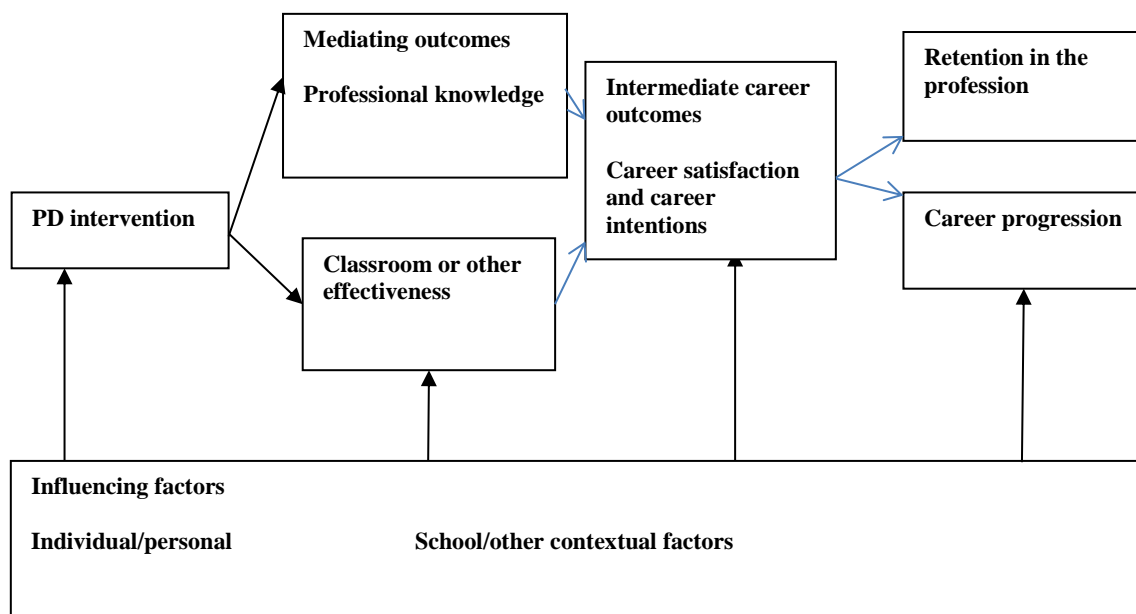
This initial framework suggests that professional development interventions can have an impact on what for the purposes of this study are the **final outcomes** of career progression and retention, but that this relationship is mediated by other **mediating outcomes** that are not themselves usually thought of as 'career outcomes', specifically

professional knowledge, and improved practice. Taken together, these impacts can influence **intermediate career outcomes** - intention to stay in the profession, career intentions, career satisfaction - and thence to actual career development and/or retention in the profession. However, the potential effects on career are influenced by two key sets of **influencing factors**. The first of these are individual factors, identified in the literature on impact of PD as including teacher motivation, "career potential" and prior skills and knowledge. We can add, from the literature we have examined for the purposes of this review, career phase. The second set of variables we term 'contexts', a catch-all phrase for the factors beyond the locus of the individual that enhance or inhibit the likelihood of PD having an impact on career. For example, Desimone (2009) identifies that school leadership is an important contextual factor, and Bubb et al. (2008) note that the culture of the school is particularly important here. We used this model to help design the primary data gathering phase discussed below, and to frame subsequent analysis.

4. The study and methods

4.1 The study

The framework presented in Figure 1 was used to inform the design and analysis of a mixed methods study comprising a self-completion survey based on mainly closed response questions of over 500 teachers and semi-structured telephone interviews with 25 teachers, examining the perceived impact of professional development - specifically, PD provided by Science Learning Centres (SLCs) in England - on teacher career outcomes and retention. Since the mid-2000s, the network of SLCs have provided a range of professional development to teachers of science in schools and colleges of all types (from primary to tertiary, and also special schools), as well as to science

technicians and sometimes other teaching staff (Bishop & Denley, 2006). In England, there is no professional requirement for teachers to undertake this or any other form of PD, so it is important to note that participation was voluntary, at least on the part of the schools. A feature of the work of the SLCs at the time of the research was that the majority of their provision took place away from the school or college, at either a regional centre or the national centre. Most of the PD consisted of courses of relatively short duration (a few days at most) although this could be spread over a longer period of time. It is important to note that other forms of PD were available, including longer term programmes leading to Master's accreditation which are associated with more positive outcomes (Desimone, 2009) which indicates that the findings from the sample are limited.

