

## **Collaborative and innovative climates in pre-service teacher programs: the role of social capital.**

**Mireia Civis, Blanquerna - Universitat Ramon Llull, Barcelona, Spain**

**Jordi Díaz-Gibson, Blanquerna - Universitat Ramon Llull, Barcelona, Spain**

**Susana López, Blanquerna - Universitat Ramon Llull, Barcelona, Spain**

**Nienke Moolenaar, Utrecht University, Utrecht, Holland**

### **Abstract**

While the value of social capital for teaching seems paramount, a crucial question is how to shape the necessary learning climate that allows beginning pre-service teachers to build and access such social capital. A total of 321 pre-service teachers from Barcelona participated in a survey including social network questions, climate scales, and performance data.

Findings reveal a significant relationship between pre-service teachers' social capital and performance as well as professional competence. Also, results show that a collaborative and innovative climate is positively related to pre-service teachers' performance and professional competence as mediated through student's social capital. Thus, social capital plays a mediating role by explaining the relationship between a supportive learning climate in internship schools and pre-service teachers' performance.

**Keywords:** social capital, pre-service teachers, mediator variable, social networks, collaboration, innovation.

### **1.- Introduction**

Scholars and practitioners around the world are calling to intensify efforts at supporting pre-service teachers (PSTs)' learning. Reasons for this call include an alarming rate of beginning teacher attrition within the first five years of service (17% in the U.S.) and signals of insufficient teacher preparation (Landmann, 2013; Vaillant, 2011). This call for increased attention to PST training has been characterized by a focus on formal, as well as informal ways to support PST learning. Formal, more 'technical' ways, aim at supporting PSTs' human capital (e.g., knowledge of instructional strategies and innovative teaching tools), while informal supports contribute to teachers' access of social capital (i.e., the resources embedded in social networks which can be accessed or mobilized across the network through a purposive action (Lin, 1999) to further develop their knowledge and skills).

This social side of teaching has gained incremental scholarly attention in the last years (Liou et al., 2016; Cornelissen et al., 2015; Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hofman, 2012). These studies focus on PSTs' training programs as a crucial context where PSTs acquire an important set of competences that will support their future performance and development. Recent studies show that PSTs perform better (academic achievement and self-efficacy) when they have access to social capital, meaning, when their social networks facilitate access to resources, such as instructional materials, information and emotional support (Klassen, Perry, & Frenzel, 2012; López, Civís, & Díaz-Gibson, 2017). This suggests that PSTs training programs, both at teacher training institutes and universities as well as at in-school placements, need to uncover what type of learning climate is needed to support

the development of PSTs' social capital. To this end, we focus on the role of internship schools' collaborative and innovative climates in shaping PSTs' opportunities to accrue social capital, which will ultimately affect their success.

Social capital theory has usually been used in educational literature to explain academic or professional achievement (Hommes et al., 2012; Mayer & Puller, 2008; Rizzuto, LeDoux, & Hatala, 2009; Smith & Peterson, 2007; Yuan, Gay, & Hembrooke, 2006; Gasevic, Zouaq, & Janzen, 2013). However, most of the studies have focused on investigating the direct impact of social capital while there are less studies that examine their mediating role as it is done in other fields such in economics or health (Daud & Yusoff, 2010; Li, 2012; Woolcock & Narayan, 2000). Therefore, this paper aims to explore the mediating role of social capital in PSTs performance.

## 2.- Theoretical Framework

### 2.1.- Learning climate: innovation and collaboration

In the light of the fact that educational systems need well-trained and well-prepared teachers, targeting on good PSTs is a strategy that makes this enterprise achievable. Consequently, there is a need to study factors that affect PSTs' academic achievement (grade point average) and professional performance (practicum grade and self-efficacy). The number of studies on teacher training has risen in recent years (Prats, 2016; Esteban & Mellen, 2016; Vaillant, 2011; Imbernon, 2015; Eurydice, 2013) and the point of convergence between teacher training and schools' needs often lies in teachers' competences. In this regard, there has been an increasing interest in better understanding how university programs can support PSTs by shaping supportive climates (Daly, Moolenaar, Bolivar, & Burke, 2010; Forbes & Billet, 2012; Liou & Daly, 2016; OECD, 2013).

Learning climate becomes crucial to enhance PSTs' social capital in support of their professional development (Daly, Moolenaar, Der-Martirosian, & Liou, 2014; Cosner, 2009; Bryk & Schneider, 2002). Research argues that two climate conditions may play a role in supporting PSTs' relationships and performance, namely 1) collaborative climate characterized by high levels of trust, and 2) innovative climate characterized by a safe environment in which PSTs are willing to take risks to improve education. The collaborative perspective encourages a sense of community in which trusting relationships between and among PSTs is generated and supported (Dinsmore & Wenger, 2006; Liou et al, 2016). Thus, peer social support could help manage individual pressures for new future teachers (Ewing & Manuel, 2005; Stauffer & Mason, 2013) being social interaction with peers one of the critical factor for facilitating learning processes (Gasevic et al., 2013). Additionally, the emotions generated thanks to this interactions also constitute teacher identities through discourses, practices, and performance (Zembylas, 2003). Hence, for the PSTs' preparation it will be essential everything that helps to create learning environments, a work exchange and experimentation, as well as a cooperative culture based on social and academic support and the opportunity to develop themselves with more efficacy (Liou et al., 2016). A number of studies suggest the importance of professional and social relationships for PSTs in achieving teaching and learning success (Baldwin, Bedell, & Johnson, 1997; Bloomfield, 2010; Hommes et al., 2012; Rizzuto et al., 2009).

Educational innovation can be understood as a series of interventions, decisions and processes, with a certain degree of intentionality and systematization, with the aim to modify attitudes, ideas, cultures, contents, models and pedagogical practices (Carbonell, 2001; Fullan, 2010). It also involves the introduction of new projects and programs, curricular materials, teaching and learning strategies, didactic models and other ways of organizing and managing the curriculum, the school and the dynamics of the classroom (Carbonell, 2001; Leadbeater, 2012). Foray & Raffo (2012) define educational innovation as the act of creating and disseminating new educational tools, teaching practices, organizational systems and technologies in order to improve quality and productivity in education. Hence, educational innovation refers to the overall process, from the development of new ideas to the implementation of new actions and projects and has become a clear priority worldwide as a result of the need to adapt educational structures and professional skills to the present world (Hargreaves, Lieberman, Fullan & Hopkins, 2010).

Also, innovation climate is regarded as a social process in which social interaction provides multiple opportunities for input and refinement (Calantone, Garcia, & Droge, 2003; Nohari & Gulati, 1996). Communication, sharing ideas, and focusing on larger organizational goals are critical for a collaborative orientation towards innovation (Frank, Zhao, & Borman, 2004), taking into account the emotional conditions needed to implement it (Kelchtermans, 2005). Teachers usually undergo emotional struggles with demands for change regarding their professional hesitations about these demands, feeling vulnerable (Kelchtermans, 2005). This suggests that a social process underlies the development of an innovative climate (Paavola, Lipponen, & Hakkarainen, 2004), in which the combination of different people, knowledge, and resources must trigger the generation of new ideas and practices (Kogut & Zander, 1992).

The combination of both collaboration and innovation leads to the so called concept of Collaborative Innovation (Torfing & Díaz-Gibson, 2016). In the context of PSTs we define a Collaborative Innovation Climate as the scenery and conditions regarding the practices, procedures, and behaviors within the program that promote the generation of new knowledge and practices. Central to this definition are PSTs' perceptions around individual and collective trust, and the collective willingness to adopt an open orientation toward new practices and change (Moolenaar, Daly, & Slegers, 2011) thanks to their commitment with education (Kelchtermans, 2005).

Given the multi-layered complexity of these related variables and the point that climate is likely influencing PSTs' achievement in a more indirect way, in this paper we argue that it is social capital (through peer social networks) that mediates and explains the extent to which learning climate support PSTs' success. Hence, research supports that learning climate is one of the key players responsible to increase PSTs' social capital by promoting a collaborative environment, based on trust, so as an orientation to innovation from a practical standpoint (Paavola et al., 2004; Sorensen & Torfing, 2011; Stoll, Bolam, McMahon, Wallace, & Thomas 2006).

