Improving teacher collaboration -
The role of classroom characteristics and individual factors on teachers’
collaboration: A latent Growth Curve Approach

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Abstract
A growing body of research suggests that participation in more collaborative professional communities affect teaching practice and improves students learning. This paper presents results from a study aimed to explore the improvement in teachers’ collaboration throughout participation in one out of two school improvement projects carried out in the period of 2006-2009. Both projects were initiated to strengthen classroom management. Structured and collaborative interaction around identified topics was a key implementation strategy in both interventions. The present study aimed at investigating teachers’ increase in collaboration throughout the projects and discusses the implications for professional development.

Teachers at 28 Norwegian schools attending either the Respect programme or “Handbook on classroom management” were included. Both interventions lasted two years. A web- based questionnaire was administered at three times, before (T1), one year into (T2) and at the end (T3) of the two year interventions. Latent variable growth curves were applied for investigation of the improvement of teacher collaboration. Results suggested that teachers, in general, increased collaboration throughout the interventions. Also, factors affecting teacher collaboration are discussed. The teachers’ perceptions of the learning environment in their classroom and work strain due to pupil misbehaviour were among the investigated factors. Differences between the two interventions discussed.

Introduction
Traditionally teachers worked alone in their classroom, with little or no professional discussion with their colleagues. Researchers have suggested that teachers generally avoid seeking opportunities to share or communicate in ways that impose on other teachers. Also, teachers value autonomy more than the chance to influence others’ work (Hargreaves, 2005; Levine & Marcus, 2008; McLaughlin & Talbert, 2001). A growing body of research suggests that participation in more collaborative professional communities affect teaching practice and improve students’ learning (Vescio, Ross, & Adams, 2008). A key finding are the critical role of collaboration and development of a collaborative culture to accomplish in schools to improve teaching practice and increase student achievement (Waldron & McLeskey, 2010). Previous research (Midthassel & Bru, 2001) indicates that a collective approach which implied reflection in teacher groups was a motivating factor. The social value of working with colleagues has been recognised (Locke & Taylor, 1991). Since teachers may feel left alone with their problems in the classrooms, the social value associated with teacher collaboration might be a motivation factor for engaging in interventions. Also, teacher collaboration is presumed to be a powerful learning environment for teachers’ professional development (Meirink, Meijer, & Verloop, 2007). This paper presents results
from a study aimed to explore the improvement in teachers’ collaboration throughout participation in one out of two school improvement projects carried out in the period of 2006-2009. The two interventions were The Respect programme, a school-wide intervention to prevent and reduce problem behaviour and support the learning environment, and the “The handbook on classroom management”-project. Both projects were initiated to enhance the teachers’ authoritative teaching. Structured and collaborative interaction around identified topics was a key implementation strategy in both interventions. The present study aim at investigating teachers’ increase in collaboration throughout the projects and discuss the implications for professional development.

**Theoretical framework**

Nearly three decades ago Little (1982) described four types of collaborative activities that appear crucial for continuous professional development: 1) teachers engage in frequent, continuous, and increasingly concrete and precise talk about teaching practice 2) teachers are frequently observed and provided with useful critiques of their teaching, 3) teachers plan, design, research, evaluate, and prepare teaching materials together, 4) teachers teach each other the practice of teaching. Schools are thereby distinguished on the basis of specific support for discussion of classroom practice, mutual observation and critique, shared efforts to design and prepare curriculum, and shared participation in the business of instructional improvement. These four types of practices so clearly distinguish the more successful from the less successful schools, Little argues. Perhaps the major similarity between these four activities is that all of them can involve dialogic reflection (Munthe, 2003). The concept of ‘the reflective practitioner’ as developed by Schön (1987) is one way of describing and developing skilled and thoughtful judgement. How situations are perceived can further be developed through reflection and observation in practice going hand-in-hand.

