Paper Title Mapping Changes in Support: A Longitudinal Analysis of Networks of Preservice Mathematics and Science Teachers

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Mapping Changes in Support: A Longitudinal Analysis of Networks of Preservice Mathematics and Science Teachers

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Introduction

Recent policies towards more school-based training have significantly changed the Initial Teacher Education (ITE) landscape. With an emphasis of trainees spending more time in school, rather than at universities, this might mean that networks of support, for example through peers, university mentors or school mentors change as well. As previous research indicates that networks can play an important role in trainees' development we set out to investigate how trainees' networks developed throughout the Academic Year 2014-2015. We focus here on mathematics and science trainees as shortages in maths and science trainees have made it important to study the way trainees form relationships in more detail. It is our expectation that this might provide valuable insights in the way we might (re-)organise ITE provision. Hence, this paper reports on a project which involved researching the support relationships of trainee (student) teachers on initial teacher education programmes, and the impact of these networks on trainees' perceived progress through their programme of study.

Background

To sketch the scene of our research focus we first describe the literature background of the two main themes underpinning the study: the role of networks in teacher trainee development and recent changes in the provision of ITE in England, with particular regard to the nature of school-based training.

The role of networks on teacher trainee development

Darling-Hammond and Sclan (1996) once described the experience of novice teachers as "sink or swim" indicating the sparsity of good quality support for early career teachers which can result in early departures from the profession. A number of articles on pre-service and early-career teacher education and development point to the importance of social elements of support that can contribute to teachers' survival through early stages as novice teachers as well as providing resources to support their professional learning and the development of core teacher competences (e.g. Hudson, 2012; Le Cornu and Ewing, 2008; McCormack et al., 2006).

McCormack et al (2006) in a study of a group of early career teacher in the first year of teaching emphasise the shock experienced on entering their full time posts as trained teachers. The researchers indicate the importance of peer support as a means by which early career teachers develop strategies to progress beyond the initial feeling of being overwhelmed by the transition to first teaching posts. This is particularly linked to the need to develop classroom and behaviour management strategies in order to emerge from "survival mode" and establish an effective foundation for teaching their classes. According to McCormack et al (2006) secondary (high) school teachers, more than their primary

(elementary) school colleagues valued informal means of support via colleagues in their teaching departments and other schools over the support received by mentors. Such support normally came via impromptu opportunities for dialogue and exchange (such as staffroom conversations). Their research participants point especially to the importance of maintaining support relationships with their network of former peers from their training course, in order to benefit form a strong sense of empathy derived from a shared experience and common language between fellow early-career teachers.

Hudson's (2012) study reports novice teachers referring to a range of key actors in in their support networks, from senior and more experienced colleagues in their school, assigned experienced mentors through to understanding spouses, friends and family members cooking dinner while the teacher works on their preparation at home. A key source of support is described as the "teacher next door" (p. 76), which suggests a sense of both physical and social proximity that may be derived from an empathetic and understanding peer.

As well as emphasising the role that school based and university mentors can play in the development of pre-service teachers, research with pre-service teachers (Le Cornu and Ewing, 2008) also provides evidence for the importance of relationships between peers as a source of mutual support that is beneficial to both professional learning and personal well-being. Reciprocal relationships within peer support networks were viewed as particularly empowering because the pre-service teachers were on an equal footing with one another and less likely to judge one another. Such relationships also offer a strong source of emotional support (Nieto, 2003) which help to foster greater resilience in pre-service and novice teachers (Gu & Day, 2007), leading Le Cornu (2009) to conclude that student teachers don't just need to be alerted to the importance of developing strong peer support networks but rather "need to *experience* peer support" (p.721, emphasis in original).

We therefore propose to conduct research that examines the association between the perceived level of development achieved by trainee teachers at key points during an intensive one year postgraduate course of initial teacher training and various factors related to the development over time of relational ties as a form of social capital (Coleman, 1990; Lin, 2001) that facilitate access to support during their year of training. The structure of social capital might be viewed in the form of a network of ties (Burt, 2000) which indicate that the sources of support are located within different actors operating in particular positions within a social network and therefore may not be equally available to everyone in a local network system. The presence or absence of relational ties indicate the capacity for individuals to gain access to particular forms of expertise or resources within the network of actors.

Liou et al. (2013) employed survey and social network analysis (SNA) techniques in order to examine how the social capital of preservice teachers was related to their professional development. They found that interpersonal trust and perceived self-efficacy were positively associated with preservice teachers' performance on an assessment of mathematics teaching competence. The social network position of preservice teachers within their peer group was also related to their performance on the assessment. They conclude that support relationships within the peer-network provide an important source of resilience in a pressured environment. By conducting a longitudinal social network study of trainee teachers' relational ties to various supporting actors, we hope to determine how the various university and school-based phases during the year long course contribute to changes in the nature and extent of support networks between trainee teachers and their peers, mentors, colleagues, friends and family members. We also aim to examine how recent developments in the provision of predominantly school-based initial teacher education in England serve to influence the nature and development of such support networks during the training period.