## **2.2.- Social networks of pre-service teachers**

Social capital is generally defined as the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit (Nahapiet & Ghoshal, 1998). Therefore, this perspective moves from a primary focus on the individual and the attributes of an actor to the more dynamic supports and constraints of the social structure (Borgatti & Foster, 2003; Cross, Borgatti, & Parker, 2002; Wellman & Berkowitz, 1998). Networks are typically identified by the content that is exchanged between actors or transferred through the social ties, such as knowledge, information or expertise; those linkages form a structure of relationships and can facilitate or inhibit access to social capital (Lin, 2001; Scott, 2000; Wasserman & Faust, 1998). In many cases, the underlying social structure determine the type, access, and flow of resources to actors in the network leading. The balance of scholarship suggests the necessity to better understand the interconnected networks of relations that may facilitate or inhibit the exchange of resources related to organizational change.

Social network inquiries in the sphere of education have covered a wide range of topics including: school, teacher and policy networks (Coburn & Russell, 2008; Frank et al., 2004; Penuel, Frank, & Krause, 2006; Spillane, 2006); support teacher professional development networks (Baker-Doyle, 2008); networks in reform (Daly & Finnigan, 2010; Cole & Weinbaum, 2010); innovation and trust networks (Atteberry & Bryk, 2009; Moolenaar et al., 2011) leadership networks (Daly & Finnigan, 2012) and PST networks (Çelik & Ekinci, 2012; Civís, López, & Díaz-Gibson, 2017; Daly et al., 2014; Liou et al., 2016; Penuel, Sun, Frank, & Gallagher, 2012), among others. Overall this work suggests the dynamic interplay between formal and informal structures in the change process, providing insights into how social ties may support or constrain efforts at change in a variety of contexts at different levels in the educational system.

Explicitly, in the area of teacher training and PSTs, literature discloses that networks governed by cooperation, collaboration, sharing and exchange among PSTs are central to professional development (Çelik & Ekinci, 2012; Civís et al., 2017; Daly, Moolenaar, Der-Martirosian, & Liou, 2014; Liou et al., 2016; Penuel et al., 2012). However, while there is a theoretical agreement about the importance of social capital not only in education but also in PSTs,

literature also express a lack of empirical studies (Daly & Finnigan, 2012; Dika & Singh, 2002; Liou et al., 2016) that are decisive for improving teacher training programs.

The acknowledgement of PSTs social networks, besides being a part of them, becomes fundamental to access pedagogical resources and being successful (Civís et al., 2017). Thereupon, this also becomes critical to teacher training by giving access to understanding better the pattern of social ties that exist between actors -teachers- in a social network and what support or constrain the access of the resources (Lin, 2001; Liou et al., 2016; Smethem, 2007; Wasserman & Faust, 1998).

Hence, more social capital means better teacher performance -self efficacy and effectiveness- (Dika & Singh, 2002; Liou et al., 2016; Smethem, 2007) and research suggests the importance of teacher collaboration networks in building teacher capacity and student achievement (Daly & Finnigan, 2010; Moolenaar, Daly, & Slegers, 2010; Penuel, Riel, Krause, & Frank, 2009). Moreover, studies on teacher collaboration highlight the role of educators' interactions in improving the quality and effectiveness of teaching practices and school organizations (Goddard, Goddard, & Tschannen-Moran, 2007; Moolenaar et al., 2011; Yasumoto, Uekawa, & Bidwell, 2001), leaving aside the idea of teacher isolation (Baumard & Starbuck, 2005; Collinson & Cook, 2004; Lieberman, 2000).

On the other side, recent studies show that network centrality may be a predictor of PST' academic success, and specifically being a new ideas giver (López et al. 2017). Several studies highlight the positive association between social ties and academic performance (Hommes et al., 2012; Mayer & Puller, 2008; Rizzuto et al., 2009; Smith & Peterson, 2007; Yuan et al., 2006) and the importance of degree centrality in academic performance (Gasevic et al., 2013). Moreover, the relationship between different ties and networks, known as multiplexity, can also help to understand the strength the interaction of exchanges can bring to the whole network. That occurs when multiple types of relationships overlap within the same set of actors (Doreian, 1974; Bliemel, McCarthy, & Maine, 2014), something usual within a group of people.

Besides, literature shows that social capital may play a mediating role in diverse fields as the economical (Woolcock & Narayan, 2000), financial (Blasco, Navas, & López, 2010; Daud & Yusoff, 2010), sociological (Karlsdotter, Martín, & López del Amo, 2011; Lai, 2013), and also in the educational. In this sense, some studies focus on the mediating role of social capital involving educational equity and educational achievement (Dika, 2003; Poonpol, 2017), or school continuation (Borgonovi & Pokropek, 2016; Teachman, Paasch, & Carve, 1997), between organizational leadership and organizational learning (Golmoradi & Ardabili, 2016), or interorganizational relationships and entrepreneurship attitudes (Bojica, Arroyo, & Fuentes, 2012; Portes, 1998). However, there is a lack of research on the mediating role of social capital in PST training and their professional development.

In this regard, previous studies done by the authors (López et al., 2017) shed some light on emerging teaching models that are based on team teaching, co-teaching, collaborative teaching or educational collaborative networks as models where more knowledge is shared and built. Consequently an implication was for reform programmes to increase social capital also by promoting a collaborative innovation environment. Although, more research needs to be done to understand the role that social capital can play as a mediator between a collaborative innovation climate and PSTs' professional development.

As such, our study is guided by the following hypotheses:

H1: A pre-service teachers learning climate involving collaboration and innovation is positively related to academic achievement (grade point average) and professional competences (practicum grade and self-efficacy).

H2: Centrality measures in pre-service teachers' social networks, as an indicator of greater social capital, are positively related to academic achievement (grade point average) and professional competences (practicum grade and self-efficacy).

H3: Social capital of pre-service teachers is a mediator variable between learning climate and their academic achievement (grade point average) and professional competences (practicum grade and self-efficacy).

### 3.- Methodology

#### 3.1.- Data collection

##### 3.1.1.- Context

Catalonia has recently been undergoing different educational changes in schools and universities, with a strong impetus from civil society and families. Carbonell (2016) refers to as the third educational spring, characterized by a push to spur the process of educational change by scaling up successful smaller-scale educational projects (e.g., 'Escola nova 21' project, the Network of Innovative Secondary Schools or the Eines per al Canvi (Tools for Change) programme) to a larger number of schools.

This results in pedagogical trends that encompass comprehensive competency-based approaches, greater interaction between students groups of different ages, problem-based learning, flipped classroom methodologies, collaborative group work, greater student autonomy allowing them to make learning choices freely and globalised places designed to respond to this diversity (Díaz et al., 2019). On the other hand, these schools are having strong leaderships that help teachers feel empowered by promoting team-work and co-teaching.

Within this context, the Agency for the Quality of the University System of Catalonia (AQU) started on 2014 the Programme of Improvement and Innovation in Teacher Training (MIF). This programme has supported several studies on teacher training programs, carried out by teams of university professors and school teachers, like the one we are presenting. The program is very committed with innovation being aware that is fundamental that new teachers brings it to schools. At the moment, the different projects developed within the program have good results regarding PST' attitudes towards innovation (Programa MIF, 2018).

In Catalonia (Spain), where this study takes place, there are two teacher training grades: Preschool Education Teacher Training Programme and Primary Education Teacher Training Programme. These grades are taught at 8 teacher training schools, of which on average 2500 students graduate each year. Both programs take 4 years and include part training at a University and part in-school placement as a teacher intern at a local preschool or primary school (on average, 24 weeks).

##### 3.1.2.- Sample

This study took place at the Ramon Llull University-FPCEE Blanquerna in Barcelona, Catalonia (Spain). A total of 321 PSTs participated in an online questionnaire. The PSTs were enrolled full time in Teacher Training Preschool Education Program (N = 158) or Teacher Training Primary Education Program (N = 163). The voluntary survey was administered during the 4th grade training program when they did their internships at the school. The students were grouped in cohorts/classes of about 60 students, and cohorts remain stable throughout the period of 4 years, favouring different types of social interaction while completing the program. Average attrition in these programs is about 4% each year. The response rate of the questionnaire was 80%, 277 PSTs (86%) were female and 44 (14%) were males, a common percentage in these undergraduate studies.

##### 3.1.3.- Instruments

*Dependent variables.* We assessed PSTs' performance by two variables, namely academic achievement (grade point average) and professional performance (practicum grade and self-efficacy).

