Abstract

This paper reports on the effect of individual and collective efficacy beliefs of teachers in early literacy learning at socially vulnerable schools that are involved in a school improvement program. Also assessed are their influence on student learning and the weight that may be ascribed to them in terms of organizational effects. Difference in the assessment of the importance that teachers ascribe to external factors in student learning between the experimental and control group are found. Chilean and international studies suggest that perceptions of individual and collective efficacy have a positive effect on teacher performance and student learning, which stresses the relevance of detecting how these variables behave in socially vulnerable schools.

Antecedents

Nowadays, there is consensus that the quality of teaching in initial school levels is a strategic factor for improving the educational system and for the development of countries (OECD, 2005). With this in mind, Universidad Católica de Chile’s Faculty of Education implemented a development project in the year 2000 called Pedagogical Innovation Program for the Initial Learning of Reading, Writing, and Mathematics (AILEM UC). This program includes three main components for fostering teachers’ professional development and for improving children’s learning in grades 1-4: i) a pedagogical-curricular part aimed at applying specific methodologies for literacy teaching (Swartz, 2010), ii) a professional development module, focused on promoting changes that strengthen teachers’ collaborative training and contribution in grades 1-4, and iii) a management section intended to improve shared instructional leadership practices in schools. Evaluation is a basic process, present in each of the components described, which makes it possible to monitor incremental and sustained improvements in the capabilities of teachers, management staff, and students (Volante, Silva, Cox & Müller, 2009).

Three of the distinctive aspects of the AILEM-UC program are: i) the gradual transference of didactic strategies, ii) the support process in the classroom, and iii) organizational change strategies. One of the hypotheses behind the program is that the improvement of student learning requires the establishment of a collaborative environment among teachers, emphasizing the observation and feedback of teaching practices in Language and Mathematics.
In this context, our work is part of a longitudinal study (FONDECYT (1095170 / 2009-2011), whose objective is to evaluate the effectiveness of the AILEM-UC program applied from Kindergarten [Nivel Transición 2] to second grade, in five schools, and to compare our observations with five control schools (State schools in the city of Talcahuano).

The hypothesis of this study is that classroom support and professional development interventions influence the individual and collective efficacy beliefs of the teachers involved, and that such beliefs have an impact on student learning. This hypothesis is based on self-efficacy theory (Bandura, 1993), which posits that an adequate learning level requires both the existence of skills and the subject's belief that he/she has the necessary resources for using such skills to pursue a certain goal.

**Teacher Efficacy**

Teacher efficacy is a concept derived from Albert Bandura's sociocognitive theory (1993, 1997). One of its characteristics is its influence in educational organizations, which has been studied by researchers who use a sociocognitive approach to understand, among other matters, how the emergent theories of individuals affect organizational performance (Bandura, 1997). In parallel to the traditional concept of self-efficacy, the perception of collective efficacy is defined as the shared belief of the members of a group that they are capable of organizing and implementing certain courses of action in order to achieve a given result. Thus, individual agency theory can be applied to collective units such as human organizations, like Goddard, Hoy and Woolfolk (2000) have done with educational organizations.

Research in the field of teacher self-efficacy beliefs has provided key information which shows that high self-efficacy teachers are more likely to persevere in their attempts to reach learning goals when they encounter obstacles, are more prone to experimenting with effective instructional strategies that represent a challenge, and are more willing to run risks in their classrooms (Bruce, Esmonde, Ross, Dookie & Beatty, 2010). The main sources of self-efficacy mentioned by Bandura (1986) are: i) mastery experiences (direct teaching experiences which are challenging and successful), ii) vicarious experiences (observing peers with similar performance levels who overcome challenges successfully), iii) physiological and emotional states (feelings of confidence and success), and iv) verbal and social persuasion (receiving positive feedback from students, their peers, management staff, and families). Out of these four sources, mastery experiences are regarded as the most influential on teacher self-efficiency (Bandura, 1997; Tschanen-Moran et al., 1998). In this regard, school improvement interventions, and especially those associated to the AILEM project are aimed at promoting direct mastery experiences and vicarious ones through the observation of peers and expert consultants; therefore, the intervention is expected to have an impact on individual and collective efficacy beliefs.
Measuring the Connection Between Self-Efficacy and Collective Efficacy

Beliefs of collective efficacy refer to perceptions about the executive capabilities of a given human group with respect to its significant tasks, which require an effective coordination of its members. In the case of schools, they refer to teachers’ perception of the capacity that the educational organization has to prepare and implement the necessary courses of action to produce a positive effect in student learning (Goddard, 2002).