ITE and school-based training

Initial Teacher Training[1] (ITT) in England has been subject to major changes ever since the 2010 Schools White Paper (DfE, 2010) in which the incoming Secretary of State for Education described a transformation of ITE. According to new policies, teacher training needed a shift of control away from universities and into schools (ibid.). Part of this 'school led focus was the introduction of the School Direct programme. There are two major routes into teaching. The first is university led, also called 'Provider Led' (PL), in which "universities and colleges offer teacher training courses for both graduates and undergraduates. " (Get into teaching website[2]). University-led courses run full-time over one year or part-time over two years. Training involves spending time at a university or college, working with other trainees and being taught by university colleagues. A minimum of 24 weeks is spent at placement schools, helping in the development of practical teaching skills and ability to manage and plan classes. School-led training is described as being "for graduates who want hands-on training in a school." On the same Get Into Teaching website this option is described as "On a school-led training course, you'll get the chance to learn on the job in at least two schools, learning from experienced colleagues and putting your new skills into practice from day one. School-led courses generally last a year and result in the award of qualified teacher status (QTS). Most courses include a postgraduate qualification, which is likely to carry with it Master's-level credits. "[3]. School-led courses are referred to as the SCITT (school-centred initial teacher training) programme and School Direct (SD) training programme. SD courses are designed by groups of schools – with a university or a SCITT – based on skills these schools are looking for in a newly qualified teacher (NQT). The schools trainees onto their SD course with a specific job in mind. SD courses generally last a year, and trainees spend time in at least two schools. According to the official government website "School Direct courses all result in qualified teacher status (QTS). Most also award you a postgraduate certificate in education (PGCE) and/or Master's-level credits". SD trainees become part of a team from the start, and receive support from teachers and mentors. SD can be said to favour "an apprenticeship model of teacher training that can be located entirely in the workplace" (REF). Several sources like the Good Teacher Training Guide (Smithers and Robinson, 2013), the 2014 NQT survey (NCTL, 2014) and a report by the Institute for Fiscal Studies (Allen et al., 2014) suggest that the move towards school-led ITT has had benefits, while others take a more critical stance towards the wider policy implications we refer to other literature (e.g. Parker, 2015; Whitty, 2014; Childs, 2013). This article, however, follows the more pragmatic approach expressed in the Carter Review of Initial Teacher Training (Carter, 2015). Sir Carter conjectured that discussion about whether ITT should be delivered by School-centred ITT, or universities, or School Direct were not very helpful. It focused on 'partnership' being key, but within an increasingly school led system.

The focus of this article might be illustrated by claims made by McNamara and Murray (2013) suggesting that one different role for university involvement might be that they "are important in the provision of teacher education because they give students and teachers space and time for exploration and critical thinking away from the fray". Hodgson (2014), reporting on a survey from the National Association for the Teaching of English on the changes to ITT, mentions how some teachers argue that working only with a locally based adviser will disadvantage trainees. He cites a student: 'If your mentor is not good you will have no course tutor or other students to fall back on. You will also not have the promise of receiving a new mentor when you move to train in a different school.' It is

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[1] ITT is sometimes referred to as Initial Teacher Education (ITE)
[2] https://getintoteaching.education.gov.uk/
[3] Note that the university led mostly leads to QTS, PGCE and Masters credit but this is not mentioned on the Get Into Teaching website.

suggested that PGCE tutors have better networks as well (Hodgson, 2014, p.17). A secondary head of department states that "Time away from the school to discuss and share ideas with students who have been to different schools is a vital part of the learning process", while another says "there will be no time for those all-important discussions with other post graduates students, as these students will be pulled and prodded into fitting into a busy pressurised department.". Finally, he mentions how one student teacher reports that their university encourages students to create a network with each other, a peer network, which provides invaluable resources and support. A common theme throughout these views is the emphasis on networks, an aspect also included in Teachers' Standards "develop effective professional relationships with colleagues, knowing how and when to draw on advice and specialist support." (DfE, 2011). Given the distinctly different nature of the two routes into teaching, it might be expected that the network trainees develop might be different between the routes. This article wants to look into this, and to this end we will now review the literature on the development of peer and wider networks in trainee teachers.

Research questions

The paper sets out to answer the following research questions:

RQ1: Are certain network characteristics (such as network homophily, network intentionality, peer trust and views on support) significantly associated with the growth in perceived self-efficacy of these pre-service teachers?

RQ2: How do the support networks of trainee teachers vary between Provider Led (PL) and School Direct (SD) programmes?

Methodology

Research design

The study employs a longitudinal survey design. The first phase is a longitudinal survey of the peer support networks of trainee teachers. The survey will also collect data on background factors such as self-reports of organisational and interpersonal trust and efficacy as a teacher.

Instrument and variables

The survey instrument collected several variables at four different waves throughout 2014-2015.