*Academic achievement* was measured by Grade Point Average (GPA), reflecting the average value of the accumulated final grade earned in courses over time. It is calculated as the sum of all accumulated final grades divided by the number of grades awarded. It ranges from 0.0 to a 4.0.

*Professional performance* was assessed using two variables, namely a practicum grade and self-efficacy. The practicum grade is the score they get after following a practicum involving school practices and reflections at the university throughout the 4th year. This score ranged from 0.0 to 10.0. GPA and practicum scores were obtained

after the PSTs ended the program (June 2015). Finally, we assessed PST performance by measuring PSTs self-efficacy. Self-efficacy refers to the confidence of the students on their ability to achieve intended results in the school context. It is measured by a self-report scale designed by Liou et al. (2016), based on the work by Tschannen-Moran & Hoy (2001). This scale has been translated and adapted to the context of this study. The perception of self-efficacy was ranged from 1 (not at all) to 9 (totally).

*Independent variables.* We assessed the learning climate by two variables, namely Innovation orientation (Collective and Individual innovation orientation) and Trust (Collective and Individual trust) The scale ranged from 1 (not at all) to 9 (totally). The items and factor loadings of collective and individual innovation are summarized in Table 1.

*Innovation orientation.* We assessed PSTs' innovation orientation by using two scales related to the individual and collective perspective on innovation. The scales were designed by the Chicago Consortium on Public Schools (2008). They involve the will to try and develop new ideas and the desire to acquire new knowledge even though it seems risky. The scale 'Individual innovation' measures self-perception of a student's own innovation orientation. The scale 'Collective innovation' assesses a student's perception of the group's orientation to innovation.

*Trust.* We assessed PSTs' trust by using two scales related to the individual and collective perspective on trust. These scales were originally designed by Liou et al. (2016) and based on the work by Tschannen-Moran (2004) and Daly & Chrispeels (2008). The scale 'Individual trust' assesses students' perception of their own trust towards their peers. The scale 'collective trust' measures students' perceptions of the level of trust in the program, among peers and instructors.

*Mediating variables.* We used a social network survey based on previous research (Liou et al., 2016). We translated and adapted this survey to our university context. Social network literature makes a distinction between instrumental and expressive networks (Borgatti & Foster, 2003; Ibarra, 1993; Lin, 1982; Lincoln & Miller, 1979). Instrumental networks are related to work role and academic performance, involving the exchange of information, knowledge, advice and instructional material resources. In contrast, expressive networks are focused on the transfer of personal, affective, and emotional resources such as friendship and the need to vent frustrations or worries. Therefore, in this study, we use two instrumental networks questions ("From whom do you seek *advice* regarding improving your practice" and "From whom do you seek *new ideas* regarding teaching") and one expressive network question ("to whom you turn to when you *need to vent*"). Respondents could name cohort members to whom they turn for these relational resource and the frequency of that interaction (with 1="once per month" and 4 ="once or twice per week").

Table 1. Factor loadings for innovative and trust scales

Items	Factor loading
<i>Students' Orientation to Innovation ( <math>\alpha</math> = .89)</i>	
1. Students are willing to take risks to improve the quality of their learning	.87
2. Students are generally willing to try new ideas	.87
3. Students have a positive 'can-do' attitude	.87
4. Students are encouraged to go as far as they can	.88
5. Students are continually learning and developing new ideas	.87

6. Students are constantly trying to improve their teaching	.86
7. A big part of the students are involved in trying new ideas	.89
8. Students have professional support for developing innovations	.90
9. Students are really excited about new learning	.88
10. Students always give their best to implement new ideas	.87
<i>Individual Orientation to Innovation ( <math>\alpha=.78</math> )</i>	
1. I am willing to take risks to improve the quality of my learning	.75
2. I am generally willing to try new ideas	.74
3. I have a positive 'can-do' attitude	.76
4. I am encouraged to go as far as I can	.75
5. I am continually learning and developing new ideas	.73
6. I am constantly trying to improve my teaching	.75
7. A big part of the my colleagues are involved in trying new ideas	.81
8. I have the professional support for developing new ideas	.79
9. I am really excited about new learning	.77
10. I always give my best to implement new ideas	.75
<i>Collective Trust ( <math>\alpha=.91</math> )</i>	
1. Students in this program care about each other.	.90
2. Students in this program typically look out for each other.	.90
3. Students in this program have faith in the integrity of the instructors.	.90
4. Even in difficult situations, students in this program can depend on each other.	.90
5. The instructors in this program typically act in the best interests of the students.	.90
6. Students in this program can rely on the instructors.	.91
7. Students in this program trust each other.	.90
8. Students in this program trust the instructors.	.90
9. Students in this program are open with each other.	.90

10. Students in this program can be counted on to do their work.	.91
11. The instructors tell students what is really going on.	.91
12. The instructors of the program show concern for students.	.91
13. Students in this program have faith in the integrity of their colleagues.	.90
14. Students in this program are not suspicious of each other.	.91
15. Students here are not secretive.	.91
16. When Students in this program tell you something you can believe it.	.91
17. Students in this program do their work well.	.91
18. Instructors here believe that students are competent learners.	.90
19. The students in this program are not suspicious of most of the instructors' actions.	.91
20. The instructors in this program is competent in doing their jobs.	.91
21. Students in this program trust their instructors.	.90
<i>Individual Trust ( <math>\alpha=.90</math> )</i>	
1. I trust my classmates	.88
2. Even in difficult situations, I can depend on my classmates	.88
3. I can always count on my classmates	.87
4. I find that my classmates are open to me	.88
5. I also share personal information with my classmates	.88
6. I really care about my classmates	.88
7. I find that my classmates typically look out for me	.90
8. I am not suspicious of my classmates	.90
9. I find that my classmates are honest with me	.88
10. I find that my classmates always keep their word	.91

N=321 PSTs

*Control variables.* Additionally, we collected demographic variables (gender, group) as in earlier research these showed to be important.

### 3.2.- Data Analysis



*Descriptive statistics.* We used descriptive statistics to explore the *PST performance, innovation and trust scales*.

*Social network analysis.* We analyzed students' social capital by calculating the centrality of each student in the cohort network. We used social network software (UCINET 6; Borgatti, Everett, & Freeman, 2005) to calculate various network statistics that reflect the network position of the PSTs in the PSTs cohort at the university. Centrality captures the extent to which an actor occupies an important position in the social network, as a symbol of prestige and visibility (Carolan, 2014). Actors in a central position have the possibility to guide, control and broker the flow of resources within a group (Daly, 2012). In this study, we used some of the most frequently used centrality measures: *Degree centrality* and *Betweenness centrality*, also according to their robustness (Iacobucci, McBride, Popovich, & Rouziou, 2017)

*Degree centrality* is calculated by summing up the number of ties to and from an actor. *In-degree* reflects the number of ties received from others, and as such can be seen as a measure of network popularity. *Out-degree* reflects the number of ties sent to others (Carolan, 2014), and as such can be seen as a measure of network activity. These numbers are subsequently normalized (divided by cohort size) so that centrality scores of students in different cohorts can be compared with each other. The normalized scores are from 0 (an actor with no relationships with the others) to 1 (an actor is connected with all the others actors in the network).

*Betweenness centrality* measures the degree to which other actors lie on the shortest geodesic path between pairs of actors in the network that are not directly linked, also referred to as a 'brokerage' position (Carolan, 2014; Freeman, 1979; Wasserman & Faust, 1998). This measure captures how actors control or mediate the relations between pairs of actors that are not directly connected. This measure was normalized and ranged from 0 (an actor does not occupy any betweenness position) to 1 (an actor is 'in between' all relationships in the network, meaning that actor is the only one connecting all other actors), depending on the possibility for an individual of reaching this position.

*Hypothesis testing.* To test our hypotheses, we conducted a series of correlation analysis and a multiple regression analysis using IBM SPSS. To examine the mediation hypothesis, we followed a procedure as outlined by Preacher & Hayes (2004) consisting of a three-step procedure to examine the social capital of PST as a mediator variable between a learning climate and their academic and professional performance (Figure 1). The formal heuristic analysis is straightforward and follows directly from the definition of a mediator provided by Baron and Kenny (1986), as it is cited by Preacher & Hayes (2004). Following our hypotheses, we first analyzed the relation between a learning climate (trust and innovation orientation) and PST performance through correlation and regression analysis (path c). Second, we analyzed the relation between social capital (outgoing ties, incoming ties and betweenness) and PST performance through correlation and regression analysis (path b). And third, we analyzed the indirect relation between a learning climate and PST performance (path c') through the mediating effect of social capital.