More recent research evidence supports that certain types of professional development activities, (e.g. regular study groups, structured collaborative initiatives) are more likely than others to offer sustained learning opportunities. In comparison to the traditional ‘one-hit’ workshop, these types of activities are usually longer in duration, allow teachers the opportunity to practice and reflect upon their teaching and are embedded in ongoing teaching activities (Boyle, While, & Boyle, 2004). It is assumed that exchanging ideas, conceptions, opinions, people can generate or create knowledge which could not have been generated by one individual (Meirink, et al., 2007; Tillema, 2006). Both intervention contained structured and collaborative interactions around the topics of classroom management and behavioural problems throughout the project. A main aim of the present study is to investigate if the perceived collaboration on discussing, planning and performing teaching increased as intended by participation in the intervention.

Pupils’ misbehaviour is a great concern to many teachers and has been shown to affect stress and burnout among teachers (e.g. Kokkinos, 2007; Clunies-Ross, 2008). Perceiving unhealthy learning environment in the classroom or strain due to pupils’ misbehaviour may affect teachers’ self-efficacy (Lambert, McCharthy, O’Donnel, & Wang, 2009) as a teacher and placing them at risk for stress and burnout. Collaboration may provide guidance and support on how to handle pupil behaviour in class. Given this it may provide the social support found to be essential in managing stress and burnout among teachers (van Dick & Wagner, 2001).
Hargreaves (2005) found that for teachers late in their career, their experiences of repetitive educational change tend to wear them down, and most teachers become resistant to and resilient towards change efforts. Based on this, it is interesting to investigate if more experienced teachers show a lower level of collaboration at base-line indicating that this also applies to collaboration. However, this does not apply to change inside the classroom. Many teachers in later career whose energy is beginning to wane, becomes positive focusers who concentrate their improvement efforts in their own classrooms where they believe they can best make a difference. Being an activity not specifically carried out in the classroom, albeit highly relevant to classroom activity, collaboration may be affected by teachers’ work experience. The challenges related to managing pupils misbehaviour in class, both to beginning and more experienced teachers (Evertson & Weinstein, 2006) may be a motivating factor for collaborative activities like discussions on teaching practice and managing behaviour. Since teachers may feel left alone with their problems in the classrooms, the social value associated with teacher collaboration might be a motivating factor for engaging in interventions. Teacher collaboration is presumed to create a powerful learning environment for teachers’ professional development (Meirink, Meijer, & Verloop, 2007). However, Little (1982) points to ways of collaboration that did not enhance learning and Hargreaves (1995) warns that contrived collaboration can be a threat to teacher development. This is in line with Zahorik (1987) arguing that teacher behaviour might be a difficult issue in collaboration.

**Methods**

**Sample**

Teachers at 28 schools attending one out of two school-wide interventions were included. 243 teachers at 10 schools attended a project on creation of a *Handbook on classroom management* (Midthassel, 2006) and 657 teachers at 18 schools attended the Respect programme (Ertesvåg, 2009; Ertesvåg & Vaaland, 2007), which is aimed at prevent and reduce problem behaviour. Both interventions lasted two years. A web-based questionnaire was administered at three times, before (T1), one year into (T2) and at the end of (T3) the two year interventions. The response rate was 66%, 70% and 59% respectively. A rolling design was applied, including the teachers working at the school at the time of data collection. Teachers who left the schools dropped out of the study. New teachers starting work at the schools were included at the second and third waves, as the sample at each wave was teachers currently working at the school. The implications of missingness due to design is discussed. A thorough discussion of missing data and its implication for the study is provided in Ertesvåg (2011).

**Measures**

Teachers’ self-reported collaboration was measured by a scale made up to cover the categories that Little (1982) found to be characteristic of schools where professional development takes place. The relationship between increased collaboration and schools’ innovation climate, and teachers’ perception of work strain due to pupil misbehaviour was investigated. Teachers’ self-reported collaboration is measured by a four item (see Table 1) scale made up to cover the categories mentioned above that Little (1982) found to be characteristic of
schools where professional development takes place. Previous studies have found this measurement to be valid and reliable (Munthe, 2003).