The dependent variable was self-perception of development (self-efficacy, variable named DEVELOPMENT). This was a set of twelve 9 point Likert scale (1=not at all, 9=always) which based on a scale developed by Tschannen-Moran and Woolfolk Hoy (2001) and used in several previous studies (Daly, Der-Martirosian, Ong-Dean, Park, & Wishard, 2011; Daly, Liou, Tran, Cornelissen, & Park, 2013). Three scales could be calculated from them, namely classroom management, student motivation, and instructional skills, according to previous PCA methods. In this study we used the mean of all items as metric for self-perceived self-efficacy/development. Internal consistency of the scale was high (α= .96, calculated over all waves).

The contextual variables were gender (0=male, 1=female), age (numeric but also split in categories with width 5 from 20 to 59 years old), subject (0=maths, 1=science) and program type (0=Provider led, 1=School Direct).

As described in the literature, several concepts were used as independent variables.

- A peer trust scale (TRUST), after PCA, consisted of six items explaining 74% of the variance. This scale was modified from previous work by Daly and Chrispeels (2008) and Hoy and Tschannen-Moran (2004). The items were scored on a 9-point Likert type response scale (1 =very strongly disagree, 9 = very strongly agree). In this study we used the mean of all items as metric for peer trust. Internal consistency of the scale was high (α= .95, calculated over all waves).
- Views on support (SUPPORT). This scale consisted of thirteen items concerning the extent in which respondents are open to asking support, for example by asking help from friends. The items have been used in previous studies but no references are available. The items are tabulated in appendix A. The items were scored on a 6-point Likert type response scale (1 =strongly disagree, 6 =strongly agree). In this study we used the mean of all items as metric for support. Internal consistency of the scale was relatively low (α= .61, calculated over all waves) but we felt it was acceptable in the context of the study.
- Network intentionality (NETWORK). This scale consisted of twenty-two items concerning the extent in which respondents are prone to care about their network(s), like "I attempt to connect to people who are prominent or central in the course/at school" or "I periodically evaluate the nature of my connections and networks within the course/at school". Some items are reversed. The items have been used in previous studies but no references are available. The items are tabulated in appendix A. The items were scored on a 5-point Likert type response scale (1 =strongly disagree, 5 =strongly agree). In this study we used the mean of all items as metric for network intentionality. Internal consistency of the scale was high (α= .81, calculated over all waves).

Of course network measures were also used in the study. This was done on two levels. Firstly, every trainee, distinguishing maths and science as different groups, trainees were presented with names from their group and asked whether they had any communication with this trainee during the last month. We refer to this data as data pertaining to their *peer network* and call this number of *internal* links I. Secondly, we asked about the *wider network*. Trainees were asked to indicate whether they had had contact with the wider group of network links, in this case family, friend, school colleague, school mentor, university tutor/mentor, online contacts and other acquaintances. If there were more links in one category, we asked to enter this for each of the (network) links. There was an option to indicate more precision (who the network link was), but we have not used these for this particular analysis, just like follow-up questions on the *type* of support. We refer to this data as data pertaining to their *wider network* and call this number of *external* links E. This means that the total outward connections (the *out degree*) is the sum of I, the internal links, and E, the external links. This can be perceived as the size of their total *ego network*. With E and I we calculated Krackhardt and Stern's (1988) External–Internal (EI) index, a social network measure which denotes the relative density of internal connections within a social group compared to the number of connections that group has to the external world. The EI index takes the number of links of members of the group to students outside the group (E), subtracts the number of links to members within the group (I), and divides by the total number of links:

$$\text{EI} - \text{index} = \frac{E - I}{E + I}$$

The resulting index ranges from −1 (all ties are only with own group members, so-called *homophily*) to +1 (all ties are to students outside the group, so-called *heterophily*). According to Hernández-Nanclares, García-Muñiz and Rienties (2016, p.5) the "values of the EI index highlight if a group develops strong and cohesive learning links within a group (values near to −1) or present strong knowledge spillovers outside the group (values near to +1)". Not all variables and scales were collected at all time points.

The metrics were collected in four waves, spaced across the Academic Year 2014-2015. Table 1 shows which metrics were collected in what wave. Time points were partly determined by programmatic 'ideal moments' for both Provider Led (PL) and School Direct (SD) courses, with an aim to have a wave every two weeks. The first wave was in October 2014, the second wave December 2014, the third wave March 2015 and the last wave begin May 2015.