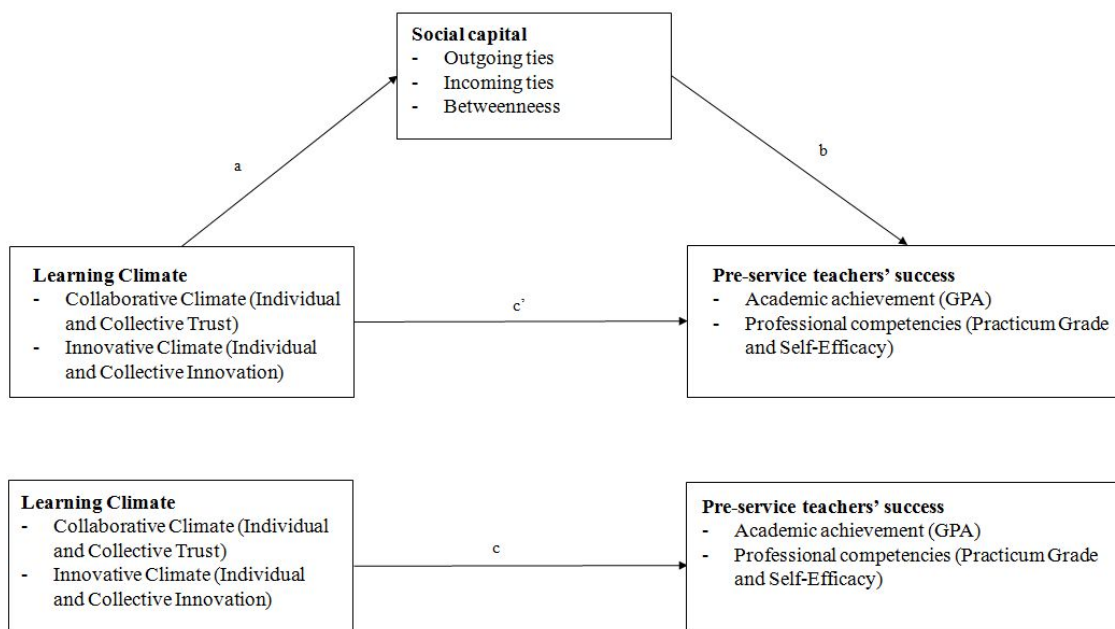


Figure 1. Path diagram

#### 4.- Results

##### 4.1.- Descriptive Statistics

We report the descriptive statistics in Table 2. Related to academic performance, GPA is on average 1.81 (out of 4). Concerning professional competences, Practicum grade is on average around 8 (out of 10) and the Perception of Self-Efficacy is 6.68 (out of 9). Regarding the learning climate, we find that individual innovation is on average the highest aspect of the learning climate with an average of 7.18 (out of 9), followed by collective innovation 6.25 (out of 9) (see Table 2). On the other hand, both individual and collective trust are on average around 6 (out of 9) in the learning climate.

An analysis of PST social networks reflects that teachers indicate to ask for advice to about 25% of their colleagues (advice out-degree and in-degree). Therefore, is the most used network for them. In addition, teachers share educational ideas with about 14% of their peers. Finally, teachers indicate to vent about their work with about 10% of the teachers.

Table 2. Descriptive Statistics

	M	Min	Max	SD
Collective Innovation	6.25	1.30	9	1.25
Individual Innovation	7.18	3.90	9	.94
Collective Trust	6.04	2.71	8.52	1
Individual Trust	6.20	2.20	9	1.36

GPA	1.81	1.18	2.98	.33
Practicum Grade	7.97	4	10	1.21
Self-Efficacy	6.68	3.75	9	1.08
Advice In-Degree	.25	.09	.51	.09
Advice Out-Degree	.25	.00	1	.35
Advice Betweenness	.01	.00	.10	.01
Need to vent In-Degree	.09	.04	.21	.04
Need to vent Out-Degree	.09	.00	1	.23
Need to vent Betweenness	.01	.00	.32	.02
Ideas In-Degree	.14	.06	.34	.07
Ideas Out-Degree	.14	.00	1	.27
Ideas Betweenness	.01	.00	.15	.02

N= 321 PSTs

### Correlation Analysis

#### Learning climate and PSTs' success

Results (see Table 3) suggest a positive correlation between the learning climate variables concerning innovation and trust. Additionally, a positive correlation is found between PSTs' GPA and Practicum grade ( $r=.62$ ,  $p<.01$ ). However, there are no significant correlations between self-efficacy and achievement and performance variables.

To test the first hypothesis (H1), we also explored the relationship between PSTs' performance and innovation and trust. We found a significant, positive correlation between self-efficacy and respectively individual innovation ( $r=.46$ ,  $p<.01$ ), collective trust ( $r=.14$ ,  $p<.05$ ), and individual trust ( $r=.21$ ,  $p<.01$ ). Results suggest that students with higher perceptions of individual and collective trust, so as higher innovation openness report higher levels of self-efficacy. So, climate seems to impact academic performance but only in terms of self-efficacy, not in terms of academic achievement (GPA) or practicum grade.

Table 3. Correlation analysis: learning climate and PSTs' success

	1b	1c	1d	2	3a	3b
1. Collaborative innovation climate						
a. Collective Innovation	.52*	.53*	.22**	-.07	-.06	.12
b. Individual Innovation	-	.41**	.30**	.11	.07	.46**
c. Collective Trust		-	.63**	-.03	.06	.14*
d. Individual Trust			-	.00	.13	.21**
2. Academic achievement (GPA)				-	.62**	.00
3. Professional competences						
3a. Practicum Grade					-	.08
3b. Self-Efficacy						-

Note. \*\* $p < .01$ , \* $p < .05$ , N= 321 PSTs

#### Social capital with learning climate and PSTs' success

Results of the relation between social capital and teachers' outcomes (hypothesis 2) suggest a positive relationship between academic performance and occupying a central position (Table 4). Specifically, we found that students' academic success was related to incoming ties in all the networks (advice:  $r = .15$ ,  $p < .05$ ; need to vent:  $r = .13$ ,  $p < .05$ ; new ideas:  $r = .24$ ,  $p < .01$ ) and betweenness in advice ( $r = .17$ ,  $p < .01$ ) and new ideas ( $r = .14$ ,  $p < .05$ ) networks. Going into professional competences, findings suggest a positive correlation between PSTs' position centrality, in terms of betweenness. Specifically, we found a positive relationship with betweenness indicator and practicum grade in the need to vent network ( $r = .16$ ,  $p < .01$ ). The same occurred for students' self-efficacy with a positive correlation among betweenness in ask for advice network ( $r = .14$ ,  $p < .05$ ).

Concerning the relationship between a collaborative and innovative climate and social capital (hypothesis 3), we found a positive, significant correlation between incoming ties in advice and collective trust ( $r = .16$ ,  $p < .05$ ), advice with individual trust ( $r = .18$ ,  $p < .05$ ), need to vent with collective trust ( $r = .18$ ,  $p < .05$ ), need to vent with individual trust ( $r = .16$ ,  $p < .05$ ), new ideas with collective trust ( $r = .16$ ,  $p < .05$ ) and new ideas with individual trust ( $r = .19$ ,  $p < .01$ ). Thus, students who perceive higher levels of trust, are more requested and asked for advice, for vending and for sharing new ideas. Therefore, results suggest that there is a mediator effect with the variable social capital

meditating the relationship between the learning climate and PSTs' performance. In this case, this suggests that there may be a partial mediation because an innovative climate has significant impact on PSTs' self-efficacy.