4.2 Survey

Survey data were gathered from an initial sample of participants on SLC courses across England divided into three user types: 'high users' who had engaged more than 5 days of SLC provision, 'medium users' who had engaged in between 1.5 and 5 days of provision and 'low users' who had engaged in between 0.5 and up to 1.5 days of provision. The sample was constructed so that equal numbers were randomly selected from each of the three user groups (one third of the sample within each group). As indicated in Table 1, in total, 519 useable responses were received giving a response rate, from the 3707 sent out, of 14%. The achieved sample was skewed towards higher users, with 311 (60%) of the responses from this group compared with 151 (29%) from the medium user group and 57 (11%) from the low user group, probably because they felt more able to participate in the survey given their higher level of engagement. Given that returns are skewed towards high users, the findings are presented separately for each user group.

The smaller numbers of returns from medium and especially low users need to be borne in mind in interpreting the causal relationship, a point I return to in the concluding section.

Table 1: The survey sample

Participant group[1]	Questionnaires received (Response rate)	Response rate
Low users	57	5%
Medium users	151	12%
High users	311	23%
TOTAL	519	15%

[1]3707 questionnaires were sent out, evenly split between the three participant groups.

Overall 312 respondents (60%) were secondary school teachers, 100 (19%) were primary school teachers and a further 61 (12%) taught in Further Education (FE) Colleges, whilst a smaller number taught in special schools and independent schools (14 (3%) and 32 (6%) respectively).

The questionnaire content mainly comprised a set of closed response questions focused on the impact of the PD overall, an different aspects of it, on staying in teaching in the profession; and the impact of the PD on other aspects of career development, as well as demographic data and questions on previous career development. The questionnaire is included as an appendix to the article. The findings presented in this article draw primarily on univariate and bivariate analyses of data entered as a case by variable matrix using SPSS.

4.3 Telephone interviews

A total of 25 telephone interviews were conducted with science teachers (19 secondary

teachers, 4 primary teachers and 2 FE college teachers) who had taken part in the survey and agreed to be contacted by telephone as a follow up. As with the survey, high level users were over-represented in the achieved sample, comprising 16 of the 25 interviews, with the remainder consisting of 7 medium users and 2 low users. The telephone interviews addressed the core themes of the survey study - teachers' responses to PD and their views of the relationship between PD and their intentions regarding in staying in teaching and their career development. It should be noted that the findings from the analysis of interviews were used to help explain the survey findings, and explicitly to test out whether the reported experiences of participants accorded with the explanations indicated in the initial path model (Figure 1). In this sense, the study utilised a form of explanatory mixed methods design (Creswell & Plano Clark, 2007). In such designs, qualitative findings deriving from a small sample of interviews are used to indicate explanations rather than provide representative or generalisable data. The number of interviews conducted in this study provides the basis for this testing of the theoretical framework and the development of sub-categories in the framework. These sub-categories represent multiple participants in the data set. However, the extent of the prevalence of these categories in any particular population of teachers engaged in PD would require further empirical study and it is feasible that this would lead to an extension of the number of categories or revision of the framework, as I discuss further in Section 6.

A thematic analysis of transcripts and written reports on the interviews was conducted, based on an initial set of codes derived from the data collection framework (Figure 1 above) that was then further refined and new codes developed inductively as the analysis proceeded, broadly utilising a Framework Analysis (Smith & Davies, 2010) approach - involving gaining an initial overview of the data, building an initial

framework, coding or charting data according to themes from the framework and finally interpreting the data within the framework.