Table 1 overview of data collection points

	Network		Related factors			
	Peer (I)	**Wider (E)**	**Trust**	**Network intent**	**Support views**	**Self-efficacy**
1	✓	✓	✓			✓
2	✓	✓		✓	✓	✓
3	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓

Participants

Participants are trainee teachers on Initial Teacher Education (ITE) programmes associated with the Southampton Education School of the University of Southampton. The majority of data will be collected as part of the project. Any secondary data as additional contextual data will be provided through the programme records to support the interpretation of the network analyses. For the survey all participants were invited to give their consent at the beginning of the survey on each data collection occasion. Participants engaging in the interview phase will be asked to complete the accompanying consent form prior to any initial interview. Trainee teachers selected for the interview phase will be asked to identify members of their wider support network such as family, friends, colleagues and mentors and also provide an indication of the level/degree of support each member of their wider network provides. They will be asked if they are willing to provide illustrative examples of how their network has provided support for them during their period of study to that point. Finally, in the context of different situations/scenarios relating to the typical experience of a trainee teacher, the interview participants will also be asked questions about their decision-making to determine which member of their support network they would turn to in each situation. The survey will required

participants to complete a 20 minute (approx) survey on a number of occasions during the time span of the project. A summary of the survey instrument is provided in appendix A. Response rates are indicated in Table 2. Note that attrition had two causes: the first one being students who had dropped out of the whole programme, the second one non-response.

Table 2 response rate over waves

Subject	1	2	3	4
Maths (37)	35 (95%)	28 (81%)	29 (94%)	29 (90%)
Science (40)	38 (95%)	33 (83%)	32 (86%)	31 (83%)
Total	73	61	61	60

We used SPSS version 22 to generate descriptives, cross-tabulations and graphs. We further examined the longitudinal development by using a repeated measure ANOVA. Finally, for every time point (wave) we fit simple OLS regression with wave 4 variables with perceived self-efficacy (DEVELOPMENT) as dependent variable. There we used two additional independent variables: the network growth, being the total network (I+E) gain from wave 1 to wave 4 (NETWORKGAIN), and the EI-change, the difference in EI-index between wave 1 and wave 4 (EIGAIN).

Results

We report the descriptive statistics, graphs of key variables for PL and SD courses and regression models respectively.

Table 3 descriptive statistics for key variables

Wave	1		2		3		4	
	M	**StD**	**M**	**StD**	**M**	**StD**	**M**	**StD**
Age category	2.05	1.57	1.80	1.18	1.90	1.19	1.87	1.19
Gender	0.49	0.50	0.49	0.50	0.54	0.50	0.55	0.50
Subject	0.52	0.50	0.54	0.50	0.52	0.50	0.52	0.50
Program	0.29	0.46	0.21	0.41	0.25	0.43	0.23	0.43
SUPPORT			4.77	0.45	4.68	0.39	4.66	0.45
NETWORK			3.39	0.34	3.46	0.36	3.43	0.33
DEVELOPMENT	4.87	1.48	5.74	1.05	6.48	0.79	6.84	0.87
TRUST	6.69	1.61			7.13	1.54	7.19	1.85
E	5.42	3.65	6.00	3.74	5.90	3.73	5.40	3.42

I	10.86	7.09	11.28	7.46	7.59	5.36	5.33	4.65
EI-index	-0.25	0.46	-0.24	0.41	-0.05	0.44	0.08	0.49

M=Mean, StD=Standard Deviation

Descriptive statistics are presented in Table 3. The first four lines refer to contextual variables. As expected, these should not change that much over subsequent waves. The only influence is the influence of non-response as presented in Table 2. The only difference over time that might have some influence, because of our distinctive focus on PL and SD, is that SD responses were somewhat lower than PL, which explains that initial values dropped towards 0. The same can be said about the higher age category: as SD students tended to be slightly older, the mean age is lower for later waves. The SUPPORT scale is quite constant over the three relevant waves (0.11 difference between min and max), suggesting that SUPPORT is quite trait-like. With a difference of 0.07 between minimum and maximum for NETWORK, the same can be said about network intentionality.

RQ1: Are certain network characteristics (such as network homophily, network intentionality, peer trust and views on support) significantly associated with the growth in perceived self-efficacy of these pre-service teachers?