Table 4. Correlation analysis: social capital with learning climate and PSTs' success

	1a. Collective Innovation	1b. Individual Innovation	1c. Collective Trust	1d. Individual Trust	2. Academic achievement (GPA)	3a. Practicum Grade	3b. Self-Efficacy
<b>4. Networks and characteristics</b>							
a. Advice In-Degree	.07	.03	<b>.16</b>	<b>.18*</b>	<b>.15*</b>	.07	.02
b. Advice Out-Degree	.05	-.00	-.06	-.08	.10	.04	.09
c. Advice Betweenness	.05	.05	-.08	-.09	<b>.17**</b>	.06	<b>.14*</b>
d. Need to vent In-Degree	.08	-.01	<b>.18*</b>	<b>.16*</b>	<b>.13*</b>	.08	-.02
e. Need to vent Out-Degree	.11	-.03	-.01	-.05	.08	.03	-.01
f. Need to vent Betweenness	.00	-.09	.03	.06	.08	<b>.16**</b>	.01
g. Ideas In-Degree	.04	.08	<b>.16*</b>	<b>.19**</b>	<b>.24**</b>	.09	.09
h. Ideas Out-Degree	.11	.01	.02	-.02	.04	.01	.06
i. Ideas Betweenness	.05	.01	.03	.04	<b>.14*</b>	.09	.01

Note. \*\*p<.01, \*p<.05, N= 321 PSTs

#### 4.2.- Regression Analysis

##### 4.2.1.- Learning climate and social capital with PSTs' success

In addition to correlations, we ran a multiple regression analysis to test our three hypotheses. We selected the variable self-efficacy to run the analysis taking into account the results on the previous correlation analysis while testing the first hypothesis (H1). Firstly, the multiple regression analysis confirms that individual innovation has a positive impact on self-efficacy ( $r=.55, p<.01$ ), while the collective innovation has a negative impact ( $r=-.16, p<.05$ ) (see Table 5).

Further, based on earlier correlational findings, we selected in-degree and betweenness as indicators of centrality to predict GPA. In addition, we chose the betweenness indicator to predict professional performance for each network. Results suggest that incoming ties in the new ideas network are related to a positive effect on students' academic performance -GPA- ( $r = .24, p < .05$ ). In terms of betweenness, the advice network is related to a positive effect on GPAs ( $r = .17, p < .01$ ). Therefore, new ideas and advice networks have an influence on students' academic success. These results of the regression analysis replicated our correlational findings.

Table 5 also shows that advice network has a positive effect on professional success in terms of self-efficacy with the betweenness indicator ( $r = .14, p < .05$ ). At the same time, the students' professional performance considering practicum grade was found to be affected by the need to vent network with the network characteristic of betweenness ( $r = .16, p < .01$ ). However, the proportion explained variance for each of the tested model is small ( $R^2$  and  $R^2_{adjusted}$  from .01 to .06).

Table 5. Multiple Regression Analysis: learning climate and social capital with PSTs' success

	GPA			Practicum Grade			Self-Efficacy		
	$\beta$	Adj R2	R2	$\beta$	Adj R2	R2	$\beta$	Adj R2	R2
Collaborative innovation climate									
Collective Innovation	-			-			<b>-.16*</b>		
Individual Innovation	-			-			<b>.55**</b>		
Collective Trust	-			-			-.01		
Individual Trust	-			-			.08		
		-	-		-	-		.23	.23
Network characteristics									
Advice In-degree	-.15			-			-		
Need to vent In-degree	-.18			-			-		
Ideas In-degree	<b>.24*</b>			-			-		
		.05	.06		-	-		-	-
Advice Betweenness	<b>.17**</b>			.02			<b>.14*</b>		
Need to vent Betweenness	.03			<b>.16**</b>			-.04		

Ideas Betweenness	.07			-.01				-.05		
		.03	.03		.02	.03			.01	.02

Note. \*\*p<.01, \*p<.05, N= 321 PSTs

#### 4.2.2.- Learning climate with social capital

We followed our analysis by looking for a mediator effect between trust and teachers’ performance by examining the relationship between this learning climate and the social capital (hypothesis 3, see Table 6) . We performed a multiple regression analysis to confirm if exists a relation from collective and individual trust (selected from the correlation analysis) to social capital, in the centrality measure of in-degree. Results confirm that trust has an influence on being a “giver” in the network advice with individual trust (r= .18, p< .05), need to vent with collective trust ( r=.18, p< .05) and new ideas with individual trust (r=.18, p< .01).

Table 6. Multiple Regression Analysis: learning climate with social capital

	Advice In-degree			Need to vent In-degree			Ideas In-degree		
Trust	$\beta$	Adj R2	R2	$\beta$	Adj R2	R2	$\beta$	Adj R2	R2
Collective Trust	.08			<b>.18*</b>			.07		
Individual Trust	<b>.18*</b>			.09			<b>.18**</b>		
		.03	.03		.03	.03		.03	.03

Note. \*\*p<.01, \*p<.05, N= 321 PSTs

Results can also be presented graphically through the network sociograms that provide initial visualization of the network structure generated by NetDraw (Borgatti, 2002). Figure 2 represents the PSTs’ advice network. Students are represented by squares (nodes) and lines that connect these squares illustrate PSTs’ advice ties. Nodes are coloured by the GPA, ranging from 1 to 4. Then, we sized individuals by centrality measures. Bigger nodes reflect more betweenness ties in this case. These sociograms correspond to our regression analysis, showing that bigger nodes (“brokers”) generally also represent higher grades. Therefore, been a broker in advice networks causes higher achievement.

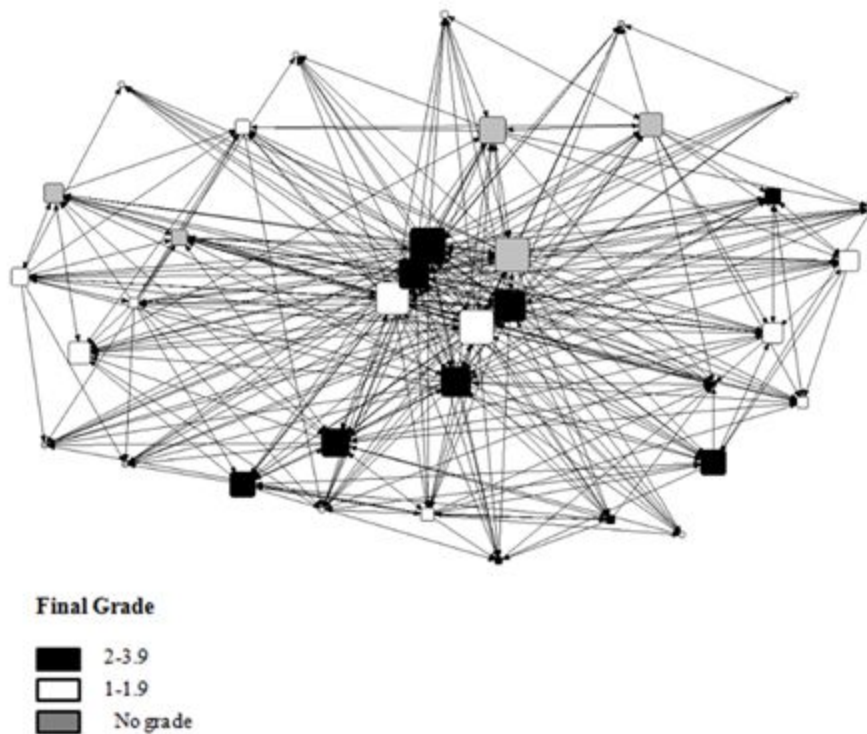


Figure 2. Example of PSTs' GPA in an advice network (betweenness)

To sum up, by testing Hypothesis 1 (H1) we have seen that an innovative climate, with the perception of individual innovation, has a positive relation on PSTs' perception of self-efficacy. Regarding Hypothesis 2 (H2), findings in general indicate a positive relationships between social incoming ties in new ideas network and academic achievement as well as between the measure betweenness ("broker") in advice, with both academic and professional performance, and need to vent networks with practicum grade. Finally, through Hypothesis 3 (H3) we have noted that a collaborative climate is mediated by social capital to be related with academic achievement and professional competences, regarding Hypothesis 2 (H2). Specifically, through incoming ties ("giver"), individual trust is related to advice and ideas networks while collective trust is related to need to vent network.

## 5.- Discussion

Results illustrate the influence of a learning climate open to innovation in PSTs self-efficacy. Also, findings confirm the direct effect of PSTs' social capital in their general performance (Çelik & Ekinci, 2012; Cívís et al., 2017; Daly et al., 2014; Liou et al., 2016; Penuel et al., 2012) and the direct relationship between learning climate and social capital (Bryk & Schneider, 2002; Cosner, 2009; Daly et al., 2014). Finally, results showed that there is a partial mediator effect played by social capital as a crucial interconnection between learning climates and PSTs' performance.