5. Findings

5.1 Organising findings using a path model frame

As indicated in Section 4, the study examined both retention and career outcomes including career progression, so the findings are presented separately in this section and then drawn together in the Discussion. Each subsection is organised by considering the findings in relation to the key components of the model, utilising data as indicated in Table 2 below. Note that, in the interviews, influencing factors were usually discussed in relation to both retention and career outcomes, so they are presented together:

Table 2: organisation of findings by elements of the path model and methods

Subsection	Elements of path model	Data sources
5.2 Retention in the profession	Final and intermediate outcomes	Survey
	Mediating outcomes	Qualitative interviews
5.3 Career outcomes	Final and intermediate outcomes	Survey
	Mediating outcomes	Qualitative interviews
5.4 Influencing factors	Influencing factors	Survey and qualitative interviews

5.2 Retention in the profession

5.2.1Final outcomes and intermediate outcomes

Survey respondents were asked about their perception of the impact of Science Learning Centre PD (hereafter 'the PD') on their likelihood of staying in teaching on a scale from 'much more likely to stay in teaching' via 'more likely to stay in teaching', 'no more or less likely to say in teaching', 'less likely to say in teaching' to 'much less likely to stay in teaching' with a 'don't' know' category included (see Appendix 1, item 4).

Within the path model frame (Figure 1), we were therefore gathering data on an **intermediate outcome** rather than the final outcome of **actual measured retention**, which would require longitudinal or comparative data gathering involving those who had actually left the profession as well as those still in it. Bivariate analysis indicated a statistically significant relationship between higher levels of engagement with the PD and greater perceived likelihood of staying in the profession (p<0.01, CV=0.13), with the majority (57 per cent) of respondents in the high level user group indicated that they felt their involvement in the PD had made them more, or much more, likely to stay in teaching compared with 44 per cent of medium level users and 33 per cent of low level users, as indicated in Table 3 below.

Table 3: Stated likelihood of staying in profession as a result of PD from survey - **frequency (percentage within category)**

Participant group	More likely or much more likely to say in profession due to PD[1]
Low users	17 (33%)
Medium users	67 (44%)
High users	171 (57%)
TOTAL	255 (51%)

[1] percentages exclude missing values; see Appendix q4 for question details

For the high level user group, those in secondary schools were significantly more likely (p<0.01, CV=0.21) than those in other organisations to agree that engagement in the PD had this effect, with almost two thirds of secondary school respondents indicating that this was the case compared with around 40 per cent of others.

Fifteen of the teachers interviewed intended to stay in the profession and although they had varying responses to the PD it was not a significant direct influence on 10 of these. 5 others discussed a set of other factors that were much bigger influences than PD - however good it might be - on their intentions to stay in or leave teaching, related often to pressures and changes in relation to the education system and the school - key

influencing factors identified in 5.3 below. This finding - that PD is often less important than other factors in relation to interviewees' intention to stay in the profession - is in line with earlier work (such as Ladd, 2007; Hobson et al., 2007, De Nobile & McCormick, 2008; DeAngelis & Presley, 2011).

5.2.2 Mediating outcomes

Analysis of the interview element of the study provided two broad, closely related areas of explanation for this relationship - what I refer to in Figure 1 as mediating outcomes - as identified by those interviewees that agreed that the PD had directly affected their intentions towards staying in or leaving the profession.

Increased knowledge and validation of knowledge

Increased knowledge was mentioned by 8 of the 25 interviewees including primary and secondary interviewees. For 4 of these teachers, this helped them feel more effective educators, especially in relation to teaching subjects in which they were not specialists, for example:

> SLC efforts will likely increase staying in teaching for teachers like me who are not specialists in the subjects because of the enrichment they offer in the understanding of the contents as well as the new strategies that they show in tackling certain topics. (Secondary school teacher)

Four teachers discussed the PD acting as validation of their knowledge as teachers:

> It's only since I have been on these courses that I think I have something to offer and I can lead people to change the way its taught across the school, before I was in the dark about what I could offer because I had become science lead by default and wasn't an expert in any way but now I feel I have a level of expertise

to pass on, it's given me a lot of confidence as a middle leader, I feel I am doing my current role properly now. (Secondary school teacher)

Motivation

This increased knowledge enabled teachers to feel confident in their abilities as effective educators which 6 of the interviewees related to increased motivation and job satisfaction, for example:

