Title
A comparative study of the impact of enhanced input on inclusion at pre-service and induction phases on the self-efficacy of beginning teachers to work effectively with children with special educational needs.

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Abstract
There is a well founded assumption in the literature that the first year of teaching presents challenges to beginning teachers. However, few studies have looked empirically at how beginning teacher perceptions about teaching ability change from the pre-service to novice teacher year. This is particularly the case for inclusive education where no substantive empirical studies have measured such change in teacher perceptions across these phases of teacher development. This study tracks changes in the perceived self-efficacy of teachers in relation to working effectively with children with special educational needs (n=67) following an inclusion enhancement programme in the pre-service phase and enriched induction on inclusion in the novice teacher phase. The study employed a repeated panel survey design with an intervention and comparison group. A critique is made of the domain specificity of current measures used for considering self-efficacy for inclusion, and an alternative approach proposed. Results indicate that there were relative gains in self-efficacy from the start to the end of the pre-service teacher year due to the enhancement programme, and that these gains were maintained in to the novice teacher year. However, there was no evidence that the induction enrichment had any impact on self-efficacy in this domain. Implications for the timing and intensity of induction for beginning teachers, as well as for future research directions on teacher education are considered.

Introduction

The Transition to the Novice Teacher Year

A considerable body of literature has considered the complexity and challenge of the first year of teaching (Feiman-Nemser 2001; Johnson & The Project on the Next Generation of Teachers 2004; O'Sullivan & Conway 2016). Veenman (1984) reports on a synthesis of over 100 studies on the transition to teaching, which identifies classroom management, discipline, motivating pupils, dealing with individual differences, assessment, relations with parents, classroom organization, insufficient resources and dealing with needs of individual students as the most challenging areas for novice teachers. These factors continue to feature in the more recent literature (e.g. Dicke *et al.* 2015; Liston *et al.* 2006; Meister & Melnick 2003; Schuck *et al.* 2017). A number of studies have also identified working with children with special needs as a particular challenge for new teachers (Anthony *et al.* 2015; Fantilli & McDougall 2009; Meister & Melnick 2003).

The change in professional experience as beginning teachers move from pre-service education to being novice teachers has been characterised as a reality shock (McCormack & Thomas 2003) and praxis shock (Ballantyne 2007; Feiman-Nemser 2001). Both represent the phenomenon whereby when novice teachers are faced with the challenges involved in the transition, the extent to which they think they have the ability to be effective in their role as teachers is negatively affected. If such factors, impacting on perception of ability, have a relationship to teaching effectiveness in the first few years of the teaching career, then it is

important to understand if and how teacher education can be designed to ameliorate such effects. In this study I will employ teacher self-efficacy, the most applicable construct used in the literature to consider such perceptions (Klassen *et al.* 2011). There is an implicit assumption that the pattern, content and pedagogy of teacher education at pre-service and induction stages has an effect on both teacher ability and teacher self-efficacy. As Wyatt (2014) notes in his review of the use of the construct, there are relatively few studies on the sources of development of self-efficacy. As well, as my review of the literature will indicate, there are also few substantive studies which investigate how self-efficacy changes across the phases of teacher development. Given that working with children with SEN has been identified in several papers as one of the key challenges in the novice teacher year, this paper will explore how a particular approach to teacher education for inclusion, crossing the pre-service and novice teacher year impacts on teacher self-efficacy.

Teacher Induction

The potential importance of induction in the novice teacher year to help beginning teachers deal with these challenges is well recognised in the literature. Ingersoll and Strong's (2011) influential review of key studies since the 1980s concluded that there is reasonable evidence of the positive impact of induction and mentoring on retention, student outcomes and teacher practices. Yet they also indicate that the relationship is not always clear, particularly noting that Glazerman et al.'s (2010) randomized control study which showed a more uncertain relationship between induction and all three of these outcome measures, with impact on student outcomes only being significant after two years of induction support.

The pattern, intensity and rate of take up of induction support provided to teachers varies considerably between territories. The OECD (2014) TALIS 2013 study reported on a large scale survey of teachers and school principals across 33 countries, mainly in Europe.. Across the study, 76% of teachers worked in schools with formal induction programmes, although the average rates across countries varied considerably, as did the rate of take up of induction offers, with uptake for induction being at 50% relative to the availability of programmes across the study.

In England, from the early 2000s a statutory period of induction for new teachers was introduced, with requirements for novice teachers to be assessed, mainly by their principal, against a set of professional standards, before full accreditation for teaching was awarded (DfEE 1999; Hagger *et al.* 2011). The 2013 TALIS country report brief for England, which reported on responses from over 2,000 teachers (albeit only in the lower secondary phase) in 154 schools, is the most comprehensive data available on induction in England. It indicates that 75% of teacher reported that they had a programme of induction in their first teaching employment, and 99% of principals said that their school had an induction programme for newly qualified teachers. In respect of mentoring, again 99% of principals indicated that mentoring programmes were available and 65% of teachers under 25 indicated that they had participated in a mentoring programme.. Hobson *et al.* (2009) surveyed 1000 newly qualified teachers across England and found that 77% rated the level of induction support available as good or very good, and 88% reported having undertaken additional professional development, mainly in the form of standard in service professional development days provided for all teachers in their schools. None of the available evidence gives a detailed view of the specific content or quality of induction programmes, which is likely to vary between schools and local authorities. However, Hobson *et al.*'s (2009) study included 45 detailed case studies,, which indicated that programme content for this sample was broad, covering a range of topics such as classroom management and organisation, pedagogy, and working with other adults.. There was no systematic reference to input on inclusion or special

educational needs (SEN) as subject topics in induction support programmes across the sample.