Our findings suggest that learning environments based on an innovation orientation, open to share new ideas between the cohort and to implement new practices in their schools, positively shapes preservice teacher's competences by enhancing their own self-efficacy. Thus, it seems like when teachers feel and experience an environment where errors are learning pieces and where teachers can discuss and implement new ways of organizing resources, new methodologies and new didactics, their teacher efficacy is empowered in a substantial way. Also, the cohort learning climate is shown as non compensate in terms of the two climate conditions described for supportive environments (trust and innovation), being trust the condition that should be improved to enhance professional development (Dinsmore & Wenger, 2006; Ewing & Manuel, 2005; Liou et al., 2016; Stauffer



& Mason, 2013). Moreover, the positive correlation between innovation and trust seems to indicate that both variables are highly linked, so developing a more innovative environment that in turn reinforces a more trustful climate for teachers, and at the same time, developing a climate based on trust helps teachers to become more innovative.

Furthermore, we have seen that climate does not affect academic achievement (GPA) and professional competence (practicum grade), being this indirect link proved in other studies (Moolenaar, Sleegers, & Daly, 2012). However, literature on the field of preservice teachers and professional development is not univocal at this point as other studies shows its direct effect (Bryk & Schneider, 2002; Cosner, 2009; Daly et al., 2014). This result could indicate that University ratings and assessments are not always aligned with some emergent competences for teachers in the 21st century as being a continuous innovator. This gap between educational needs in the field and rigid competences in higher education is underlined by different authors as Prats (2016), Tiana (2013) or Pantic & Wubbels (2010).

Results indicate a positive relationship between social capital and PST performance, confirming earlier literature (Dika & Singh, 2002; Gasevic et al., 2013; Liou et al., 2016; Smethem, 2007) and also indicating the importance of networks where teachers interact and collaborate (Daly & Finnigan, 2010; Moolenaar et al., 2010; Penuel et al., 2009). Findings show that occupying a central position in networks where PSTs share new ideas and where they ask for advice enhances their performance. Therefore, the network where PSTs ask for professional advice seems to be the most influential, as students with higher academic achievement are more sought out for work-related interaction.

Also, a brokering position in this network is correlated with higher achievement and higher self-efficacy, meaning that those actors that interact with disconnected people are key players that receive and gain knowledge from others, tending to perform in a better way than the rest of the cohort. These brokers may gain much more social capital than the rest by their connections across the network, and use this capital to comprehensively improve in their teachers' path. At the same time, PSTs that are central in giving and sharing new ideas with the rest of the group tend to show a higher academic achievement. So, putting into play new learnings and ideas by sharing them with the rest of the group suggests also a key position of those who show higher scores in the program.

Findings seem to indicate that students who perceive more trust, are asked more for advice, for venting and for sharing new ideas. Furthermore, regression helped us to note that trust has an influence of being a "giver" in the three network. This last question makes us think if that happens because perceiving more trust implies seeming more trustworthy.

Also, results confirmed the mediator effect of social capital on the relationship between a learning climate and teachers' performance, being in this case a partial mediation. That may be due to the significant impact of an innovation orientation on PSTs' self-efficacy that implies no need of mediation, contrary to what happens to trust. Consequently, a trustful climate could improve PSTs' performance through social capital both in instrumental and expressive networks. Thus, the learning climate as a whole has an effect on teachers' performance thanks to the mediation effect of social capital. These results help us confirm the mediating role of social capital in the educational area adding evidence to its mediation role in other studies on educational equity (Borgonovi & Pokropek, 2016; Dika, 2003; Poonpol, 2017; Teachman et al., 1997) or in the organizational sphere (Bojica et al., 2012; Golmorad & Ardabili, 2016). As such, social capital becomes a key piece in the Universities program plan in order to build a meaningful learning climate that empowers the professional development of PSTs.

## 6.- Conclusion

This paper brings light to the social side of teacher performance by increasing the limited empirical research inquiring the type of learning climate needed to support PSTs' professional path and the role of their social capital. As a result, the paper confirms the mediator effect of social capital on the relationship between a learning climate

and teachers' performance. Through social capital both in instrumental and expressive networks, a collaborative innovation climate can improve PSTs' performance. More specifically, having a trustful environment oriented to innovation facilitates the interaction between teachers' and the creation of social capital that also affects positively their academic achievement and professional competences. Thus, a collaborative innovation climate has an effect on teachers' performance thanks to the mediation role of social capital. Also, these results underline the important performance of social capital in improving PSTs programs. Specifically, findings appear to be critical in a catalonian and spanish context that are deeply involved in different educational changes concerning teacher training programs.

As a limitation, we can refer that a valid network dataset requires a high response rate - typically a 75% to be considered reliable-. In our case we have a response rate of 80% and though considered generally enough, some studies describe a robust results above 80% so that a bigger rate would be desirable (De Brún & McAuliffe, 2018). Additionally, the method we followed to test the mediation role sometimes suffers from low statistical power. However, the validity of one's conclusions about mediation is determined by the design of the study as much as by statistical criteria (Preacher & Hayes, 2004), a point that is solidly build through the paper. Furthermore, deeper understanding is needed to comprehend the effects of social capital in PSTs professional development. In this regard, we would rise two research lines that appear to be significant in this effort: on the one side, the use of mixed method studies including more qualitative assessments of the relationships between beginning teachers and how these affect their instructional practice and study success. On the other, the study of the overlap of networks and resources in order to discover if it can increase the possibility for PSTs to gain benefit from this multiplex ties. In sum, this paper contributes to the social and relational side of teacher training, where program effectiveness and improvement does not result solely through technical plans and blueprints, but through the interaction of participants (Daly, 2010).

### **Compliance with Ethical Standards**

We confirm that this article is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. All of the authors approved the manuscript and this submission. Furthermore, the study followed ethical standards and was conducted according to the guidelines established in the Declaration of Helsinki. Written informed consent was obtained from all of the subjects. The authors have no conflicts of interest to disclose.

### **Financial Support**

This work was supported by European Social Funds and the Secretariat of Universities and Research of the Department of Economy and Knowledge of the Generalitat de Catalunya under Grant 2017 FI\_B2 00142.

### **References**

- Atteberry, A., & Bryk, A. (2009). *The role of schools' social networks in intervention diffusion*. Paper presented at the Annual Meeting of the American Educational Research Association.
- Baker-Doyle, K. J. (2008). Circles of support: New urban teachers' social support networks. *Dissertations available from ProQuest*. AAI3309395.
- Baldwin, T. T., Bedell, D. M., & Johnson, J. L. (1997). The social fabric of a team-based M.B.A. program: Network effects on student satisfaction and performance. *Academy of Management Journal*, 40(6), 1369-1397.

- Blasco, P., Navas, J.E., & López, P. (2010). El efecto mediador del capital social sobre los beneficios de la empresa: una aproximación teórica. *Cuadernos de estudios empresariales*, 20, 11.
- Baumard, P., & Starbuck, W. H. (2005). Learning from failures: Why it may not happen. *Long Range Planning*, 38(3), 281-298.
- Bliemel, M. J., McCarthy, I. P., & Maine, E. M. (2014). An integrated approach to studying Multiplexity in Entrepreneurial Networks. *Entrepreneurship Research Journal*, 4(4), 367-402.
- Bloomfield, D. (2010). Emotions and 'getting by': A preservice teacher navigating professional experience. *Asia-Pacific Journal of Teacher Education*, 38, 221-234
- Bojica, A. M., Arroyo, M. R., & Fuentes, M. D. M. F. (2012). La adquisición de conocimiento a través de relaciones interorganizativas y la orientación emprendedora: el papel mediador del capital social de segundo orden. *Cuadernos de Economía y Dirección de la Empresa*, 15(3), 141-153.
- Borgatti, S. P. (2002). *Netdraw network visualization*. Harvard, MA: Analytic Technologies.
- Borgatti, S., Everett, M., & Freeman, L. (2005). *UCINET 6 for Windows software for social network analysis*. Harvard, MA: Analytic Technologies.
- Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of management*, 29(6), 991-1013.
- Borgonovi, F., & Pokropek, A. (2016). Education and self-reported health: Evidence from 23 countries on the role of years of schooling, cognitive skills and social capital. *PloS one*, 11(2), e0149716.
- Bryk, A. S., & Schneider, B. (2002). *Trust in schools: A core resource for school improvement*. New York, NY: Russell Sage Foundation.
- Calantone, R. J., Garcia, R., & Droge, C. (2003). The effects of environmental turbulence on new product development strategy planning. *Journal of Product Innovation Management*, 20(2), 90-103.
- Canrinus, E. T., Helms-Lorenz, M., Beijaard, D., Buitink, J., Hofman, A. (2012). Self-efficacy, job satisfaction, motivation and commitment: exploring the relationships between indicators of teachers' professional identity. *European journal of psychology of education*, 27(1), 115-132.
- Carbonell, J. (2001). *La aventura de innovar. El cambio en la escuela*. Madrid: Morata.
- Carbonell, J. (2016). Les tres primaveres pedagògiques. *El diari de l'Educació. Bloc de la Fundació Jaume Bofill*. Retrieved from <http://diarieducacio.cat/les-tres-primaveres-pedagogiques/>
- Carolan, B.V (2014). *Social Network Analysis and education: theory, methods and applications*. Los Angeles: SAGE.
- Çelik, V., & Ekinçi, A. (2012). The Effects of Social Capital on School Success. *Internal Journal of Social Science and Education*, 2(January), 211-223.
- Cívís, M., López, S., & Díaz-Gibson, J. (2017). El capital social dels estudiants del darrer curs de Magisteri. Una aproximació a les seves xarxes socials en el marc de la facultat. *REIRE Revista d'Innovació i Recerca en Educació*, 10(1), 34-56.
- Coburn, C. E., & Russell, J. L. (2008). District policy and teachers' social networks. *Educational evaluation and policy analysis*, 30(3), 203-235.
- Cole, R. P., & Weinbaum, E. H. (2010). Changes in attitude: Peer influence in high school reform. En A. J. Daly (Ed.), *Social network theory and educational change* (pp. 77-96). Cambridge, MA: Harvard University Press.