> Yes, I hit a bit of a low, feeling tired and jaded with it, and now doing this and getting more ideas it helps you see the future in a better light, feel a bit more upbeat about it. It does help me decide to remain in teaching yes. Because I start varying what I am doing its better for me, I get more out of it and the children do so you feel better about what you have done. (Secondary school teacher)

In addition, 7 of the interviewees that did not feel that the PD had directly affected their likelihood of remaining in the profession were able to describe indirect effects largely relating to their motivation as a teacher. For example, several teachers talked about seeing teaching as a profession that "grinds you down" or discussed a feeling of "plodding along" that had been partially remedied by the PD:

> You often feel like you are on your own in a primary school and you lose momentum, because you get bogged down with everything else and these are just really good opportunities to get to be with other people who feel enthusiastic about science and want to do something with it, rather than getting ground down with the other stuff you do in school, we get bogged down with standards. (Primary school teacher)

Both sets of issues, clustering around knowledge, motivation and confidence are closely

related to self-efficacy which is linked with commitment to and retention in the profession (Tschannen-Moran et al., 1998; Klassen et al., 2011).

5.3 Career outcomes

5.3.1 Final and intermediate outcomes

Two methods were used to examine the impact of the PD on survey respondent career progression and development: an analysis of the correlation between the final outcome career progression over time and their engagement with the PD, and self-report.

For the correlational analysis, respondents were asked to give their job role at the time when they first took part in the PD as well as their current job role (see Appendix 1, item 12). The lists of previous and current job roles were recoded into an 8 point scale, with the higher points corresponding to more senior positions (see Wolstenholme, Coldwell and Stevens (2012) for full details) so that any progression could be measured quantitatively. So, for example, if a respondent moved from pre-threshold classroom teacher (point 2 on the scale) to Assistant headteacher (point 5 on the scale) this would be treated as a move of three progression points. These progression figures were merged into three groups - those making no progress or going down the progression scale; those making a small amount of progress (moving on 1 or 2 progression points) and those making a large amount of progress (moving on 3 or more progression points). Using this analysis, there was no significant association between level of engagement in PD career progression, although a slightly lower proportion of those in the low level user group had made a large amount of progress.

The second method was to ask respondents to rate the impact of Science Learning Centre PD on a set of different career outcomes including both final outcomes and

intermediate career outcomes. Table 4 below indicates that, overall, respondents within each user group felt that the PD had had the most impact on taking on new responsibilities whilst fewer respondents indicated an impact on promotion, which is in line with the career progression analysis, although it is important to note that for every aspect of career there was a significant association[1] between level of engagement and perceived impact: in each case high level users were the most likely to feel there was a positive impact on all three areas. In addition, for the high user group, respondents in secondary schools were significantly[2] more likely to see a positive impact on promotion (45 per cent compared with 21 per cent of those in primary schools and 26 per cent of those in further education).

Table 4: Responses to survey questions on perceived impact of PD on aspects of career

Participant group	Responses to selected survey questions - frequency (percentage within category[1])		
	PD had a positive impact on promotion[2]	PD had a positive impact on taking on new responsibilities[2]	PD had a positive impact on moving into new areas of work[2]
Low users	7 (16%)	23 (50%)	20 (44%)
Medium users	32 (26%)	83 (60%)	64 (50%)
High users	100 (38%)	198 (70%)	161 (61%)
TOTAL	139 (32%)	304 (65%)	235 (54%)

[1] excluding missing values
[2] see Appendix q4 for question details

5.3.2 Mediating outcomes

Teachers who took part in the interview study discussed a range of mediating outcomes: the ways in which, for some, they felt the PD had affected their career progression or,

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[1] Statistical values for aspects of PD by level of engagement: Promotion - $p<0.01$, CV=0.17; Taking on new responsibilities - $p<0.01$, CV=0.15; Moving into new areas of work - $p<0.05$, CV=0.13

[2] $p<0.01$, CV=0.21

for most, they felt it had influenced the key intermediate career outcome of changed career aspirations.