Teacher Self Efficacy

Teacher self-efficacy is a well utilised construct in the literature on teaching and teacher education that, in the context of the transition from pre-service to novice teacher, can be used to represent the extent to which teachers feel capable of successfully undertaking teaching in a variety of domains. Bandura's (1977) social cognitive theory sets out that self-efficacy encapsulates individuals' beliefs about their capabilities to successfully carry out a particular course of action. A number of studies have evaluated teacher self-efficacy against other outcomes, showing links to academic measures in the classroom (; Caprara *et al.* 2006; Holzberger *et al.* 2013; Künsting *et al.* 2016)) as well as to the extent to which teachers value educational innovation (Cousins & Walker 2000; Fives *et al.* 2007).

Self-efficacy beliefs are at least to some extent independent of measures of actual or inherent ability, and in Bandura's (1977) model, influence intention, motivation and engagement in relation to particular task domains. Such beliefs are affected by mastery experience, verbal persuasion, vicarious experience, and physiological arousal. Mastery experiences are identified in the literature as the most significant source of self-efficacy beliefs for teachers; for beginning teachers this is most commonly the successful experience of teaching classes (Tschannen-Moran & Hoy 2007; Wyatt 2014). In teacher education, taught programme content, as well as feedback from cooperating teachers, has been considered as a form of verbal persuasion (Tschannen-Moran and Hoy 2007; Wyatt 2014), and the observation of more experienced teachers teaching successfully as a form of vicarious experience (Fives *et al.* 2007). Palmer (2011) argues that taught input on pedagogy and subject knowledge can in itself be another source of self-efficacy beliefs, styling this as "cognitive mastery", arguing that if teachers feel that they understand relevant subject matter then they will feel more capable of effective teaching. Wyatt (2014) suggests that such taught input may have a more indirect effect on self-efficacy, arguing that increased pedagogical and content knowledge may reinforce mastery experience. For example, if teachers are able to effectively answer questions in class, such successful experiences will lead to greater self-efficacy.

Frameworks for Early Teacher Development

Frameworks which conceptualise early teacher learning and development include progressive differentiation (Snow *et al.* 2005), the professional learning continuum (Feiman-Nemser, 2001), and teacher adaptive expertise (Hammerness *et al.* 2007). In all of these, the novice moves from uncertainty to a position where their decisions and tasks become more automatic and require less time for overt thinking and deliberation. This frees up capacity to be more flexible in their pedagogy with a greater focus on learning rather than the process of teaching. Hammerness *et al.* (2007) define the development of adaptive expertise as moving to a position where one can perform routine tasks without too much attentional resource, as well as moving beyond existing routines to respond flexibly to novel situations. In the pre-service and novice teacher year, these frameworks suggest that beginning teachers need to spend lots of attentional resources on what for more expert teachers are routine tasks, and that they lack flexibility in responding to novel situations (Anthony *et al.* 2015). This can be linked to the challenges of the first year of teaching in terms of classroom management etc., in that the relatively few resources that are possessed by the novice teacher in terms of knowledge and experience mean that attention is focused on the routine. Thus the attentional resources available for responding flexibly to novel situations are reduced. This is compounded by the anxiety associated with meeting these challenges, related to the lack of knowledge and

experience of how to respond. However, this connection between the specific challenge of the novice teacher year and attentional resource, flexibility and anxiety is not always explicitly acknowledged and examined in the literature, although it implicitly underlies much of what is written about early teacher development (e.g. Feiman-Nemser 2001; Liston *et al.* 2006), with the assumption being that with appropriate pre-service education and induction support, the effect of such challenges can be reduced. If self-efficacy is a useful construct in considering whether teachers feel capable of meeting the task demands of their role, then measuring the impact of beginning teacher education programmes on self-efficacy, particularly during the transition to novice teacher, can potentially illuminate their ongoing design and development.

Studies across the Pre-service and Novice Teacher Phases

The evidence base in relation to how teacher perceptions change from the pre-service to the novice teacher year is limited. It is the case that in the US there have been a number of larger scale longitudinal studies mainly focusing on the impact of teacher induction on teacher retention, making use of extant national survey databases (Glazerman *et al.* 2010;; Ronfeldt & McQueen 2017).However these studies focus on surveys of teachers in the first few years of teaching in schools and do not encompass data which bridges from pre-service to in-service phases. Searches on the SCOPUS and PSYCINFO databases using the terms "pre-service", "induction", "novice" and "longitudinal" identified only a few papers representing substantive cross phase studies in this area, using constructs other than self-efficacy. These include Chong (2011) which employed teachers' sense of self and Hatletkiv (2017) which used professional competence.

Cross Phase Studies on Self Efficacy

Previous literature has indicated that teacher self-efficacy increases during pre-service teacher education (Wenner 2001; Woolfolk & Hoy 1990). A small number of studies have looked specifically at changes in self-efficacy during the novice teacher year. LoCasale-Crouch *et al.* (2012) in a study of 77 Virginia teachers, saw no change in self-efficacy during the induction year. Few substantive studies, however, have looked at changes in self-efficacy across the pre-service and novice teacher years. Most commonly cited is Hoy and Spero (2005), who tracked four measures of teacher self-efficacy with a group of 29 pre-service teachers at the start and end of their pre-service education, and then again at the end of their novice teacher year. On all four measures, self-efficacy significantly increased during the pre-service year. On three of the measures - general teacher efficacy and personal teacher efficacy from the Gibson and Dembo short form scale (1984), and the Bandura (1997) teacher self efficacy scale - there was a significant drop in self-efficacy during the novice teacher year. For the fourth measure – a specific instrument designed for the study to evaluate self-efficacy specifically in relation to the pre-service teacher education programme that the participants undertook - there was no significant change during the novice teacher year.