- Collinson, V., & Cook, T.F. (2004). Learning to share, sharing to learn. Fostering organizational learning through teacher's dissemination of knowledge. *Journal of Educational Administration*, 42, 312-332.
- Cornelissen, F., Liou, Y., Daly, A.J., Van Swet, J., Beijaard, D., Bergen, T., Canrinus, E. T. (2015). Teacher Education's Challenge of Changing Research Relationships With Schools. *AERA Open*, 1(4), 1-24.
- Cosner, S. (2009). Building organizational capacity through trust. *Educational Administration Quarterly*, 45(2), 248-291.
- Cross, R., Borgatti, S., & Parker, A. (2002). Making invisible work visible. *California Management Review*, 44(2), 25-46.
- Daly, A. J. (2010). *Social network theory and educational change*. Cambridge, MA: Harvard Education Press.
- Daly, A. J., & Chrispeels, J. (2008). A question of trust: predictive conditions for adaptive and technical leadership in educational contexts. *Leadership and Policy in Schools*, 7(1), 30-63.
- Daly, A. J., Moolenaar, N. M., Bolivar, J. M., & Burke, P. (2010). Relationships in reform: The role of teachers' social networks. *Journal of Educational Administration*, 48(3), 359-391
- Daly, A.J. (2012). Data, Dyads, and Dynamics: Exploring Data Use and Social Networks in Educational improvement. *Teachers College Record*, 114 (11), 1-38.
- Daly, A.J., & Finnigan, K. S. (2010). A bridge between worlds: Understanding network structure to understand change strategy. *Journal of Educational Change*, 11(2), 111-138.
- Daly, A., & Finnigan, K.S. (2012) Exploring the Space Between: Social Networks, Trust, and Urban School District Leaders. *Journal of School Leadership*, 22(3), 493-530.
- Daly, A. J., Moolenaar, N. M., Der-Martirosian, C., & Liou, Y.-H. (2014). Accessing capital resources: Investigating the effects of teacher human and social capital on student achievement. *Teachers College Record*, 116(7), 1-42.
- Daud, S., & Yusoff, W. F. W. (2010). Knowledge management and firm performance in SMEs: The role of social capital as a mediating variable. *Asian Academy of Management Journal*, 15(2), 135-155.
- De Brún, A., & McAuliffe, E. (2018). Recruitment of Healthcare Staff to Social Network Studies: A Case Study Exploring Experiences, Challenges, and Considerations. *International journal of environmental research and public health*, 15(12), 2778.
- Díaz-Gibson, J., Cívís,M., Fontanet,A., López, S., & Prats, MA. (2019). La visión de los directores de escuela sobre el impulso de la innovación educativa en Cataluña. *Cultura y Educación (in press)*
- Dika, S. (2003). *The effects of self-processes and social capital on the educational outcomes of high school students* (Doctoral dissertation, Virginia Tech).
- Dika, S., & Singh K. (2002). Applications of Social Capital in Educational Literature: A Critical Synthesis. *Review of Educational Research*, 72(1), 31-60.
- Dinsmore, J., & Wenger, K. (2006). Relationships in preservice teacher preparation: From cohorts to communities. *Teacher Education Quarterly*, 33(1), 57-74.
- Doreian, P. (1974). On the connectivity of social networks. *Journal of Mathematical Sociology*, 3(2), 245-258.
- Esteban, F, & Mellen, T. (2016). ¿Por qué quieres ser maestro? ¿Cómo es un buen maestro? Ideas para la formación universitaria. *Bordón. Revista de pedagogía*, 68 (2), 185-198.
- Eurydice (2013). *Cifras clave del profesorado y la dirección de centros educativos en Europa*. Luxemburg: Oficina de Publicaciones de la Unión Europea.

- Ewing, R., & Manuel, J. (2005). Retaining quality early career teachers in the profession. *Change: Transformations in Education*, 8(1), 1-16.
- Frank, K. A., Zhao, Y., & Borman, K. (2004). Social capital and the diffusion of innovations within organizations: The case of computer technology in schools. *Sociology of education*, 77(2), 148-171.
- Freeman, L.C (1979). Centrality in Social Networks Conceptual Clarification. *Social Networks*, 1, 215-239.
- Foray, D., & Raffo, J. (2012). Business-driven innovation: is it making a difference in education? An analysis of educational patents. *OECD Education Working Papers*, No. 84, OECD Publishing, Paris.
- Golmoradi, R., & Ardabili, F. S. (2016). The effects of Social Capital and Leadership Styles on Organizational Learning. *Procedia-Social and Behavioral Sciences*, 230, 372-378.
- Forbes, L., & Billet, S. (2012). *Successful Co-Teaching in the Science Classroom*. *Science Scope*, 36(1), 61-64. Retrieved from EBSCO.
- Fullan, M. (2010). *All systems go: The change imperative for whole system reform*. Thousand Oaks, CA: Corwin Press.
- Gasevic, D., Zouaq, A., & Janzen, R. (2013). "Choose your classmates, your GPA is at stake!": The association of cross-class social ties and academic performance. *American Behavioral Scientist*, 57(10), 1460-1479.
- Goddard, Y. L., Goddard, R. D., & Tschannen-Moran, M. (2007). A theoretical and empirical examination of teacher collaboration for school improvement and student achievement in public elementary schools. *Teachers College Record*, 109(4), 877-896.
- Golmoradi, R., & Ardabili, F. S. (2016). The effects of Social Capital and Leadership Styles on Organizational Learning. *Procedia-Social and Behavioral Sciences*, 230, 372-378.
- Hargreaves, A., Lieberman, A., Fullan, M., & Hopkins, D., (Eds.) (2010). *Second International Handbook of Educational Change*. Dordrecht: Springer.
- Hommes, J., Rienties, B., Grave, W. D., Bos, G., Schuwirth, L., & Scherpbier, A. (2012). Visualising the invisible: A network approach to reveal the informal social side of student learning. *Advances in Health Education*, 17(5), 743-757.
- Iacobucci, D., McBride, R., Popovich, D. L., & Rouziou, M. (2017). In social network analysis, which centrality index should i use?: Theoretical differences and empirical similarities among top centralities. *Journal of Methods and Measurement in the Social Sciences*, 8(2), 72-99.
- Ibarra, H. (1993). Personal networks of women and minorities in management: a conceptual-framework. *Academy of Management Review*, 18(1) 58-67.
- Imbernon, F. (2015). Cap a una millor professionalització docent del professorat. *Revista Catalana de Pedagogia*, 9, 11-23.
- Karlsdotter, K., Martín, J. J. M., & López del Amo, M.P. (2011). Influencia de La renta, la desigualdad de renta y el capital social en la salud de los mayores de 65 años en España en 2007. *Gaceta Sanitaria*, 25, 59-65.
- Kelchtermans, G. (2005). Teachers' emotions in educational reforms: Self-understanding, vulnerable commitment and micropolitical literacy. *Teaching and teacher education*, 21(8), 995-1006.
- Klassen, R. M., Perry, N. E., & Frenzel, A. C. (2012). Teachers' relatedness with students: An underemphasized component of teachers' basic psychological needs. *Journal of Educational Psychology*, 104, 150-165.
- Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), 383-397

Lai, C. (2013). Sense of Community and Self-Rated Health: Mediating Effect of Social Capital. *Sociology Mind*, 3, 217-222. doi: [10.4236/sm.2013.33029](https://doi.org/10.4236/sm.2013.33029).