Demonstrating positive attributes

Five teachers felt the PD had helped them demonstrate their skills and attributes, which in some cases had led to a furthering of their career:

> I think absolutely because unofficially the principal said it was because I showed so much initiative and if I say I'll do something I'll do it properly was the reason he really wanted to keep me. This course has just helped to show that off really. (Secondary school teacher)

Two of these interviewees stated that the PD had allowed them to move into different subject areas in the future, one looking at moving from chemistry to specialising in physics, and the other being given wider curriculum responsibility, drawing on these skills:

> We started using a thematic curriculum at the school, and being able to use those skills [gained from the PD] really helped, and I ended up getting responsibility for it (Primary school teacher)

Validation of knowledge

Five teachers discussed an increase in confidence that had come from taking part in the PD, which related in most of these cases to validation of knowledge:

> Now I feel I have a level of expertise to pass on, it has given me a lot of confidence as a middle leader, I feel I am doing my current role properly now, so going into performance management or looking into going up pay scales I can

say I have done these things and a lot of what I have done has been a direct

results of the training I have been on. (Secondary school teacher)

Other potential mediating outcomes

Several other teachers discussed their increased career aspirations in more general

terms, with a number thinking about their career options and progression opportunities,

and starting to apply for promotion. In addition, the vast majority of teachers we spoke

with were able to discuss potential mediating outcomes that that may or may not help

provide the foundations for career progression in the future, in areas including improved

classroom practice, enhanced subject knowledge, increased job satisfaction and

confidence.

5.4 Influencing factors

The findings presented above indicate a varied picture of the potential for PD to

influence career outcomes, including retention. Analysis of interview data (and some of

the survey analysis) identified four broad groups of what are referred to in the initial

path model (Figure 1) as influencing factors: those wider factors that respondents felt

explained the impact, or not, of the PD on their career.

5.4.1 The Professional Development itself

The first group comprised factors associated with the PD itself. The survey data

identifies that the level of engagement in PD was associated with more positive

perceived impacts on both intentions to stay in the profession, and on career. The

interview data indicated that other aspects of the PD that were important included the

quality of training, influencing intermediate knowledge outcomes, as well as

opportunity to meet teachers from other institutions, influencing career intentions, for

example:

> We had this really brilliant Ecologist…and she'd done absolutely stacks of
>
> research on all sorts of things and she'd done Education and Science teaching in
>
> Sweden…and she was great…she was sort of like really encouraging us to… go
>
> ahead and do this and I think at the time it was sort of the boost I needed to sort
>
> of have the self-confidence to start looking at my career and applying for
>
> promotion. (Secondary school teacher)

5.4.2 Individual factors

The second set of factors related to the individual undertaking the PD. Where

individuals were motivated to engage in the PD at least partly to develop their careers,

they were more likely to see positive final career outcomes, for example:

> I think it was just a stepping stone to get to where I wanted to be. I always knew
>
> what I wanted to do because a woman at my old school had the job I wanted. It
>
> was a matter of I want that job how do I get there. (Secondary school teacher)

In contrast, if they saw their career as being in the classroom, or were towards the end

of their career, or were looking to prioritise starting a family, they were less likely to see

a positive impact on final career or retention outcomes, for example:

> I don't have anywhere to progress - we only have 4 classes, I don't have any
>
> ambition to move on and I don't have anywhere to go. (Primary school teacher)

5.4.3 The organisational context

The third set of factors related to the organisational context the individual was working

within. The survey findings presented above indicate that (for those respondents who

had engaged in a high level of PD activity) those in secondary schools were more likely to see positive intermediate and final career outcomes including intention to stay in the profession compared with other groups than their equivalents. Interviewees indicated that the reasons for this centred around progression opportunities available, both within the school and in the sector, for example:

> The only opportunity for career development for me is to resign from my current employer and work as a head of department with a different employer. However, I am reluctant to do this because good working conditions are more important to me than career progression. (Secondary school teacher)

> I believe that [the Science Learning Network] should do more to secure recognition for science specialists in primary schools as all my work and effort have not done anything to secure me promotion at the whole school level. Science is still marginalised. (Primary school teacher)