With a larger sample (n=362), Dicke *et al.* (2015) tracked teacher self-efficacy from the mid point of the final year of a teacher preparation through to the mid-point in the novice teacher year, and saw small increases in self-efficacy during this period. As far as I am aware, no other substantive studies have measured teacher self-efficacy, in any domain, across the pre-service and novice teacher years. There have been some cross-sectional studies comparing self-efficacy in novice and experienced teachers which have indicated that experienced teachers with over 3 years of in-service teaching have higher levels of self-efficacy than novices (Chan 2008; Tschannen-Moran & Hoy 2007). This suggests that teacher self-efficacy may increase after a few years of teaching. In a longitudinal study of in-service teachers with 3-5 years of in-service experience, over a time span of 6 years,

Künsting *et al.* (2016) found that teacher self-efficacy was relatively stable over this time period for individual teachers. Thus the literature could be read to suggest that the shock of the transition to the novice teacher year leads to a drop in self-efficacy, but, possibly due to the increasing mastery experiences of in-service teachers, self-efficacy then increases over time.

Self-Efficacy and Domain Specificity in Teacher Education for Inclusion

Klassen *et al.* (2011) in a review of the development of the construct of teacher self efficacy in the literature, note that in order to align with this construct, as opposed to other belief constructs such as self-concept or self-worth, measures of self-efficacy should focus on forward looking beliefs about capability. They also note, following Tschannen-Moran *et al.* (1998) that in Bandura's (1977) original formulation, self-efficacy is a domain specific construct which refers to capabilities in relation to a particular area of expertise. There has been renewed interest in developing teacher self efficacy scales in relation to inclusive practice (Loreman *et al.* 2013; Savolainen *et al.* 2012; Sharma *et al.* 2012). Sharma *et al.* (2012) have presented the Teacher Efficacy for Inclusive Practices (TEIP) scale, which includes items in relation to broad elements of inclusive pedagogy, such as confidence in being able to work with teaching assistants, or effective classroom management. However, I argue that inclusive pedagogy is too broad and ill-defined a concept to be applied within measures of self-efficacy.

Inclusive pedagogy theorists argue that teachers need to be aware of a set of broad principles linked to an orientation towards being aware of each child's individual needs (Black-Hawkins & Florian 2012;;;; Spratt & Florian 2015). However, as debates in the literature in the last five years have shown (Author and Other 2015; Norwich 2013; 2014; Shakespeare 2013), one of the problems with inclusive pedagogy is that it difficult to specify, beyond a minimum set of expectations what actual practices in the classroom would be classed as inclusive, nor how practices often considered as inclusive pedagogy such as working with other adults in the classroom, behaviour management and reflection on practice might be differentiated from pedagogic practices in general. This lack of precision has been discussed by Norwich (2014), drawing on Berlin (; 1990), as the inevitable outcome when conceptual terms are employed in too hegemonic a fashion. Drawing on these critiques, I argue that self-efficacy scales developed from this perspective are likely to be lacking in domain specificity due to the lack of clear delineation between what inclusive pedagogy means in contrast to pedagogy in general. As such, in Bandura's terms they will have little predictive value for teacher behaviours. A focus on working with particular groups of children in particular contexts would be a stronger basis for specific, context dependent self-efficacy scale items. In making this argument, I am explicitly disagreeing with the position of inclusive pedagogy theorists (e.g. ; Hodkinson 2012; Slee 2014) who have consistently argued against any emphasis on psychological perspectives related to particular categories of children in preparing teachers to work with children with SEN. Indeed, Sharma *et al.* (2012), in the construction of the TEIP, explicitly criticizes those such as Hutzler *et al.* (2005) who have considered elements such as these in scale construction, as being overly allied to a medical model. In taking this position, they reflect critiques of the role of categorisation in special education (Oliver 1990; Oliver 2013), to the effect that there is no rationale for considering the needs of particular groups of children with SEN, as there is no specific pedagogy that could be applied to such groups (Lewis and Norwich 2005). As I have argued previously (Author and Other 2015), notwithstanding the attendant risks of labelling and marginalisation, it nonetheless remains the case that there is a range of evidence, derived from the scientific method in a broad sense, that can have potential application to meeting the particular learning needs of specific categories of children with SEN. Similarly, measures of

self-efficacy which do take account of the beliefs of teachers about their capabilities in relation to groups of children with particular needs, especially in relation to specific teaching scenarios, may have greater utility when compared to measures which are based on conceptualisations of inclusive pedagogy that are undifferentiated from pedagogy in general.

In the present study I have formulated a more specific construct of teacher self-efficacy for working effectively with children with SEN in the mainstream classroom, which includes items which specify particular classroom contexts in relation to the needs of different groups of children.

Teacher Education for Inclusion across Phases

Some studies have measured self efficacy for inclusion within one phase. In two separate Canadian studies, Specht *et al*. (2016) and Peebles & Mendaglio (2014) used the TEIP across samples of pre-service teachers from different institutions. These studies indicated that experience of working directly with children with SEN has a small correlation with increased self-efficacy. Some other studies (e.g. Savolainen *et al.* 2012) have focused on samples of in-service teachers, but have not included specific information about respondents' teacher education programmes.