The pupil strain scale is made up of four items representing different types of strain related to pupil behaviour. Items are: “How much strain do you experience related to the following conditions?” 1) ‘Pupils threatening other pupils’, 2) ‘Pupils in conflict with other pupils outside the classroom’ 3) ‘Pupils threatening staff members’ 4) ‘Classes where I as a teacher do not have control’. The measurement model is not optimal because modification indices indicate that two of the error terms correlate with each other indicating that they belong to a common different factor. Specifying this correlation, the fit indices are good (CFI = 1.00; TLI 1.00; SRMR=.032; RMSEA = .004 90% CI =.000-.101).

The teachers’ perception of the learning environment in the classroom is measured by five items related to the pupils off-task behaviour. Items are 1) When I am teaching the whole class, most pupils are listening carefully 2) When the pupils are working in groups, most pupils concentrate on the task 3) When the pupils are working individually, most pupils concentrate on the task 4) When pupil are working on projects, most pupils concentrate on the task 5) When I ask the pupils to change activity, most pupils change quick and quietly. Scores were 0 – Agree completely, 1 –agree to some degree, 2 –disagree to some degree, 3 –totally disagree. The specified model did not provide perfect fit. Although most fit indices were within the cut-off suggested by Hu and Bentler, the RMSEA value was not. Inspection of the modification indices indicated that the error terms of item 2 and 4 correlate with each other. Specifying this correlation provided good fit (CFI = 1.00; TLI 0.98; SRMR=.013; RMSEA = .053 90% CI =.024-.084).

Work experience was measured by years of teaching. Teachers were divided in groups according to experience. This demarcation of the career in periods according to experience must be seen as arbitrary and not connected to specific career stages. The teachers were divided in four groups 0-3 years (N= 220), 5-10 years (N= 207), 11-20 years (N= 222), more than 20 years (N= 235).

Gender was scored 1 for women and 2 for men and Intervention was scored 1 for the Respect programme and 2 for the Handbook on classroom management.

Data analysis

Latent variable growth curves using Mplus (Muthen & Muthen, 1998-2007) were applied for investigation of the improvement of teacher collaboration. Also, Confirmatory factor analysis (CFA)and Structural equation modelling (SEM) were applied. Conventional analyses were conducted using SPSS (Noruïsis, 2007).

In their recommendations for goodness of fit indices Hu and Bentler (1999) suggested using cut-off value close to .08 for the standardized root mean squared residual (SRMR) and supplementing it with indices like the Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI) with cut-off values close to .95. They also recommended including the root mean square error of approximation (RMSEA) with cut-off value of about .06 or less. The RMSEA is supported by a 90% confidence interval (90% CI). Due to the relatively large number of subjects, traditional $\chi^2$ test may provide inadequate assessment of model fit (Jöreskog, 1993). Given this $\chi^2$ tests is not included.

Results

Descriptive statistics

Descriptive statistics for the different items representing collaboration at different time points is presented in Table 1. Results indicate an increase in collaboration for most
items. Inspections of the descriptive statistics for the two intervention groups indicated a larger increase in collaboration for teachers participating in the Respect programme than for teachers participating in the Handbook project.

Growth model

The growth model builds on a framework for measuring collaboration longitudinal previously developed. A step by step procedure was applied as suggested by Jöreskog, 1993. Detailed information of the fit indices for the different models are provided by Ertesvåg (submitted).

In growth curve modeling “intercept” is a latent variable expressing the individual base-line/T1 score, here base-line score for collaboration. “Slope” is a latent variable that expresses the individual change from base-line/T1 to post-test/T3, i.e. the mean change in collaboration. The mean value of intercept and slope are expressions of average base-line score and average change scores respectively. Test of the unconditional theoretical model provided good fit (CFI = 0.98; TLI 0.98; SRMR=.056; RMSEA = .029 90% CI =.019-.039).

The main aim was to examine effects of perceived learning environment in the classroom and strain due to pupil misbehaviour on base-line score and change in collaboration. Addition the effect of work experience and gender were investigated. Also, differences between in collaboration the two interventions were of interest.