Perhaps most centrally for most teachers was the culture of the organisation (see McIntyre et al., 2009; Bubb et al., 2008), with those in a supportive, development-focussed culture more likely to want to stay in the profession and see opportunities for positive career outcomes:

> I have now left the profession due to stress caused by poor management by senior leaders. This has nothing to do with the consequences or impact of PD. I believe that the SLC training courses are the best I ever attended in my 19 years as a teacher. They are professionally delivered by enthusiasts and are of the highest standards. (Secondary school teacher)

5.4.4 The wider policy context

The final set of factors related to the wider context, in particular the educational policy context. Many individuals noted that the current educational policy context in England, often coupled with or implemented via policies in their own school - led to them feeling disempowered as teachers, over-worked and under-valued, which influenced both their likelihood of staying in the profession and of moving on in their careers, for example:

> I am leaving the profession, but the reasons cannot be addressed by the SLC work. SLCs actually help teachers deliver better, more inspiring lessons; unfortunately, the systems in place in schools and nationally do not. In fact, it is my experience that management in school, exam boards, and the various quangos and other organisations actually make life more difficult'. (Secondary school teacher)

6. Discussion

6.1 Developing a model for researching the impact of PD on teacher retention and careers

The findings above shows that whilst PD was perceived to be less important than other factors including school and policy pressures on intentions to stay in the profession, those that were most strongly engaged in Science Learning Centre PD were more likely to perceive that the PD had positively influenced their likelihood of staying in teaching, and this was particularly true for secondary school teachers. The qualitative data indicates that this occurred by PD improving or validating teachers' professional knowledge, making them feel more confident and capable as science educators, and by improving motivation and job satisfaction. Those most highly engaged in SLC PD were also more likely to perceive a positive impact on career progression and development.

Qualitative evidence suggested that these outcomes were related to PD helping demonstrate commitment to teaching and to continuing improvement as a science teacher. In some cases, PD influenced teachers' ability to teach in new areas and to raise their career aspirations. Even where there was no current influence on career, qualitative data suggested there were influences on intermediate outcomes such as classroom practice, subject knowledge, increased job satisfaction and confidence. The likelihood of these outcomes occurring was influenced, according to our analysis of qualitative data, by a set of other contextual factors. These contextual factors appeared to have differential effects on different points in the posited path, relating to the quality and relevance of the PD itself, the motivations and characteristics of the individuals engaged with the PD, the organisational context - especially the opportunities for development, and senior leader support - and the wider context especially governmental policy.

These findings enabled the development of the initial model (Figure 1) to create a final model (Figure 2):