Searches on the SCOPUS and PSYCINFO databases in relation to teacher education for inclusion indicated no substantive studies in this area which have tracked students from their pre-service to novice teacher year and none which have involved measures of self-efficacy.

Research Questions

The research questions for the study were:

1. How does teacher self-efficacy for working effectively with children with SEN change from the pre-service to novice teacher year?
2. What is the impact of additional input on inclusive pedagogy and approaches to teaching children with special needs, during pre-service and induction phases, on such self-efficacy?

Methods

The Intervention

The core of the study was a new enhanced route on inclusive pedagogy and approaches to working effectively with children with SEN for pre-service students involving a cohort of 20 primary (elementary) and 23 secondary phase students at one large teacher education provider in London.

In England, the vast majority of pre-service teacher education is delivered via one year Postgraduate Certificate in Education (PGCE) courses. The students in the pilot were drawn from the pool of students already registered for the programme (300 for primary, 600 for secondary). Students were invited to apply at the start of the programme in early September and were asked to write a 300 word statement indicating why they felt they were suitable for the specialist route. Approximately 120 applications were received for 43 available places.

A curriculum for this route (both the pre-service and novice teacher year elements) was devised via a review of the literature on teacher education for inclusion, as well as consultation with leading experts in the UK via a series of roundtable meetings, as well as drawing on the professional expertise of a network of schools led by a major special school in London.

We recognised the consensus in the literature that in order to be effective at inclusion, teachers should develop an understanding of the purposes of education, particularly, as Forlin (2012) stresses, in relation to recognising the individual worth and needs of each student. At the same time were noted the literature which notes the importance of developing knowledge about specific needs (e.g. Arthur-Kelly *et al.* 2013; Wedell 2008). We also noted that some studies have identified the need to further integrate practicum experiences with university input for inclusion (Arthur-Kelly *et al*. 2013; Romero-Contreras *et al.* 2013). Finally, we were cognizant of calls in the literature (Feiman-Nemser 2001; Cochran-Smith *et al.* 2011) to improve links between the pre-service and induction phases of teacher education. As such, we specifically designed a two year programme with input across both phases.

The programme was presented from a position which problematized the tensions between special and inclusive education in international theory and practice, which was reflected in the diverse curriculum, which included both inclusive pedagogy as well as input on knowledge about SEN.

This process of curriculum development resulted , for this group of students, in their 13/14 PGCE year, in the creation of a discrete module on inclusion and SEN. The decision to use a discrete as opposed to permeation model was largely based on logistical constraints in the study design, but we did note Sharma *et al.* (2008)'s review of different approaches and their conclusion that both approaches can be effective in teacher education for inclusion. The module took the form of additional face to face sessions on inclusive pedagogy, child development, specific difficulties with reading and writing, autism, speech language and communication needs, emotional and behavioural difficulties, alternative communication approaches in the classroom, working effectively with specialists and in teams, and creative approaches to achieving inclusion.

We also included links between practicum and university elements. Students were given specific reflective tasks related to inclusion and SEN to complete when on practicum, and their university mentors and cooperating teachers in school were given specific guidance on focusing on these areas when giving lesson observation feedback to students. The students also spent an intensive week at the special school, where they observed good practice in the classroom as well as receiving additional specialist input from professional staff at the school. The programme was supported by a range of specialist resources provided on the institution intranet and a series of tasks designed to encourage reflection on practice... Students not undertaking this route, on the "general" pre-service programmes, received typically one day of input on inclusive pedagogy. Thus the enhanced pre-service route could be regarded as including additional elements of verbal persuasion (pedagogy and content input; feedback from university mentors and cooperating teachers), and vicarious experience (observation of practice at the special school).

Then, in the 14/15 novice teacher year, this same group of students went on to undertake a masters level module which further developed the themes introduced in the first year, with a focus on locating reflection on SEN and inclusion within a professional development narrative focused on their local practice. The module consisted of 4 evening face to face sessions, and had a stronger focus on engagement with research literature related to SEN and inclusion. This was supplemented by a series of online reading based tasks, and the module culminated with an assessed presentation.

A guide for induction mentors was produced and schools were encouraged to support their novice teacher's engagement in the programme, including a monetary payment to support non-contact time and the provision of mentoring support within the school. Thus the enhanced induction route can be regarded as including additional elements of verbal persuasion - pedagogy and content input and mentoring support from school based mentors. For both the pre-service and induction elements, if Palmer's (2011) argument on the direct

link between knowledge development and self-efficacy were accepted, then the pedagogy and content input could be considered as an additional element of cognitive mastery.

Forty one students completed the pre-service year of the programme and thirty five students completed the novice teacher year.

Instrumentation

I reviewed the literature as discussed in relation to teacher education for inclusion and SEN, and from this formulated a series of initial items indicating belief in the capacity to act in specific situations. In line with Bandura's (2006) guidelines on self-efficacy scale development, statements indicating were positioned in relation to specific scenarios.

For example, the item "I can teach students with mild learning difficulties", this was positioned as "for example, working with a twelve year child who is working generally at an age appropriate level, but has difficulties with understanding number, and finds it hard to cope with lessons in maths and science." Although terms such as mild learning difficulties can have varying definitions, they are used in the literature (e.g. Berkeley, Mastropieri & Scruggs 2011), and serve as a useful general indicator of the area of capability being referred to. It could be argued that items such as "I can teach students with autism" are in themselves too general. However, I was cognizant of Tschannen-Moran *et al.* (1998)'s indication of the need not to go too far with specificity in item definition on self-efficacy scales. In particular, they note that measures that are too specific "lose their predictive power for anything beyond the specific skills and contexts being measured" (p.219). A total of 18 statement items were created. A 6-point anchor with responses from Strongly Disagree (1) to Strongly Agree (6) was employed. Four expert faculty members in London and Manchester were asked to review the scale as a process of content validation, and asked to comment on the usefulness and clarity of each item in relation to the measurement of the construct. These reviewers were provided with a draft of the literature review. Based on these recommendations, and further discussion by the project researchers, 5 items were deleted. The revised instrument was further piloted for clarity of the items and instructions by 25 pre-service and masters level students in London, and further minor revisions made based on their feedback. We posited that this instrument could be considered as a measure of perceived self-efficacy in relation to working effectively with children with SEN in the classroom.