Initially, the descriptive statistics indicated that there may be differences in improvement between the two interventions a model testing for differences between interventions were modelled. The model provided fair fit (CFI = 0.92; TLI 0.91; SRMR=.087; RMSEA = .052 90% CI =.048-.056). No significant differences in collaboration between teachers participating in the two interventions was found neither in base-line level (β = 0.09 p = .108) nor change (β=-0.20, p = .070). However, teachers that participate in the Respect programme tended to improve more, the difference was not significant. As there were no differences in collaboration between the two interventions, intervention was excluded from for a simpler model.

The theoretical model including learning environment, strain due to pupils misbehaviour, gender and was tested resulting in fit indices not meeting the suggested cut-off values suggested by Hu and Bentler (1993) (CFI = 0.95; TLI 0.94; SRMR=.082; RMSEA = .043 90% CI =.039-.047) for all fit indices. However, the indices were within what Brown (1993) characterised as fair fit.

Regarding base-line level teacher a significant negative effect of learning environment was found (β = 0.28 , p =.000). Teacher perceiving a positive learning environment reported higher level of collaboration than teachers’ reporting a problematic learning environment. No effect of perceived strain due to pupils’ misbehaviour (β = -0.04 , p =.540), for work experience (β = 0.004 , p = .941) or gender (β = -0.08 , p =.192) were found. The results indicated that there were no difference in reports of collaboration between teachers with differences in work experience, men and women or teachers with different perception of strain due to pupils’ misbehaviour. Although no direct effect of gender was found, a weak, albeit significant, indirect effect through learning
Table 1

Item means (M), standard deviation (SD), Skwenes s (Ske), Kurtosis (Kurt) and Chronbach's alpha for scales measuring warmth and control

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>SD</th>
<th>Ske</th>
<th>Kurt</th>
<th>M</th>
<th>SD</th>
<th>Ske</th>
<th>Kurt</th>
<th>M</th>
<th>SD</th>
<th>Ske</th>
<th>Kurt</th>
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<tbody>
<tr>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 3</td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 3</td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 3</td>
<td>Time 1</td>
<td>Time 2</td>
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<td>Time 1</td>
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<td>Collaboration</td>
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<td>I participate in collaboration with colleagues...</td>
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<td>1. ..planning lessons/topics</td>
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<td>2. ..in structured peer counselling in pairs or groups</td>
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<td>3. ..pupil assessment</td>
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<td>4. ..in discussing teaching and pedagogical practice</td>
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<tr>
<td>Rating format is 0-5, where 0 = never and 5 = very often.</td>
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</tbody>
</table>

Table 2

Analyses of Attrition. Demographic Statistics for Teachers Taking Part at all Waves and Teachers Taking Part at One or Two Waves.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Participants taking part at all waves (N=253)</th>
<th>Participants taking part at one or two waves (N=540)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>48%</td>
<td>52%</td>
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<tr>
<td>Male</td>
<td>53%</td>
<td>47%</td>
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<tr>
<td>Age</td>
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<tr>
<td>25 year or younger (N=32)</td>
<td>3%</td>
<td>97%</td>
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<tr>
<td>26-30 years (N=154)</td>
<td>16%</td>
<td>84%</td>
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<tr>
<td>31-40 years (N=298)</td>
<td>23%</td>
<td>77%</td>
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<tr>
<td>41-50 years (N=168)</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td>51-60 years (N=191)</td>
<td>44%</td>
<td>56%</td>
</tr>
<tr>
<td>61 years or older (N=47)</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Seniority</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 years (N=220)</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>5-10 years (N=207)</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>11-20 years (N=222)</td>
<td>37%</td>
<td>64%</td>
</tr>
<tr>
<td>More than 20 years (N=235)</td>
<td>29%</td>
<td>72%</td>
</tr>
<tr>
<td>Mean years at the school</td>
<td>11.9 (SD=8.33)***</td>
<td>7.7 (SD=7.67)</td>
</tr>
</tbody>
</table>
A main effect of collaboration was found. Given this, teachers reported increase in collaboration with colleagues from T1 to T3. No effects were found of learning environment ($\beta = 0.05, p = .582$), strain due to pupils misbehaviour ($\beta = -0.07, p = .472$) or gender($\beta = -0.06, p = .650$) nor was there any indirect effects. However, a direct effect of work experience was found ($\beta = 0.07, p = .001$) indicating that more experienced teachers improved more in collaboration than their younger colleagues.