Although personal and collective efficacy differ in their unit of agency, they have similar origins and functions, and work through comparable processes. Thus, the beliefs of individuals about collective efficacy influence the kind of future that they will imagine, their resource management, and the joint preparation of plans and strategies. Besides, they influence effort regulation within the group and persistence when collective efforts fail, or tolerance to frustration when they are not immediately reinforced (Goddard, Hoy & Woolfolk, 2004).

Regarding the measurement of collective efficacy, two main approaches can be identified: i) aggregated evaluations of members, who measure their personal capabilities in the specific tasks performed by the group; ii) aggregated evaluations of members, who measure the capacity of the group as a whole. Even though both indexes of perceived collective efficacy differ in the relative weight given to individual and social interaction factors, they are not as dissimilar as it may seem at first. Beliefs about personal efficacy are not separated from the social system to which the members of a group belong. In their assessment of their personal skills, individuals inevitably consider collective processes that facilitate or hinder their efforts. Therefore, linking efficacy, measured at an individual level, with group performance does not necessarily represent an inter-level relationship. Just as an assessment focused on the individual level is full of processes that operate within the group, one centered on the collective level cannot eliminate all the thoughts about the individuals that influence collective effects. The two indexes of collective efficacy are at least moderately interrelated.

The interdependence of the assessments of personal and collective efficacy produces analytical challenges for verifying emergent properties. In general, it is assumed that an emergent property is operational if the groups continue to differentiate after statistically controlling for the individual intra-group differences. The emergent attribute derived from the social dynamics of the group is presumably responsible for collective effects. In contrast, if inter-group differences disappear when the variables of individual characteristics are controlled within the groups, then the individuals combined as a whole, rather than a single or emergent characteristic of the
group, account for the collective effect. Therefore, controls at the individual level may inadvertently eliminate most emergent social properties (Volante, 2010).

**The Connection Between Teacher Efficacy and Learning**

The teacher's perceived efficacy not only influences his/her professional development, but may also have an effect on student learning, as shown in Figure 1 (Bruce et al, 2010):

![Fig. 1 Connection between teacher efficacy and student learning (Bruce et al, 2010)](image)

Teachers with high self-efficacy levels tend to persevere in the implementation of strategies that they consider challenging and effective. In addition, they have great expectations of their students, so they test various teaching strategies with those who have trouble attaining the proposed goals. When their perception of efficacy is high, teachers create a classroom environment intended for students to aim at mastery; that is, an approach to school tasks as a way to learn something, rather than as performance-oriented; in other words, to demonstrate their superiority to others. This leads teachers to motivate students to become responsible for their learning. Such practices have a positive impact on students' self-regulation, which in turn benefits their learning. That is to say, teachers' perceived efficacy influences learning through the strategies that those with a high perception of efficacy implement in their classrooms. This link has also been observed in Chilean studies which suggest that perceptions of collective efficacy have a beneficial effect on teacher performance and student learning (Volante, 2010)

**Organizational Vulnerability**

Given these antecedents, it is interesting to evaluate the effect of the individual and collective efficacy of teachers who work in highly vulnerable schools, since such institutions have been proven to possess organizational characteristics which negatively affect student learning, beyond the evident socioeconomic factors that reduce the sociocultural capital of families.

A comparative study done in Chile analyzed the changes in the discourse of school coordinators and principals about learning in low achievement and high vulnerability schools after a four year implementation of the Pedagogical Innovation Program for the Initial Learning of Reading, Writing, and Mathematics (Volante & Müller, 2006). Among the internal elements that characterize school organizations regarded as vulnerable, is the general perception of lack of control, social instability, and the absence of shared teaching and learning evaluation practices.
Teachers and management staff tend to feel externally assessed, and pressured by evaluation systems which they perceive as tools that authorities and administrators use to burden them (see Fig.2)

![Fig. 2: relationship scheme with respect to learning outcomes.](image)

After the intervention in the schools that improve the students results in the National Evaluation System the discourse of the school coordinators and principals was focused on beliefs of self-efficacy, high expectations regarding students learning and the perception that the school is able to teach any children. In this context, mastery experiences and vicarious learning tend to promote social cohesion rather than the orientation towards challenging goals, which results in a major dissociation between the objective of assisting teachers and students and the goal of fulfilling the academic requirements of the school curriculum. However, schools classified as vulnerable and which have received external support and manage to reach a certain degree of success in student learning, have presented changes in discourse and in organizational practices, which was associated to an effective organizational environment according to the theory of social agency (Bandura, 1997).