Landmann, M. (2013). Development of a Scale to Assess the demand for specific competences in teachers after graduation from university. *European Journal of Teacher Education*, 36(4), 413-427. <https://doi.org/10.1080/02619768.2013.837046>

Leadbeater, C. (2012). *Innovation in education: Lessons from pioneers around the world*. Doha: Bloomsbury Qatar Foundation Publishing.

Li, S. (2012). *Exploring the mediating effect of social capital on human capital in economic well-being: A micro-analysis of four countries* (Doctoral dissertation, THE PENNSYLVANIA STATE UNIVERSITY).

Lieberman, A., (2000). Networks as learning communities: shaping the future of teacher development. *Journal of teacher education*, 51(3), 221-227.

Lin, N. (1982) Social Resources and Instrumental Action. In: Marsden, P. V., & Lin, N. (Eds) *Social Structure and Network Analysis*, 131-45. Beverly Hills, CA: Sage.

Lin, N. (1999). Building a Network Theory of Social Capital. *Connections*, 22(1), 28-51.

Lin, N (2001). *Social capital: A theory of social structure and action*. New York: Cambridge University.

Lincoln, J. R., & Miller, J. (1979). Work and friendship ties in organizations: A comparative analysis of relation networks. *Administrative science quarterly*, 24, 181-199.

Liou, Y.-H., Daly, A. J., Canrinus, E. T., Forbes, C. A., Moolenaar, N. M., Cornelissen, F., & Hsiao, J. (2016). Mapping the social side of pre-service teachers: connecting closeness, trust, and efficacy with performance. *Teachers and Teaching*, 1-23.

Liou, Y.-H., & Daly, A. J. (2016). Diffusion of innovation: A social network and organizational learning approach to governance of a districtwide leadership team. *Pedagogía Social. Revista Interuniversitaria*, 28, 41-55.

López, S., Civís, M., Díaz-Gibson, J. (2017). Improving Interaction in Teacher Training Programs: The Rise of the Social Dimension in Pre-service Teacher Education. *Teachers and Teaching: Theory and Practice* (submitted).

Mayer, A., & Puller, S. L. (2008). The old boy (and girl) network: Social network formation on university campuses. *Journal of Public Economics*, 92(1-2), 329-347.

Moolenaar, N., Daly, J., & Slegers, P. (2010). Occupying the principal position: examining relationships between transformational leadership, social network position, and schools' innovative climate. *Educational Administration Quarterly*, 46(5), 623-670.

Moolenaar, N., Daly, A. J., & Slegers, P. (2011). Ties with potential: Social network structure and innovation in Dutch schools. *Teachers College Record*, 113(9), 1983-2017.

Moolenaar, N. M., Slegers, P. J., & Daly, A. J. (2012). Teaming up: Linking collaboration networks, collective efficacy, and student achievement. *Teaching and Teacher Education*, 28(2), 251-262.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of management review*, 23(2), 242-266.

Nohari, K., & Gulatti, S. (1996). Is slack good or bad for innovation. *Academy of Management Journal*, 39, 799-825.

Organisation for Economic Co-operation and Development (OECD) (2013) *Skills Outlook 2013: First Results from the Survey of Adult Skills. Programme for the International Assessment of Adult Competences (PIAAC)*. Paris: OECD Publishing.

- Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of innovative knowledge communities and three metaphors of learning. *Review of educational research*, 74(4), 557-576.
- Pantić, N. y Wubbels, T. (2010). Teacher competencies as a basis for teacher education – Views of Serbian teachers and teacher educators. *Teaching and Teacher Education*, 26(3), 694-703.
- Penuel, W. R., Frank, K. A., & Krause, A. (2006). The distribution of resources and expertise and the implementation of schoolwide reform initiatives. In Barab, S. A., Hay, K. E., & Hickey, D. T. (Eds.), *Proceedings of the 7th International Conference of the Learning Sciences* (Vol. 1, pp. 522-528). Mahwah, NJ: Lawrence Erlbaum.
- Penuel, W.R., Riel, M., Krause, A., & Frank, K.A. (2009). Analyzing teachers' professional interactions in a school as social capital: A social network approach. *Teachers College Record*, 11, 124–163
- Penuel, W. R., Sun, M., Frank, K. A., & Gallagher, H. A. (2012). Using Social Network Analysis to Study How Collegial Interactions Can Augment Teacher Learning from External Professional Development. *American Journal of Education*, 119(1), 103-136. Recuperat de <https://doi.org/10.1086/667756>
- Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual review of sociology*, 24(1), 1-24.
- Poonpol, P. (2017) .The Influence of Personal, Social and Cultural Factors on Cross-Cultural Adjustment among International Students in Thailand and the Mediating Impact of Online Social Capital. *Journal of Behavioral Science*, 23(1), 105-121.
- Prats, E. (2016) La formación inicial docente entre profesionalismo y vías alternativas: mirada internacional. *Bordón*, 68(2), 19-33.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, 36, 717-731.
- Programa MIF. (2018). Memòria 2013-2018 programa MIF. (<https://mif.cat/wp-content/uploads/2018/06/Memo%CC%80ria-MIF-DEF.pdf>)
- Rizzuto, T. E., LeDoux, J., & Hatala, J. P. (2009). It's not just what you know, it's who you know: Testing a model of the relative importance of social networks to academic performance. *Social Psychology of Education*, 12(2), 175-189
- Scott, J. (2000). *Social network analysis* (2nd ed.). London, England: Sage.
- Smethem, L. (2007). Retention and intention in teaching careers: will the new generation stay? *Teachers and Teaching*, 13(5), 465–480.
- Smith, R. A., & Peterson, B. L. (2007). "Psst . . . What do you think?" The relationship between advice prestige, type of advice, and academic performance. *Communication Education*, 56(3), 278-291
- Sorensen, E., & Torfing, J. (2011), Enhancing collaborative innovation in the public sector. *Administration and Society*, 43(8), 842-868.
- Spillane, J. P. (2006). *Distributed Leadership*. San Francisco, CA: Jossey-Bass.
- Stauffer, S. D., & Mason, E. C. (2013). Addressing elementary school teachers' professional stressors: Practical suggestions for schools and administrators. *Educational Administration Quarterly*, 49(5), 809-837.
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of educational change*, 7(4), 221-258.
- Teachman, J., Paasch, K., & Carver, K. (1997). Social Capital and the Generation of Human Capital. *Social Forces*, 75(4), 1343-1359. doi:10.2307/2580674

- Tiana, A. (2013) Los cambios recientes en la formación inicial del profesorado en España. *Revista Española de Educación Comparada*, 22, 39-58.
- Torring, J., & Díaz-Gibson, J. (2016). Transformando la gobernanza para la mejora de la innovación educativa y social. *Pedagogía Social: revista interuniversitaria*, 28, 99-111.
- Tschannen-Moran, M. (2004). *Trust matters: Leadership for successful schools*. Jossey-Bass.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783-805.
- Vaillant, D. (2011). Casos i experiències per repensar la formació del professorat. *Innov[IB]. Recursos i Recerca Educativa de les Illes Balears*, 2. 15-21.
- Wellman, B., & Berkowitz, S. D. (1998). *Social structures: A network approach*. Cambridge, MA: Cambridge University Press.
- Wasserman, S., & Faust, K. (1998). *Social network analysis: Methods and applications*. New York, NY: Cambridge University Press.
- Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The world bank research observer*, 15(2), 225-249.
- Yasumoto, J. Y., Uekawa, K., & Bidwell, C. E. (2001). The collegial focus and high school students' achievement. *Sociology of education*, 181-209.
- Yuan, Y. C., Gay, G., & Hembrooke, H. (2006). Focused activities and the development of social capital in a distributed learning "community." *Information Society*, 22(1), 25-39.
- Zembylas, M. (2003). Interrogating "teacher identity": Emotion, resistance, and self-formation. *Educational theory*, 53(1), 107-127.