The overall study design and individual data collection instruments were reviewed and approved by the institutional ethics committee.

Instrument Validation

The revised instrument was initially administered to 330 pre service teachers in four one year postgraduate programmes (primary and secondary employment based routes in to teaching, and primary and secondary full time taught) at one London institution at the start of their programmes. Student teachers were asked to complete the questionnaire on paper at the end of a course lecture. The data was analysed in SPSS. An exploratory factor analysis using principal axis factoring was undertaken. The Kaiser–Meyer–Olkin value for sampling adequacy was 0.86, exceeding Pallant's (2007) recommended minimum of 0.6. Bartlett's test of sphericity was significant at less than 0.001, indicating that the data was suitable for factor analysis. Review of the scree plot and Eigenvalues suggested that there was one factor with an Eigenvalue more than 1 and this correlated with the break point on the scree plot, (see Table S1). A second factor with an Eigenvalue of 0.855 which coincided with the break point on the scree plot was considered for inclusion. A forced analysis with these two factors, and an oblique rotation did not produce a clear attribution of the variance of items to the factors and a decision was made to only retain the first factor, loading on six items which had a factor loading of between 0.63 and 0.85. Other items were deleted from the scale. The factor

analysis as described was re-run on the 6 items, which explained 60% of the variance. Reliability and internal consistency of the 6 item instrument via Cronbach's Alpha was 0.86 and the alpha reduces if any item is deleted. Inter item correlations were between 0.26 and 0.71 and the average inter item correlation was 0.49. Clark and Watson (1995) indicate that average inter-item correlations should fall somewhere between 0.15 and 0.50 and individual item correlations between 0.15 and 0.85. The final 6 item instrument statements are shown in Appendix A. The simplex index composite score was calculated, taking the mean of the individual item ratings for each case, as a measure of perceived self-efficacy for working effectively with children with SEN in the classroom.

Table S1

Factor Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.60	60.00	60.00	3.15	52.41	52.41
2	0.86	14.26	74.26			
3	0.58	9.66	83.92			
4	0.41	6.80	90.72			
5	0.36	6.02	96.74			

Use of the Instrument

Students undertaking the enhanced route (the intervention group) completed a questionnaire at the start of the programme. The questionnaire included two elements: 1) demographic and attribute questions, including prior experience working with children with SEN and personal experience of special needs, 2) the 6 instrument items and a limited number of open ended textual responses.

A comparison group of students on the same pre-service programmes but not undertaking the enhanced route also completed the questionnaire. The comparison group was recruited via an open invitation on the programme intranet which included the incentive of being entered in to a prize draw for gift vouchers at the point of initial recruitment. The initial questionnaire was completed at the start of the 13/14 academic year (baseline), and a post-test questionnaire including the scale items was completed by the comparison and intervention groups at 2 additional time points – at the end of their pre-service year in June 2014 (follow up 1) and then again at the end of their novice teacher year in June 2015 (follow up 2).

At baseline there were 44 students in the intervention group and 88 students recruited to the comparison group completed the questionnaire. At follow up 1, 41 students in the intervention group completed the questionnaire and these students had completed at least 80% of the programme. Fifty two students in the comparison group completed the questionnaire. At follow up 2, 32 students in the intervention group (73% of the baseline sample) completed the questionnaire and all of these had completed at least 80% of the programme. Thirty five students in the comparison group (40% of the baseline sample) completed the questionnaire.

Students in the both the intervention and comparison groups would have received an induction programme, as per the statutory guidance for England, typically provided by their school. Although there are no studies available which have surveyed the extent and quality of induction programmes in England or London for the specific period of the study, given that the statutory guidance remained broadly unchanged in 2014/2015 from the early 2000s, it is reasonable to infer that the pattern of induction support outlined in the OECD (2014) and Hobson *et al.* (2009) studies was similar. Nevertheless, in order to further assess the induction support provided to schools, the intervention group were asked to complete a separate short questionnaire about their experiences of induction, apart from the enhanced SEN route, at the end of the novice teacher year and analysis of this indicated that 85% received an induction programme which included 5-10 hours of structured professional development input and regular mentoring sessions at least once per month, and 15% had a programme of 11-20 hours with regular mentoring sessions at least once every three weeks. Participants also indicated that, apart from the enhanced SEN route input, they received on average one half day session on inclusion or SEN as part of their school based induction programme. Although this data was not collected for the comparison group, there is no a priori reason to suggest that the level of induction and mentoring support provided by schools would differ from the intervention group.

Interviews were also undertaken with a small sample of students in the intervention group at the end of the 2013/2014 and 2014/2015 academic years. These, in conjunction with the open text questionnaire responses, will be reported on in a later paper.

Findings

Descriptive statistics and χ^2 cross tabulations were undertaken for demographic and attribute data in order to determine how the intervention and comparison groups compared and in order to identify any bias, particularly in relation to non-responders at Follow Up 1 and Follow Up 2.