In general women reported less problems in learning environment than men ($\beta = 0.42, p = .000$). The same applied to strain due to pupils’ misbehaviour ($\beta = 0.26, p = .001$). However, only the indirect on strain due to pupils’ misbehaviour ($\beta = 0.07, p = .001$).

**Discussion**

The main purpose of the study was to examine the direct and indirect effects of perceived learning environment and strain due to pupils’ misbehaviour on collaboration. Gender differences as well as effects of work experience were also investigated.

In general, teachers improved in collaboration throughout the intervention period. Teachers in the Respect programme tended to improve more than teacher attended the Handbook on classroom management, the difference was not significant. This may not come as a surprise, as schools attending such school-wide intervention, may be oriented towards collaboration in the first place. Reflections in pairs, groups and/or among all staff, activities associated with collaboration, was key aspects of both interventions. The Respect programme being more holistic, intervening with all sides of the school activity, one could have expected the results to be higher among these teachers. On the other hand, being a more complex intervention, it may take time before the full effect of the intervention can be seen.

The fact that teacher did improve their collaboration was not a surprise as in the interventions, as noted above, collaborative activities were central to the applied implementation strategy. Given this, the increase in collaboration may be an indication that the teachers actually implemented the intervention which, accord to previous research is not obvious (Midthassel & Ertesvåg, 2008; Ertesvåg, et al. 2010). However, it does not necessarily indicate that teachers actually learned from the collaborative activities. Wenger (1998) describes the concept of communities of practice as groups of people that are mutually engaged in a joint enterprise and who share a common repertoire – sets of routines, tools, symbols, stories, and other resources- for engaging in their work. Wenger argues that communities of practice cannot be designed. However, what can be designed are infra structures that foster learning e.g. opportunities for engagement, imagination and alignment. Implicitly, what Wenger underscore is that people cannot be forced to learn, all one can do is provide a learning opportunities. Skerrett (2010) points to the distinction between communities practice and learning community by discussing how a secondary English department in Canada struggled to develop into a learning community although they manage to develop communities of
practice. This distinction between an infrastructure providing for collaborative activities, community of practice and learning communities may be important in standardized interventions as they aim at providing for deep and collaborative learning among teachers. Previous research (Ertesvåg, et al., 2010) also indicate that the infrastructure aimed at supporting learning among teachers is vulnerable to failing leadership. Grossman and colleagues (2001) and Warren Little (2002) have conducted interesting studies into how teacher learning communities develop, the processes and typed of learning that occur in them, and the possibilities and dilemmas of developing and studying teacher learning communities. Internationally, there is general consensus in the field, that school based intervention, like the two in this study, implemented outside of efficacy trials or highly controlled research studies are typically not implemented with high quality (e.g. Domitrovich et al. 2008; Gottfredson & Gottfredson, 2002; Durlak & DuPre, 2008). Given this, there is need for further investigation of the quality of collaboration in school-wide interventions. Transferring the effective programmes into real world settings and maintaining them there is a complicated, long-term process that requires dealing effectively with the successive, complex phases of programme diffusion. Moreover, schools lacking organizational capacity are expected to have difficulty implementing sound instructional programmes of all types (Gottfredson & Gottfredson, 2002)

Many teachers struggle to manage behaviour in class (e.g. Sokal, Smith, & Mowat, 2003; van Tartwijk, den Brok, Veldman, & Wubbels, 2009). Based on the relationships between stress and burnout related to pupils strain (e.g. Kresh, Kulina, & Cothran, 2010), it was expected that perceived learning environment and/or strain due to pupils’ misbehaviour may affect the level and change of collaboration among teachers. The hypothesised model was partly supported by the data. Interestingly enough, strain due to pupils’ misbehaviour had no effect neither on base-line level nor change in collaboration. Based on the result there is no reason to anticipate that teachers perceiving strain due to pupils’ strain perceive less collaboration than teachers not perceiving strain. Neither is there any indication that they improve less in collaboration.