As the scales TRUST, NETWORK and SUPPORT seem quite constant, a repeated measures ANOVA was only used to examine DEVELOPMENT, E, I and the EI-index. Figure 1 presents profile plots for these four variables. Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, $\chi^2(5) = 40.493$, $p < 0.0001$, and therefore, a Greenhouse-Geisser correction was used. A repeated measures ANOVA with a Greenhouse-Geisser correction determined that mean CRP concentration differed statistically significantly between time points ($F(1.900, 77.925) = 21.032$, $p<0.001$). Post hoc tests using the Bonferroni correction revealed that DEVELOPMENT increased significantly over all the waves.
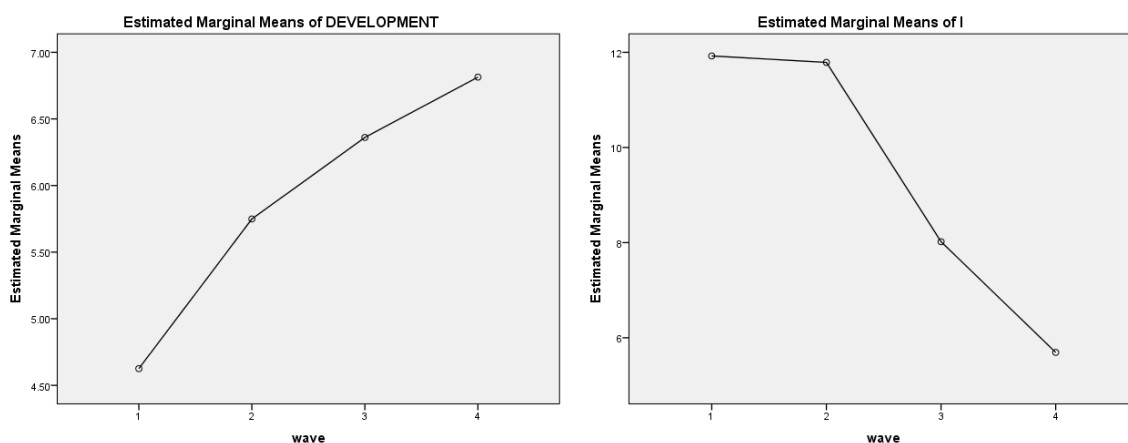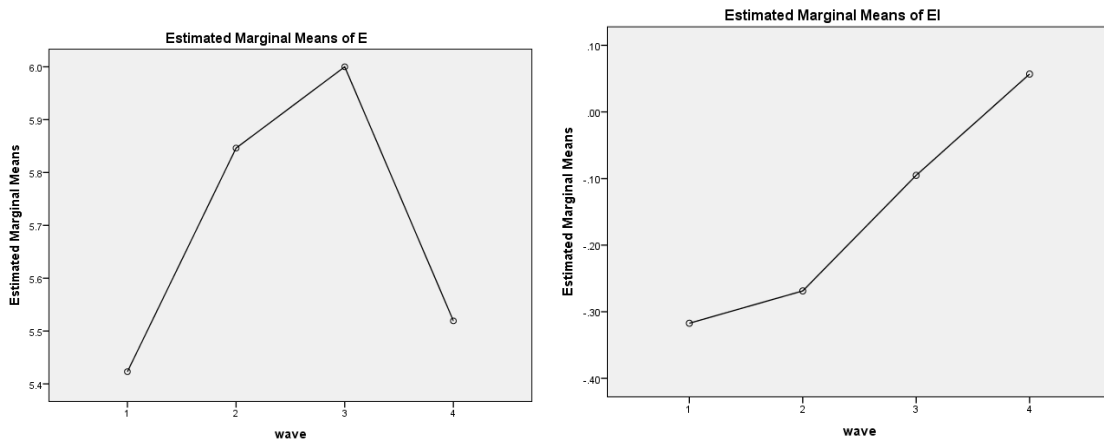
Figure 1: Profile plots for DEVELOPMENT, I, E and EI-index

A similar analysis for the network measures showed that all of them did not meet Mauchly's Test of Sphericity, hence a Greenhouse-Geisser correction was used for all of them. E did not yield significant differences, $F(2.351, 119.884)=.908$, $p=.419$, where I and the EI-index were significantly different over the waves ($F(2.521, 128.578)=22.238$, $p<.001$ and $F(2.389, 119.467)=17.589$, $p<.001$. Post hoc tests using the Bonferroni correction showed that both for I and the EI-index only the step from wave 1 to wave 2 was not significant. From our analyses of the descriptives over time it seems the most appropriate to focus on the variables DEVELOPMENT, I, E and EI-index.
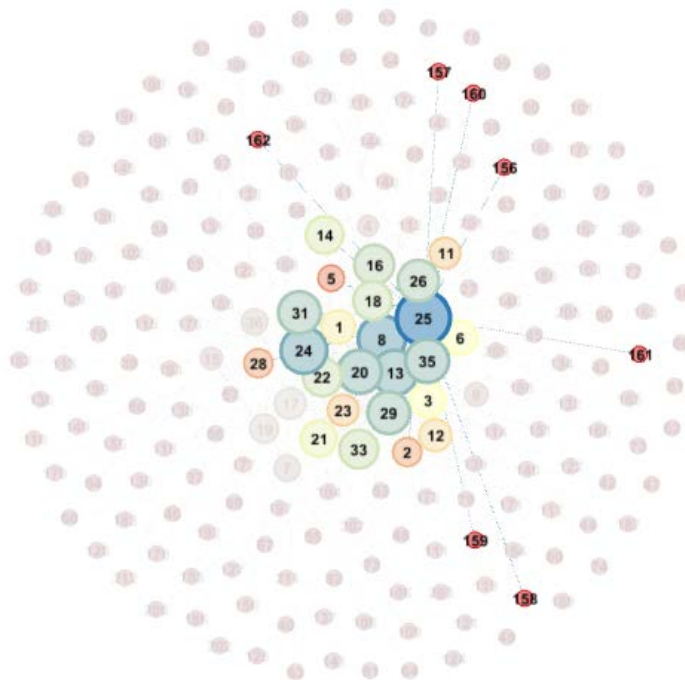

Figure 2: Sociogram highlighting the support ego-network for a trainee mathematics teacher (participant 25) at wave 3. This teacher has a network relatively high homophily indicated by the high number of ties to peers (fellow trainee teachers) in the support network, compared to ties to external alters (coloured red).