Overall completions and characteristics of respondents and non-respondents
The characteristics of the sample at baseline are shown in Table 1.

Table 1

Intervention and Comparison Groups at Baseline

	Intervention		Comparison		Chi squared
	%	n	%	n	P value
Primary	43	19	46	40	.80
Secondary	57	25	54	48	
Aged 20-30	91	40	88	77	.54
Aged 31-40	7	3	6	5	
Aged 41 to 50	2	1	6	6	
Female	82	36	70	62	.16
Male	18	8	30	26	
Prior experience of working in schools	80	35	81	71	.89
No prior experience of working in schools	20	9	19	17	
Prior experience of working with children with SEND	63	28	58	51	.53
No prior experience of working with children with SEND	37	16	42	37	
Has a Friend/relative with SEN	39	17	37	32	.80
Does not have a Friend/relative with SEN	61	27	63	56	
Has SEN themselves	18	8	7	6	.05*
Does not have SEN themselves	82	36	93	71	
Total	88	44	100	100	

**Significant difference*

The distribution of subject specialism for secondary phase students was: Art and Design 3, English 7, Maths 2, MFL 2, Physics 2, Other: 7.

The groups were broadly similar in characteristics at baseline. There was a borderline significant difference (p=0.5) with regards to students identifying as having an SEN themselves (intervention group 18%, comparison group 7%). There was also a difference, albeit non-significant with regards to gender (female students in intervention group 82%, and in the comparison group 70%). A t test of the difference between the comparison and intervention group for the composite scores at baseline indicated that the difference in means between the groups was 0.31 (Intervention Mean 3.41, St Dev 0.79; Comparison Mean 2.72, St Dev. 0.78) which was significant at p=0.039.

χ^2 tests also indicated that across the total group of all responders at follow up 1, there were no significant differences in baseline demographic characteristics between those that completed the first follow up questionnaire and those that did not. For the intervention group, as only 3 students from the original group did not complete the follow up questionnaire, no

valid conclusions can be drawn about the differential rate of response by characteristics within that group.

For the comparison group, χ^2 tests show that there were no significant differences in baseline demographic characteristics between those that completed the first follow up questionnaire and those that did not, although there were some variations. In particular, for gender, 65% of responders and 78% of non-responders were female, and for students identifying as having a relative/friend with SEN, these represented 33% of responders and 42% of non-responders.

Table 2

Mean and Standard Deviations of Initial Composite Index Scores for Groups across time points

Group	Baseline	Completed Follow Up 1	Completed Follow Up 2
Intervention	M 3.41, SD 0.79	M 3.38, SD 0.78	M 3.35 SD 0.69
Control	M 3.72, SD 0.78	M 3.72, SD 0.76	M 3.54, SD 0.80
Difference in Means	0.31	0.33	0.19

Across the total group, there were no significant differences in baseline demographic characteristics between those that completed the questionnaire at follow up 2 and those that did not. Similarly, across the total group, there were no significant differences between responders and non-responders at follow up 2 in terms of their initial composite scores at baseline. Comparisons within each arm of the study indicated that there were no significant differences between responders and non-responders at follow up 2 in terms of baseline demographics for each group, except for phase of study for the intervention group, where proportionally more primary students responded (18%) than did not respond (8%), which was significant at $p=0.04$. Two sample t tests between proportions were used to compare the percentages of responders and non-responders for each demographic variable between the intervention and comparison group, which showed no significant differences except for gender (intervention female responded 83%, did not respond 67%; comparison female responded 57%, did not respond 79%; $t=3.4$, $p<0.005$). There was also a difference, albeit non-significant, for whether participants self identified as having SEN (intervention Has SEN responded 22%, did not respond 8%; comparison Has SEN responded 8%, did not respond 6%; $t=1.91$, $p=0.053$). As in Table 3, the difference in means on the baseline composite score between the groups for those participants who completed the second follow up questionnaire was 0.19 and a test of the difference for these participants between the comparison and intervention group was not significant ($p=0.31$). Overall, although there are some minor variations, broadly the respondent sample at follow up 2 can be considered as representative of the sample at baseline for both arms of the study.

Changes in The Measure of Perceived Competence – Analysis of Variance

The changes in the composite index over time are shown in Table 4 and Figure 1.