Figure 2: Final Model of impact of Science Learning Centre PD on retention and career
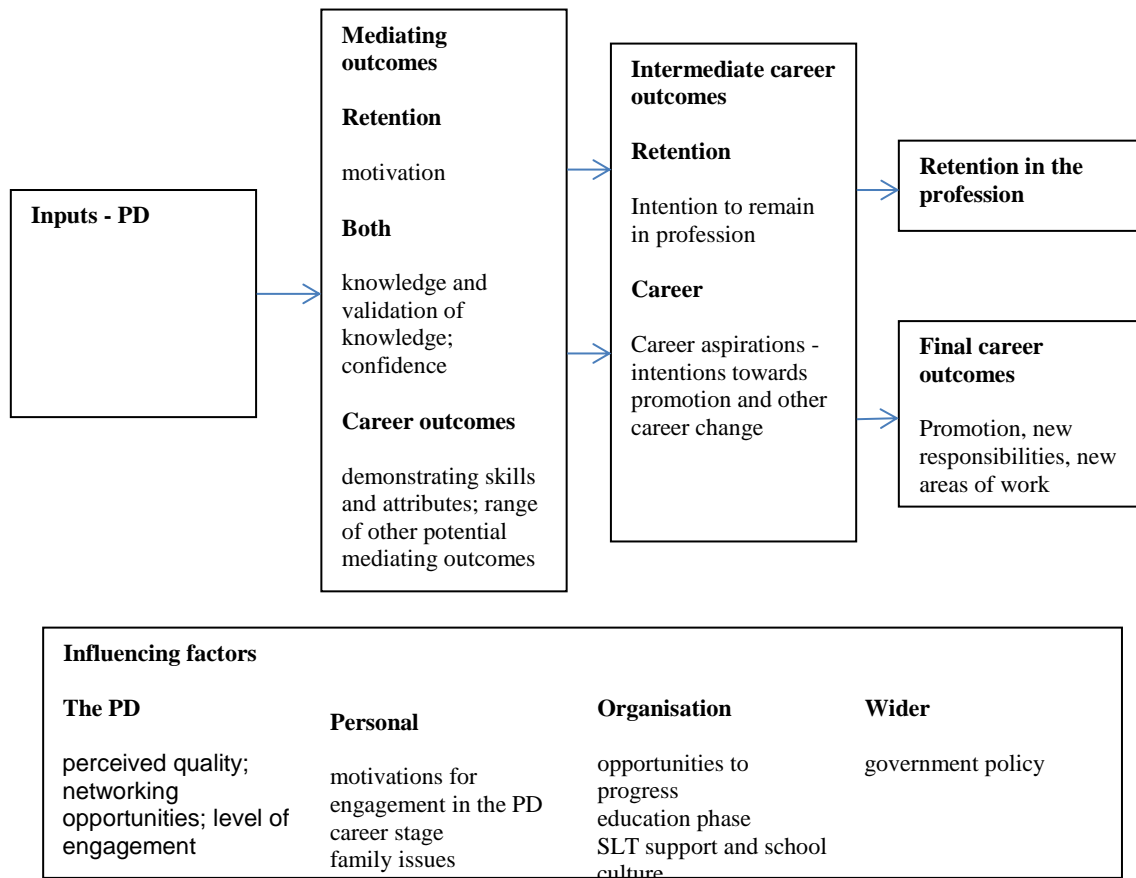
The model traces the relationships that emerged from the empirical study between PD, on the left hand side, and career and retention outcomes on the right via a pathway through a set of mediating and intermediate outcomes. The findings presented in this paper suggest that these intermediate outcomes were more likely to be apparent than the final outcomes.

Some mediating outcomes - particularly those related to increased knowledge and validation of knowledge - were related both to retention in the profession and career outcomes. However, these knowledge outcomes operated differently in relation to retention and career progression. Increased knowledge or validation of knowledge developed hand in hand with improved motivation and enthusiasm to the intermediate

retention outcome of greater likelihood of remaining in the profession, according to teachers taking part in this study. In contrast, knowledge outcomes operated alongside improved other factors such as improved classroom practice to lead to increased aspirations and then to final career outcomes of progression, wider responsibility and other career change such as teaching different subjects.

However, the likelihood of these impacts taking place is influenced by a set of other contextual factors which appeared to differentially influence different points in the path. Firstly, the PD itself is important. In this study, more positive mediating career and retention outcomes in relation to knowledge were associated with higher perceived PD quality. Further, the PD provided opportunities to network with others, and overall a higher level of engagement in the PD was associated, in the survey findings, with more positive mediating and final career outcomes. Alongside this, there were a set of personal or individual factors associated with the outcomes examined in this paper including positive motivation to engage; a focus on promotion and career development; and engagement at an early or mid-career stage; and family circumstances that did not inhibit a focus on promotion, all of which were associated with higher career aspirations. The school itself was an influence, with some settings providing greater opportunity to progress - with progression opportunities being more commonly available within secondary settings. In addition, some school and leadership cultures provided a more positive environment within which to work and develop, influencing intention to stay in teaching and career aspirations. Finally, government policies were sometimes perceived as contributing to an increased likelihood of leaving the profession, in relation to increasing workload, reducing autonomy and failing to prioritise the subject.

6.2. Considering value of path models in investigating the impact of PD on teacher career

The use and development of a path model in this study as presented in section 6.1 above indicates both the potential value and limitations of such designs in relation to the study of the outcomes of PD, especially in relation to career.