Such environments are described by management staff and teachers (Volante & Müller, 2006) as organizations with high hopes for the future and strong bonds with students, who are regarded as active members in teaching and administration processes. External evaluations are viewed as sources of comparable information, and not as tools to pressure them. The instructional objectives of the curriculum are perceived as goals which are legitimate for their institutions, and which students are capable of attaining. That is to say, these organizations integrate the personal development and academic achievement dimensions into a single educational aspiration.

Chilean and international studies (Volante, 2010) suggest that perceptions of individual and collective efficacy have a positive effect on teacher performance and student learning, which
stresses the relevance of detecting how these variables behave in socially vulnerable schools.

**Method**

This study is part of a larger research effort, whose hypotheses posit that students who are exposed at an early age (kindergarten to second grade) to a learning improvement program will obtain better scores in standardized language measurements, in spite of belonging to a socially vulnerable population. In order to test this effect on the quality of teaching and learning, a quasi-experimental longitudinal evaluative study was designed, to be implemented between 2009 and late 2011 (FONDECYT project N°1095170).

This report presents the results of a measurement of the baseline of the main organizational variables considered by the study and of the learning levels observed during the first year of intervention.

**Instruments**

The study measured teachers' perceived efficacy (IS, Spanish AI) and beliefs about collective efficacy (CE, Spanish EC). The two questionnaires used had been validated in previous studies (Volante, 2008). In addition, a test to detect students' language learning level at the start of elementary education was applied (Villalón, et. al. In Press).

The teacher efficacy questionnaire is based on the Teacher Efficacy Scale, proposed by Gibson, S. and Dembo, M.H. (1984), which has been used in Chile by the national teacher performance assessment system, specifically as a tool to assign teaching excellency grants [Asignación de Excelencia Pedagógica, AEP]. Its items are aimed at detecting teachers' beliefs about their own performance (self-efficacy) and the degree of negative influence perceived by them with respect to the social environment of students and their families (external control). When applied to the sample, the internal reliability obtained was acceptable (α = .83). Some of the items used are listed below:

- When I really try, I can get through to most difficult students (AP).
- My experience has given me the necessary skills to be an effective teacher. (AP).
- The amount that a student can learn is primarily related to family background (CE).
- Teachers are stymied in their attempts to help students by lack of support from families (CE).
The Collective Efficacy questionnaire, based on the *Collective Teacher Efficacy Scale*, designed and validated by Goddard, Hoy, and Woolfolk (2000), sought to detect teachers' perceptions about the conditions of the organization connected to collective characteristics of teachers. The questionnaire assesses two dimensions which are theoretically relevant in the case of socially vulnerable schools. First, the perception of collective capabilities (CG), which makes it possible to explain positive elements associated to teachers' work and their collaboration. Second, the perception of the difficulty of fulfilling the school's role in each institution, which is connected to the presence of environmental and organizational factors which hinder their efforts and make the attainment of goals less likely (AT). When applied to the sample, using a translation validated for Chile (Volante, 2008-2010), the internal reliability obtained was acceptable ($\alpha = .86$). Some of the items used are listed below:

- Teachers here are well prepared to teach the subjects they are assigned to teach (CG +).
- Teachers do not have the skills needed to produce meaningful student learning (CG -).
- The opportunities in this community help ensure that students will learn (AT +).
- The lack of instructional materials and supplies makes teaching very difficult (AT -).

**Participants**

The sample comprised 388 children, 40 teachers and 10 schools. The experimental group consists of five schools that are participating in the Pedagogical Innovation Program for the Initial Learning of Reading, Writing, and Mathematics (AILEM UC). The control group consists of schools without the implementation of the program, but match by socioeconomical status, school size and average score in the National Evaluation System in Language (SIMCE, 2008), see table 1

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>control</th>
</tr>
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<tbody>
<tr>
<td>school</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>teachers</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>students</td>
<td>159</td>
<td>229</td>
</tr>
</tbody>
</table>

**Procedures**

In 2009, early literacy learning was assessed at the beginning and the end of the school year. This test was applied to 144 students from the experimental schools and 209 from the control schools whose teachers participated in the study. The dimensions assessed were: knowledge of the alphabet, visual word recognition, emergent writing, and oral comprehension. These dimensions have been probed as predictors of student literacy acquisition, and in this study they make it possible to detect differences
The Teacher Self-Efficacy and Collective Efficacy questionnaires were applied to 33 teachers from the participating institutions, which teach children from kindergarten to second grade. They were applied as self-report tests in the first instrument and as an assessment of the school in the second case. Both questionnaires were uploaded to an on-line platform, and answers were followed-up individually.