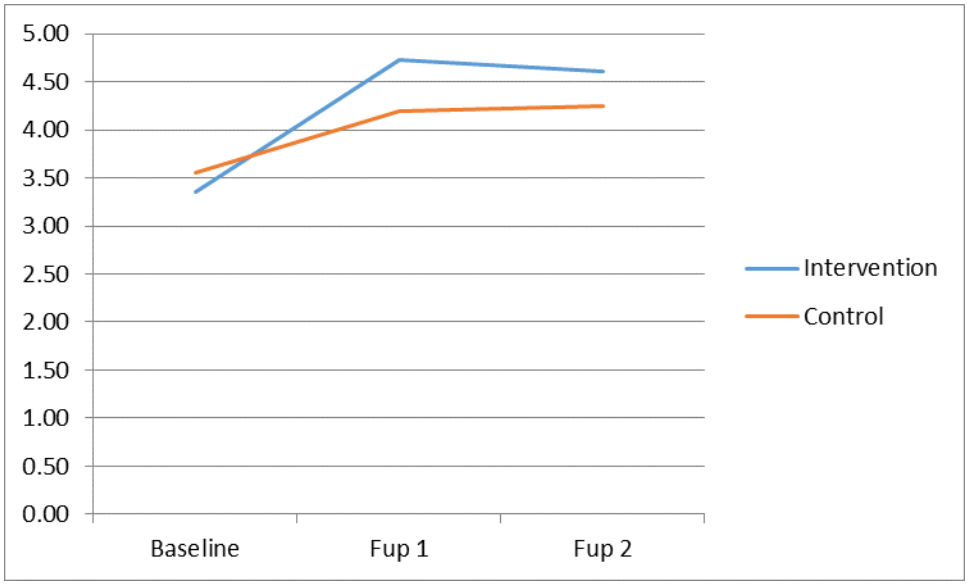
Table 3

Change Over Time

Time Point	Intervention or comparison	Mean	Std. Deviation	N
Baseline	intervention	3.35	.69	32
	comparison	3.56	.82	35
	Total	3.46	.76	67
Follow Up 1	intervention	4.73	.55	32
	comparison	4.19	.86	35
	Total	4.45	.77	67
Follow Up 2	intervention	4.61	.60	32
	comparison	4.25	.74	35
	Total	4.43	.70	67

Figure 1

Change Over Time



Visual inspection of Figure 1 suggests that between baseline and follow up 1, the composite index increases for both groups, but at a greater rate for the intervention group, Between follow up 1 and follow up 2, both groups appear to remain at roughly steady state.

A two way mixed ANOVA was run with time (Baseline, Follow Up 1 and Follow Up 2) as the within subject factor and group (Comparison and Intervention) as the between subjects factor. There were no outliers, as assessed by examination of the studentized residuals for values greater than 3. The composite scores were checked for normality at each time point and were seen to be normally distributed on a Normal Q-Q Plot. There was homogeneity of variance as indicated by Levene's test.

There was a significant group x time effect $F(1.77, 115.1) = 10.71$, $P<0.005$, $\eta_p^2 =0.141$. Simple main effects tests for time showed that the composite index changed significantly over time for the intervention group $F(1.324, 41.03) = 28.31$, $p < .001$, η_p^2

=0.781; and for the comparison group, $F(2, 68) = 19.34$, $p < .001$, $\eta_p^2 = 0.363$. For group x time, and for the simple main effect for the intervention group, Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, and therefore, a Greenhouse-Geisser correction was used.

Given the variation in pattern of results in this study compared to Hoy and Spero (2005), a main effect test for time (i.e. looking at the trend for time independent of group) was undertaken which was significant $F(1.77, 115.1) = 92.71$, $P<0.005$, $\eta_p^2 = 0.588$.

Although broadly the groups were similar at both baseline and follow up 2, as noted there were some variations, particularly in terms of the significant difference in the composite scores between the initial responders at baseline, percentage of responders at follow up 2 by phase for the intervention group, and relative rate of response for gender between the two groups for gender at follow up 2, and the near to significant difference between the groups for self identification with SEN at follow up 2. As such, an ANCOVA procedure was run with initial baseline composite score, phase, gender, and self identification for SEN as co-variates. The ANCOVA adjusted means were not significantly different to those in the standard ANOVA procedure, and as such it did not appear that differences between the groups in relation to these items had any affect on the overall results.

Pairwise comparisons with Bonferonni correction were then undertaken. For the intervention group, the composite score was significantly higher at follow up 1 compared to baseline (mean difference = 1.38, 95% CI [1.04, 1.72], $p<0.005$), and at follow up 2 compared to baseline (mean difference = 1.26, 95% CI [0.95, 1.58], $p<0.005$), but was not significantly different at follow up 2 compared to follow up 1 (mean difference = -0.12, 95% CI [-0.27, 0.04], $p=0.21$).

Similarly for the comparison group, the composite score was significantly higher at follow up 1 compared to baseline (mean difference = 0.63, 95% CI [0.35, 0.92], $p<0.005$), and at follow up 2 compared to baseline (mean difference = 0.70, 95% CI [0.35, 1.05], $p<0.005$), but was not significantly different at follow up 2 compared to follow up 1 (mean difference = 0.07, p5% CI [-0.23, 0.36], $p>0.99$).

It was also important to consider the relative rate of change between groups. As a simple measure of this, a t test of the difference of differences of the means between the two groups across the separate time points was calculated as in Table S5

Table S5

Difference of differences of the means

Time Point	Intervention or comparison	Difference of means	Std. Deviation	t	p
Baseline to Follow Up 1	intervention	1.38	.76		
	comparison	0.63	.66	4.13	<0.005
Baseline to Follow Up 2	intervention	1.26	.71		
	comparison	0.70	.87	2.51	0.015
Follow Up 1 to Follow Up 2	intervention	-0.12	.68	-0.85	0.4
	comparison	0.07	.85	35	

This indicated that there was a significantly greater rate of change for the intervention compared to the control groups between baseline and follow up 1 (intervention difference of means 1.38, comparison 0.63; $p<0.005$) and between baseline and follow up 2(intervention 1.26, comparison 0.70; $p=0.015$) , but no difference in the rate of change between follow up 1 and follow up 2 (intervention -0.12, comparison 0.07, $p=0.4$).

Analysis of Attribute Data

Additional MANOVA tests were repeated in a step wise manner for the following attributes which were captured as case data items on the administered questionnaire, in order to see if the change over time in the composite score varied according to these attributes:

Primary or Secondary Phase
Age
Gender
Experience of working with children with SEN
Identifying as having an SEN
Having a friend or relative with SEN

There were no statistically significant three way interaction (attribute, group and time) for any of these attributes. Not was there any significant two way interaction for attribute and group. Loreman *et al.* (2013) similarly noted no association between age, gender or phase in relation various measures of teacher efficacy in relation to inclusion. However Loreman *et al.* (2013) did find an association with previous interactions with people with disabilities or special needs. It may be that the size of the sample at follow up 2 restricted the possibility of detecting such trends in this study.