A path model approach can help researchers use reviewed literature to provide a frame to help shape data collection by clarifying the underlying theory of change that is being investigated in studies of PD. In this sense, path models do the same kind of analytical work as theory of change (Blamey & Mackenzie, 2007) and programme logic models (Rogers et al., 2000) used in the broader evaluation field. The type of path model used here belongs to one branch of the family, exemplified by Leithwood and Levin's (2005) model, which explicitly gather evidence for 'influencing' or 'moderating' factors to help explain differential impacts.

In this study, the use of the path model has helped to clarify a set of potential pathways from engagement in PD via a set of intermediate outcomes to final retention and career outcomes, and has indicated that - for the particular PD investigated in the empirical study presented here - there were rather limited impacts found on final career and retention outcomes.

It is important to note the limitations of the methodological approach taken here. The study is based on teacher self-report, so the findings identified by teachers themselves must be treated with caution and tested out using more objective methods in future studies. Further, the model postulated suggests a causal path from PD to career outcomes whereas it is plausible that for some teachers engagement in PD and career progression are linked to an underlying factor (for example, one with related to personal

ambition) a possibility that is further suggested by the fact that more positive career outcomes are reported by those more engaged with PD. The qualitative findings as presented provide some concrete examples of the temporal sequencing and a plausible explanation of a causal path in line with Figure 2 (e.g. where a teacher indicates a particular training programme has provided specific outcomes that can be linked to career progression), but this issue of causality suggests a need for further testing of the underlying theory of change in future research taking a path model approach, alongside further research on the differential ways in which contextual factors operate in different points in the path model.

More broadly, the path model approach per se is limited in its ability to deal with some of the complexities of the social world if one takes a rather longer term perspective on career. The key research into teacher careers referred to earlier this paper - the work of Day, Gu and colleagues in the UK; by Bullough in the US; by Cameron and colleagues in New Zealand; and by Moore Johnson and others, again in the United States - used multiple method, longitudinal approaches, without a specific model of professional development implied or used. In these studies, career outcomes are revealed to be multiple, overlapping and sometimes apparently contradictory. For some teachers, a positive career outcome is promotion. For others, it is being an effective classroom teacher. For others still, it may be the realisation that teaching is not for them and leaving the profession is the best career outcome. Moreover, what are seen to be positive career outcomes differ depending on career stage, or as Day and Gu (2010) term it 'professional life stage'. For early career teachers, classroom practice is often the key career focus. For mid-career teachers, often promotion to middle or senior leadership positions is the goal. For some, especially women (Coldwell, 2016), positive career outcomes involving moving in and out of the profession to raise a family, or

moving from full time to part-time and back again; or moving location.

This perspective lays bare a particular difficulty for path models in dealing with career given that such models typically lay out a pathway that is at least implicitly bounded within a short time period, and usually requires well-specified final outcomes.

Nevertheless, for such relatively bounded studies, path models - and especially the role of influencing factors - can have value to both researchers and those engaged in providing and supporting PD for teachers. For example, teachers may experience excellent quality professional development which improves their pedagogical knowledge and classroom practice, and this may give them greater job satisfaction; but they may leave the profession for family reasons. Similarly, a teacher may be motivated by engagement in PD to aspire to be promoted, but find there are not the opportunities to do so.

Whilst some of these influencing factors are beyond the locus of control of providers of PD to teachers, this is not to say that they cannot be affected at all. In particular, as there has been a move across many countries towards more school-led education systems, it seems evident that it is vital that researchers and PD providers continue to emphasise the importance of the role of the school in supporting teachers both to undertake and be allowed to put into practice professional learning, and the role of policy makers in supporting teachers to be able to work as autonomous professionals.

8. Conclusion

In this paper, I have developed a new model theorising the relationship between professional development on the one hand and retention and career on the other, providing empirical evidence of how this can work via a pathway of intermediate and

mediating outcomes, and how the relationship can be influenced by a set of influencing factors. I argue that such models can be useful especially for relatively time-bound studies of the influence of PD on well specified career outcomes. School and PD leaders may find that giving consideration to the factors in the model that can operate together to support or inhibit career and retention outcomes to be particularly useful, in the context of increasing school autonomy across the globe.

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