Analysis
Since the objective of the study is to compare the individual and collective efficacy of teachers in socially vulnerable schools during their participation in a language learning improvement program, the first analysis used was the comparison of the means of independent groups with t tests. Then, in order to establish the level reached after one year, we applied an association analysis between the independent variable (belonging to the intervention group) controlling for the covariant of initial performance, so as to explain any differences in variability detected (ANCOVA). The Statistical Package for the Social Sciences (SPSS, 15.0) was used for these analyses.

Finally, a preliminary hierarchical linear analysis was conducted to evaluate the magnitude of the differences between schools at the start of the intervention, thus differentiating the percentage of variance accounted for by characteristics of the students from those attributable to school variables (Brik & Raudenbush, 2002). This analysis was carried out using the Hierarchical Linear and Nonlinear Modeling: HLM 6 software (Raudenbush, Brik, Cheong, & Congdon, 2000).

Results
In order to establish the baseline for the learning level variable (y), the experimental and the control groups were measured (N Exp. = 144; N Control = 209) early in the first year of intervention. A means analysis (Student's t) showed that there were no significant differences between the experimental (M=37.4, DS = 14.77) and the control groups (M=38.68, DS = 12.58), neither in their general language performance [t(303.60) = -0.880, p = .379] nor in their specific emergent writing performance [t(386) = 0.907, p = .365]. Afterwards, the second application of the language test at the end of the first year of intervention revealed a slight positive difference for the experimental group (µEG=66.4 vs µCG= 58.6;F(1.352) = 23.043, p<.0001). Such differences were observed in the following dimensions: knowledge of the alphabet, visual word recognition, and emergent writing. The oral comprehension skills did not show significant differences between the two
groups. Finally, the writing area showed significant gender-linked differences, with female students obtaining higher scores.

Regarding the variables of the study, focusing on the school level, teacher efficacy and collective efficacy scores in the experimental and control schools were compared. This measurement sought to prove the similarity of the groups in terms of their organizational characteristics, since most of the strategies used in the improvement program applied in the experimental schools are intended to stimulate management staff and teachers to develop individual and collective skills to overcome any adverse conditions and attain higher learning levels.

The first measurement does not reveal any significant differences between the average results of teachers from experimental schools (\(\mu_{EC} = 4.9\); \(\mu_{TE} = 4.6\); \(n=16\)) with respect to those from control schools (\(\mu_{EC} = 5.0\); \(\mu_{TE} = 4.3\); \(n=14\)) (see Table 2).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Control</th>
<th>Experimental</th>
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<tbody>
<tr>
<td>Colective efficacy</td>
<td>(\mu) 5.0</td>
<td>4.9</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td>(\sigma) 1.2</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n) 14</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Teacher efficacy</td>
<td>(\mu) 4.3</td>
<td>4.6</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>(\sigma) 0.57</td>
<td>0.49</td>
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<tr>
<td></td>
<td>(n) 14</td>
<td>16</td>
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Table 2: Average comparison between schools

In addition, we evaluated the "external attribution" dimension (\(\alpha = .83\); 5 items, \(n=30\)), as a specific aspect of teacher efficacy. In this case, it was possible to observe a significant difference between the groups (Experimental < Control : \(t=-2.085\) with 28 gl and \(p: 0.045 < 0.05\)), with an advantage for the intervened one (\(\mu_{CE}=2.5\); \(\sigma=1.15\); \(n=14\)), since these teachers referred to fewer external attributions in their work than those from the control schools (\(\mu_{CE}=3.4\); \(\sigma=1.21\); \(n=16\)) (see table 3).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Control</th>
<th>Experimental</th>
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<tbody>
<tr>
<td>External attribution *</td>
<td>(\mu) 3.4</td>
<td>2.5</td>
<td>-0.73</td>
</tr>
<tr>
<td></td>
<td>(\sigma) 1.21</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n) 14</td>
<td>16</td>
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* \(p < 0.05\)

Table 3: Average comparison between schools

These results can be interpreted as an approximation of the measurements made of the schools' initial organizational status, since the data were obtained during the first semester of the intervention. The results set a baseline which supports the homogeneity of teachers' efficacy beliefs in the first intervention year, and will later make it possible to conduct a more thorough
longitudinal comparison. However, this first stage already displays a difference which may be relevant for improvement programs, because teachers from intervened schools seem less inclined to ascribing their achievements to external factors than those from control schools.