RQ2: How do the support networks of trainee teachers vary between Provider Led (PL) and School Direct (SD) programmes?

Having sketched the general picture of the complete sample we can focus on the differences between Provider Led (PL) and School Direct (SD). We will fist do this by presenting graphs of key variables over the four waves. By including error bars we can also see whether there are significant differences between both groups. In all cases it is good to remember that the SD group is relatively small compared with the PL group, partly caused by attrition (see Table 2). Figure 3 shows how DEVELOPMENT grew over time. 95% CI error bars are included. It can be seen that both groups PL and SD start off quite different, with SD having a higher perception of self-efficacy. In wave 2, the difference becomes non-significant because PL grows quicker, only to become significant again in wave 3 when SD grows quicker, to both end fairly equally in wave 4. We have not included similar graphs for SUPPORT, NETWORK and TRUST, as like in the analysis with the full group, for both PL and SD they showed a constant, almost trait-like, behaviour.
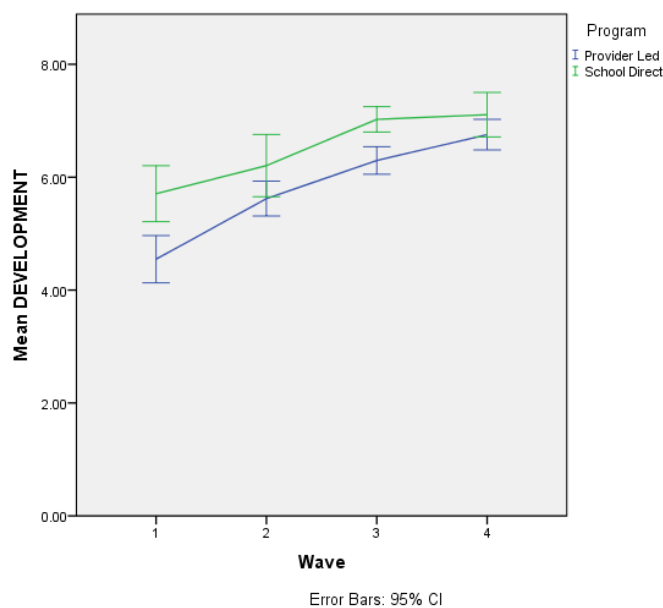

Figure 3: Development of perception of self-efficacy (DEVELOPMENT)

Figure 4 shows the development of I, E and the EI-index respectively, for Provider Led in blue and School Direct in green. It can be seen that internal network links start off significantly higher for PL than SD, to then decrease to a non-significant difference in wave 4. External links are more equal with SD decreasing throughout the waves and PL first increasing, to being significantly different from SD in wave 3, and then decreasing again. As the EI-index is calculated from I and E its development could be predicted: it starts negative for PL but increases steadily, while SD starts significantly higher but after decreases and then increasing again to end higher than PL. However, at wave 4 SD and PL's EI-index are not significantly different.
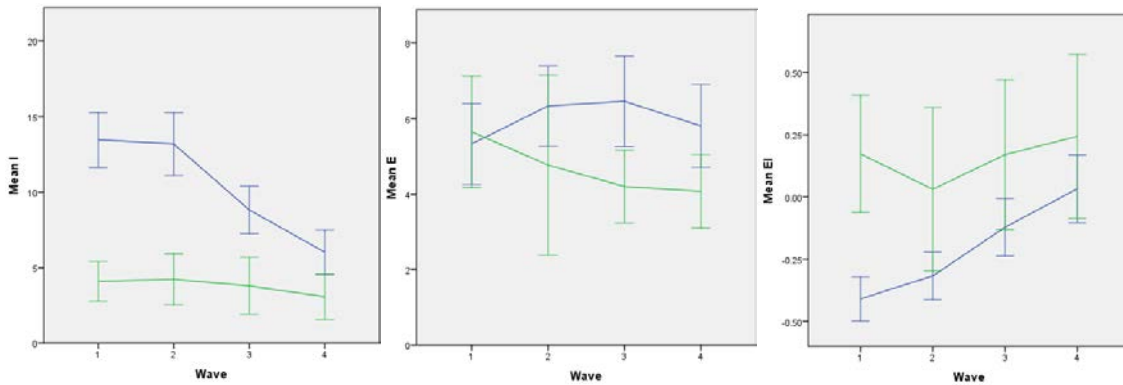
Figure 4 development of I, E and EI-index for PL and SD

Finally, we studied the influence of all independent variables on the dependent variable DEVELOPMENT. As we wanted to know the influence on the final perceived level of self-efficacy we chose the value of DEVELOPMENT for wave 4 as more precise variable. As TRUST, NETWORK and SUPPORT were fairly constant we decided to treat them as such over time. The development of the peer network (I) and wider network (E) changed over time, and therefore we chose to represent the network evolution as the gain in total network (I+E) from wave 1 to wave 4, and the gain of the EI-index from wave 1 to wave 4. These newly created variables are called NETWORKGAIN and EIGAIN respectively.