Discussion and Conclusions

As noted, Hoy and Spero (2005) found that on 3 of 4 measures, self-efficacy increased during the pre-service phase, and then dropped significantly during the novice teacher year. In contrast, in this study, in the overall sample of 67 students tracked across three time points from the start of their pre-service programme to the end of their novice teacher year, there was no significant drop in perceived self-efficacy in relation to working effectively with children with SEN during the novice teacher year, whether or not additional induction support was provided. It is the case that in the Hoy and Spero (2005) study, the fourth measure of self-efficacy designed specifically in relation to the programme content did broadly match the pattern of results in this study.. This measure was, similarly to the measure in this study, highly domain specific, as was the measure used in the Dicke *et al.* (2014) study. Although this convergence cannot in itself be taken as demonstration of the greater validity of domain specific measures of self-efficacy, it nevertheless is interesting to note in the context of debates about domain specificity.

Self-efficacy did increase significantly in the group receiving the enhanced input during the pre-service year, relative to the group not receiving this input. The same trend was observed for self-efficacy at the end of the novice teacher year compared to the baseline at the start of the pre-service year. Thus even though both groups broadly flatlined during the novice teacher year, the relative "boost" in self-efficacy from the pre-service year when compared to the comparison group was maintained through to the end of the novice teacher year. However, it is also the case that the additional induction support that the intervention group received in the novice teacher year did not lead to any further appreciable gains in self-efficacy when compared to the comparison group. Looking at the trend for the intervention

group by itself, and comparing to the general pattern in the Hoy and Spero (2005) study showing a drop in self-efficacy in the novice teacher year on three measures, it could have been hoped for that the additional induction support would offer resilience against praxis or reality shock, and that without it the participants would have shown a drop in self-efficacy. However, as the comparison group who did not receive this additional induction support show the same trend, such an argument cannot be supported. Rather the results suggest that additional domain specific induction support has no additional impact on perceived self-efficacy in that domain in the novice teacher year. Alternatively, if the trend of the fourth measure in the Hoy and Spero (2005) was admitted, then one might expect to see an increase in self-efficacy in the intervention group compared to the comparison group in the novice teacher year. As there is no such relative increase, this is similarly indicative of no impact on self-efficacy resulting from the additional induction support.

Tschannen-Moran *et al.* (1998) argue that mastery experiences in the context of educational innovation will serve to bolster self-efficacy and actual increases in self-efficacy beliefs. However, there may be a time lag between the experience and increases in self-efficacy as teachers integrate strategies in to their repertoire. They cite Stein and Wang's (1988) study in which a new elementary school instructional programme was implemented by experienced teachers. Although measures of the progress with implementation (as a proxy for mastery experience) were highest in the autumn term, measures of self-efficacy did not increase until the following spring term. Relatively few other studies have looked at the longitudinal relationship between mastery experience and self-efficacy (Klassen *et al.*, 2011). However, Holzberger *et al.* (2013) demonstrated such a time-lagged relationship between mastery experiences in the classroom and increases in self-efficacy over a one year period for German secondary school teachers. As noted, Glazerman *et al.* (2010)'s study demonstrated a time lag of two years between the provision of increased induction support and impact on student achievement. It could be that similarly, in this study, there may be a time lag between input on induction enrichment and increases in self-efficacy. In both the Stein and Wang (1988) and Holzberger *et al.* (2013) studies, this time lag effect was seen within around 6-9 months. However, in the specific context of the novice teacher year, praxis and reality shock may serve to further delay the impact of mastery experience on the development of self-efficacy.

Many researchers working in the field argue that teacher preparation can have an impact on self-efficacy. Wyatt (2014) and Klassen *et al.* (2011) in their reviews of the use of the construct both make this argument. Given the links between this construct and student outcomes in particular, being able to identify what strategies in teacher education impact on self-efficacy in particular domains could lead to useful knowledge about the design of programmes both at pre-service and induction phases. The results from this study are significant as they further illuminate how pre-service and induction phases teacher preparation relate to domain specific self-efficacy, particularly posing the question of whether induction phase support does or does not have any impact on self-efficacy. It may be that challenges of the novice teacher year that lie behind praxis and reality shock mean that support during the induction phase is not effective. It could be considered that the significant attentional resources focused on dealing with the routine and the anxiety associated with meeting the challenges of the novice teacher year may act as a block, preventing mastery experience, vicarious, persuasive (and possibly cognitive mastery) inputs being assimilated at all. If this were the case, then it might make more sense to delay the provision of such enrichment inputs until the second or third year of teaching. Alternatively, there may simply be a time lag effect. Beginning teachers may need a) more time to integrate new concepts and strategies in to their repertoire, which may be more feasible after they have overcome the shock of the novice teacher year, and b) further experience/evidence of successful student

learning to further bolster mastery experience, which may build upon the induction enrichment in the novice teacher year. If so there would remain a rationale for enriched induction during the novice teacher year.

Clearly extended longitudinal work on teacher education in general, and in particular larger scale longitudinal work on teacher education for inclusion that extends in the second and third year of in-service teaching would allow for exploration of this. Further empirical exploration of the relationship between taught input on pedagogy and content knowledge and mastery experience would also be necessary.

For inclusive education in particular, such work would shed further light on the impact of pre-service and particularly induction support on special and inclusive education, and how this can best be delivered across pre service and in-service education in the novice, second and third years of teaching.

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