In order to test and quantify how the similarities between the schools at the start of the intervention influenced their achievement levels, the percentage of the variance between schools in this first year was evaluated through the interclass correlation indicator (Brik & Raudenbush, 2002). Pre-test measurements showed that less than 3% (ICC=0.029) of the differences were accounted for by organizational variables, which confirms the homogeneity required for the selection of schools, and the equivalence of the schools' learning levels at the beginning of the intervention. The post-test measurement performed towards the end of the first period showed that the percentage of variance explained by school-level variables remained unchanged in the experimental schools, and had risen slightly in the control schools (ICC = 0.09). Figure 3 displays the variations observed through the interclass correlation of the control schools versus the experimental ones in the two measurements of the dimensions assessed by the language test.

The results presented confirm the similarity of the schools included in the study during the first year of intervention. This establishes and validates a baseline which is significant for the longitudinal evaluation strategy. In practical terms, this means that schools with a high social vulnerability do not differ from the rest in terms of teacher efficacy or collective efficacy beliefs, and that, therefore, their students are immersed in similar organizational environments. Nevertheless, the assessment of the importance that teachers ascribe to external factors in student learning reveals a difference which can be regarded as an organizational characteristic, since teachers from the experimental group displayed lower levels of external attribution.
Conclusions

A relevant problem for research on school improvement is the discussion about what a vulnerable school is. This label goes beyond indicators of socioeconomic stratification or institutional stability: school organizations become vulnerable or stop being vulnerable as their psychological environment strengthens or weakens the performance and expectations of their members.

In the case of this study, we have compared the initial state of 5 experimental and 5 control schools in the context of the application of a program whose objective is to improve the levels of achievement of all students, and boost the development of teachers as the main facilitators of school change and effectiveness. One of the key findings of this part of the study was the difference between both groups in the internal attribution of the teachers to explain the learning outcomes of the students. This is coherent with a support and improvement plan focused on the development of intra-school teaching practices and strategies. Considering that the internal attribution is theoretically related to the teachers self efficacy beliefs it is important to consider that from the four main sources of teacher efficacy described by Bandura (1997), Zimmerman (2000) argues that the most influential source was the mastery or so called enactive experiences because they are predicated on the outcomes of personal experience and that the verbal persuasion has an more limited impact because the outcomes are described, and thus depend on the credibility of the persuader. In the intervention program described in this study both sources are considered in the professional development. This could be one explanation for the difference in favor of the experimental group and a challenge for the program in the sense of focusing the intervention in offering systematically opportunities for master experiences.

The data obtained for establishing the baseline of these organizations indicates that there are no significant differences between the (experimental and control) groups resulting from socioeconomic inequalities, and that they share teacher efficacy indicators and collective efficacy beliefs. These are two aspects which, according to national and international studies, are predictors of school learning performance and organizational health. This common baseline is a valuable antecedent for identifying changes in organizational characteristics and improvements in student learning levels.

In addition, this partial evaluative study also proved that the so called school effect –the influence of the educational organization– is nearly non-existent in the first years of schooling, as it was to be expected. However, these minute differences between schools increase in magnitude in the case of control schools, which does not happen in experimental ones. This point, combined with the scarce but significant evidence suggesting that the supported group increases its language learning level during the inter-measurement period, reinforces the
hypothesis that schools with improvement programs focused on early learning may not only improve their achievement levels but also reduce the differences between students who attend them.

The analyses used in this study aims to establish the conditions at the beginning of the intervention and point out how improvements and their impact behave in subsequent periods. This exercise is important, since a longitudinal evaluation strategy requires that changes in variables and achievement indicators be compared, but it also needs to detect how much of that change can be attributed to the characteristics of individuals and to the traits of school organizations. Finally, this type of analysis will make it possible to understand how, when environmental socioeconomic characteristics are maintained, the experience and learning results of some schools can be modified through the development of educational agents.

References