Table 4 coefficients for multiple regression

		B	SE B	β	
Step 1					
1	(Constant)	2.574	1.361		
	SUPPORT	.750	.252	.392	**
	NETWORK	.126	.382	.047	
	TRUST	.045	.063	.095	
Step 2					
2	(Constant)	2.202	1.314		
	SUPPORT	.768	.243	.402	**
	NETWORK	.198	.364	.074	
	TRUST	.019	.062	.040	
	NETWORKGAIN	-.038	.014	-.347	*
	EIGAIN	-.030	.222	-.018	

Note: $R^2 = .34$ for Step 1, $\Delta R^2 = .33$ for Step 2 ($p < .05$). *$p<.05$ ** $p < .01$.

The model shows that SUPPORT is a significant positive predictor for self-perceived DEVELOPMENT while NETWORKGAIN is a negative predictor. Regarding the network gain, Figure 4 had already shown us that in particular the internal links, the peer network, changed considerably for PL, compared to SD.

Conclusions and discussion

In this paper we set out to answer whether certain network characteristics might be significantly associated with the growth in perceived self-efficacy of these pre-service teachers, and whether there were differences between Provider Led (PL) and School Direct (SD). An analysis of the variables showed that for all the trainees in the study over the four waves views on support (SUPPORT), network intentionality (NETWORK) and peer trust (TRUST) were quite trait-like and did not change much. As one might expect from Initial Teacher Education, the self-perceived self-efficacy (DEVELOPMENT) increased significantly over the four waves. With regard to the development of network ties, trainees did not develop significantly less or external ties, but they did lose internal ties and subsequently an increased EI-index . These changes, however, did only set in after wave 2. This can partly be explained by the structure of the current ITE programs, but we suspected there might be differences between PL and SD. Upon exploring these differences several differences between SD and PD could be observed.

Firstly, self-perceived efficacy as represented by DEVELOPMENT between the two groups SD and PL differed: SD starts out higher, but PL increases more from wave 1 to 4. We hypothesise that this might be caused by the fact that SD students, on average, are older than PL students, and therefore have more confidence. However, although SD students almost immediately go into the classroom, their self-perceived development grows slower than PL. When looking at the nature of their networks SD's EI-index starts relatively high and stays that way, indicating an initially more heterophilic network than PL. PL's EI-index starts negative, indicating homophily, but over time increases to slightly over 0. We see this as indication that PL students start off with a more homogeneous group of ties but that after starting school placements, the role of the peer network is slowly replaced by the wider network, with a core of peer ties remaining. This would make sense, as the school placements give the PL students exactly this wider network. Within the change in EI-index it is not the external ties that change significantly but especially the internal ties (I): Figure 4 showed that for PL that number started high and then decreased over time, leading to a non-significant difference. PL seems to provide a 'peer effect'. The change in I, and so NETWORKGAIN, seems to be a significant predictor for this development. But the direction of this is surprising if we recollect the evidencing on 'growing networks': it is the decrease in network size, a negative NETWORKGAIN, that is a significant predictor. Here it is pertinent to think about causality, though. Given the previous evidence base, it does not seem logical to assume that reducing one's (internal) peer network leads to improved self-perceived DEVELOPMENT. Rather, the reduction in peer network might be a result of with an increased perception of self-efficacy. A tentative exploration with NETWORKGAIN as the dependent variable and DEVELOPMENT in wave 4 as an independent variable seems to confirm this. This causal aspect might be explored in further research with some Structural Equation Modelling. As SUPPORT, a more trait-like feature, was a significant predictor of self-perceived DEVELOPMENT, it might be hypothesised that changing (views on) support help PL students more with their development. This, however, is something that would need to study further. Especially, the temporal aspect should be explored more. For instance, for every step in time, from wave to wave, the roles of peer and wider support, as well as the type of support, might influence the development of trainees. All in all, it is clear that although the two courses provide *different* peer opportunities, there are no differences in self-perceived development, in the end.