Perceived learning environment had a direct effect on base-line level of collaboration indicating that teachers scoring the learning environment of their classroom(s) positive reported more collaboration than their colleagues perceiving disturbing learning environment. Interestingly, there was also an indirect effect of gender through learning environment on base-line level of collaboration indicating given teachers experienced the learning environment equally positive women reported more collaboration than men. A possible explanation is that especially for those teachers experiencing problems in their classroom learning environment collaboration with colleagues serve as social support and an arena for discussing of improvements. Given that, in general, it seems to be easier for women than men to admit they have problems in the classroom, this may be one possible reason.

Limitations and implications for further research
Some caution is needed in interpreting the results. This study focused on two samples of teachers attending a school development programme, so results might not be apply to other populations. However, there is no reason to believe that the results might not apply to similar interventions. Also, attrition due to the rolling design may have affected the results as there were
found significant differences in the samples of teachers participating one or two times and those participating three times. Age and thus work experience was related to participation in that elderly teachers tended to participate three times. The results indicated that more experienced teachers tended to improve more in collaboration than their younger colleagues. Given that less experienced teachers tended to participate fewer times than their more experienced colleagues, this may have affected the results.

The data were based on the teachers’ reports of the collaboration in different areas related to teaching. The current study does not investigate the quality of the collaboration. The interventions aimed at improving the schools as learning organizations. Given this, future studies may focus on how teachers jointly engage in their practice, develop, negotiate, and shear meaning and dependent of the forms of participation and action, experience deep learning in and about their practice.

The nested structure, teachers within schools, enable a multilevel approach. However, there were inconclusive indications of a two level model as only some of the items indicated differences between schools with design effect above the rule of thumb value of 2.0. It is reasonable to assume that schools may vary in level of collaboration among schools as schools may vary in their approach to learning and development. Blossing and Ertesvåg (resubmitted) found that school failing in implementing interventions were characterised by a individual learning perspective, opposite to schools succeeding in implementing school-wide interventions. Given, this the nested structure of collaboration should be further investigated.

Implications for practice
Although, teachers in general reported increase in collaboration, the findings from this study as well as previous studies, suggest that implementing school–wide initiatives are challenging. A main challenge to teachers as well as schools is to implement collective efforts and develop a collaborative culture which aims at support the individual teachers’ professional development.

One of the most powerful factors known to undermine continuation is turnover of staff and administrators (Fullan 2007). The present study indicated relatively high teacher turnover over the three time points separated by one year each. Few interventions plan for the orientation and in-service support for new members of staff who arrive after the programme has started (Hargreaves & Fink 2006). Teacher turnover and how this is handled have previously been found to affect the continuation of the work according to the principle of the Respect programme (Ertesvåg, et al. 2010). An implication should be that the Respect programme, as well as other school-wide interventions, in order to promote lasting change carefully plan and organize for support of new teachers attending the school.
Also, teachers’ perceptions of the priority given to school development efforts influence their own involvement (Midthassel 2004). High focus from the headteacher and others in the formal leadership might support the efforts to implement collaborative actions to support implementation of the interventions. Hajnal et al. (1998) found that the schools which achieved lasting change were those with dynamic, facilitative leadership and a professional community culture. The teachers and management in these schools were
able to foster collaborative cultures for organizational learning, where the climate for renewal was promoted within the school. In turn, this indicates that strong leadership is needed both to implement and continue the intervention after the active period. The two interventions in the current study may benefit from strong leadership both from the principal and throughout the organization in order to promote collaborative activities.

References
Blossing, U., & Ertesvåg, S. K. (submitted). A social versus an individual learning perspective on school improvement work