We have made several assumptions in this study which can be construed as limitations. As SUPPORT, NETWORK and TRUST seemed fairly constant over the waves we have taken this to be a sign of a *trait-like* characteristics. Although this might have been the case in this study, theoretically it seems

probable that these characteristics also develop over time. There is a reciprocal relationship between these characteristics: an increase in (positive) thoughts about support might have an influence on network intentionality, and it is not improbable that trust influences network intentionality. Actually, upon running some quick correlational analyses for the scales SUPPORT, NETWORK and TRUST for wave 4, there were significant correlation between SUPPORT and NETWORK ($r=.343$, $p<.01$) and NETWORK and TRUST ($r=.394$, $p<.01$) but not SUPPORT and TRUST ($r=.047$, $p=.722$). We have already mentioned that the progression of many of the variables seemed to be influenced by the structure of the programs and, of course, participant characteristics. For example, SD start off teaching much quicker than PL and it might be expected that the peer network will be less developed, leading to a lower I. However, after PL goes into school, their internal ties also decrease. Also, the experience of "reality shock" for trainees (Veenman, 1984) might have strong effects on the development of their network(s). These features of the program could be a confounding factor. But this also brings us to another major assumption the study: our definition of internal and external ties. We assumed 'peers' to only be students in the same program, but perhaps, for PL, university mentors should be seen as 'internal' as well. After all, they form part of the organisational unit 'Provider Led'. Another restriction is that we used the perceived self-efficacy. Trainees are also observed formally, based on OfSTED criteria. This may be seen as a more 'objective' measure of teaching quality than self-perceived DEVELOPMENT. Therefore, in future statistical models we could use these as dependent variable. In addition, more sophisticated models might partition wave and student variance. Finally, as *network change* seems to be a significant predictor of (self-perceived) self-efficacy it would be pertinent to study the development of network measures over time in more detail, for example by using Social Network Analysis. In future research we will further unpick the different support roles internal and external ties have. For instance, ties can be useful in providing materials and literature, while other ties might be more useful for moral support. This article has tried to shed light on the development of trainees' networks over four time points.

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Scales

Self-efficacy (DEVELOPMENT), 9-point Likert type response scale (1=not at all, 9=always)

Classroom management

- How well can you establish a classroom management system with each group of students?
- How much can you do to get children to follow classroom rules?
- How much can you calm a student who is disruptive or noisy?
- How much can you control disruptive behaviour in the classroom?
- To what extent can you use a variety of assessment strategies?

Student motivation

- How much can you motivate students who show low interest in school work?
- How much can you help your students value learning?
- How much can you get students to believe they can do well in school work?
- To what extent can you craft good questions for your students?

Instructional strategies

- How much can you assist families in helping their children do well in school?
- How well can you provide an alternative explanation or example when students are confused?
- How well can you implement alternative teaching strategies in your classroom?

Peer trust (TRUST), 9-point Likert type response scale (1 =very strongly disagree, 9 = very strongly agree)

- Even in difficult situations, I can depend on my fellow trainees
- I can always count on my fellow trainees.
- I trust my fellow trainees.
- I find that my fellow trainees are open to me.
- I really care about my fellow trainees.
- I also share personal information with my fellow trainees.

Support (SUPPORT), 6-point Likert type response scale (1=strongly disagree, 6=strongly agree)

- Asking for help with problems is a good way to learn
- Asking for help can lead to even more work
- Asking for help can be seen as a sign of weakness
- Getting expert advice helps one become a better teacher
- It is better not to show that you have a problem
- Asking for help is worthwhile if it saves effort and bother
- Seeking help is a way to acquire new knowledge and skills
- If you ask for help others might think you're incompetent
- Asking for help is okay if people provide a solution
- It is better to ask for help than continue having difficulty
- It is embarrassing to show that one is having difficulty
- It is often simpler to keep having problems than to ask for help

- Consulting about problems makes work more interesting

Network intentionality (NETWORK), 5-point Likert type response scale (1=strongly disagree, 5=strongly agree)

- I attempt to connect to people who are prominent or central in the course/at school
- I periodically evaluate the nature of my connections and networks within the course/at school
- Having the right set of relationships and connections with others can be useful in helping me teach better
- I will discontinue professional relationships if they are not helpful
- I derive energy from my network of professional contacts
- Having the right set of relationships and connections with others on my course/teachers can be useful for my general happiness
- I actively plan out what I want my network to look like
- I like to be a source of advice and counsel for many others
- In the past, I have consciously chosen to wind down or distance myself from a professional relationship
- I can sometimes be worried about my network of contacts
- Having the right set of relationships and connections with other trainees/teachers can be useful in helping me put forth and champion ideas for change
- I make assessments about who would be useful to have as an ally and who wouldn't
- I like to have many others to turn to for advice and assistance
- When I perceive a professional relationship as no longer beneficial for me, I tend to limit my time fostering or trying to grow that relationship
- I feel stressed when I think about the number of people I have to catch up with or make plans to see
- Having the right set of relationships and connections with other trainees/staff at the school can make me influential within the group
- I actively search out new relationships with people who can help me improve my teaching
- I like to be the major point of connection between others on my course/at my school
- When I finish the course I will no longer stay in contact with my fellow trainees
- I am enthusiastic about my network of contacts
- I actively seek out professional relationships beyond the course/school
- I like to put people in touch with the right person when they need something