

Effects of Professional Community on Lesson Improvement of a Teacher: A Multilevel Modeling

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INTRODUCTION

The purpose of this study is to determine the effects of professional community on lesson improvement of a teacher in school organizations, through the use of multilevel modeling.

To improve students' academic achievement, teachers' lesson improvement is essential, and this is accomplished through personal effort by the teachers. However, if the lesson improvement is left to the individual teacher's discretion, it is possible that the disparity in the quality of teaching within a school would increase. In recent years, the study of organizational lesson improvement has been focused on collaborative interaction and reflection among teachers (Bryk, Camburn, & Louis, 1999; Giles & Hargreaves, 2006; Wahlstrom & Louis, 2008).

Since 1990, professional community research has focused on the values (or the structures) the leader has to build for dealing with school issues. Professional community is a concept that explains the following school characteristics: a high frequency of interaction among teachers occurs easily, and teachers' behavior is governed by the shared norms for student learning and academic improvement (Bryk *et al.*, 1999). Louis, Marks and Kruse (1996) used factor analysis to determine five dimensions of professional community: shared norms and values, collective focus on student learning, collaboration, deprivatized practice, and reflective dialogue. There are several key components in school organizations built by professional community: shared goals and issues among teachers, focus on academic performance and learning activities, and active promotion of students' learning activities through collaboration. By continuing the use of open classrooms, mutual observation, and reflective dialogue, teachers can build (and share) knowledge

about the actual situation, context, and how to improve.

THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS

Effects of Professional Community

Professional community researchers have used a qualitative approach to describe the process of the development and continuation of professional community (ex. Halverson, 2006, 2007; Hord & Sommers, 2008; Scribner, 1999; Scribner, Sawyer, Watson, & Myers, 2007; Stoll & Louis, 2007), and a quantitative approach to validate the effects on organizational learning (Bryk *et al.*, 1999), change of instructional behavior (Supovitz, Sirinides & May, 2010; Wahlstrom & Louis, 2008), improving quality of teaching (Louis & Marks, 1998), students' sense of community (Louis & Marks, 1998), and students' academic performance (Lee & Smith, 1996).

In school organizations built by professional community, sharing of goals and issues by teachers, promoting collaborative student learning activities, and facilitating reflective dialogue are carried out actively. In school organizations with these characteristics, the success rate of teachers' lesson improvement is high. As a spillover effect of lesson improvement, students' academic achievement also improves.

Lesson Improvement as a Dependent Variable

We have focused on lesson improvement by teachers who received direct support from the professional community. Lesson improvement has been positioned as the most important teacher's competence in the prefecture where this research was carried out. Tsuyuguchi & Kuramoto (2011) have pointed out that lesson improvement is

achieved following a three step process: *Lesson Design*, *Lesson Practice*, and *Lesson Evaluation*. In order to improve lessons, teachers have to think reflectively in each of these processes.

For example, in the process of lesson design, teachers meet with colleagues to discuss lesson goals, lesson planning, and evaluation standards. This session is called a lesson deliberation. The teachers may modify the lesson plan based on suggestions by colleagues during the lesson deliberation. In this process of lesson design, the teachers perform *reflection toward action*.

In the process of lesson practice, teachers attempt to improve classroom learning through the use of reflective activities, which vary depending on the situation. Through *reflection in action*, teachers change the lesson plan according to the students' behavior. Teachers who implement *reflection in action* in their lesson plan are able to immediately define students' learning problems, and identify a strategy to remedy them (refer to Schön, 1983).

In the process of lesson evaluation, performances and tasks are clarified through data collection and reflective dialogue among teachers. This process is considered *reflection on action*. In this process, some quantitative data, including the results of achievement tests, as well as student and parent questionnaires, are used for lesson analysis. In addition, the feedback and advice from teachers who have observed the classroom help the reflective thinking of the lesson practitioner. Thus, we propose that successive reflective action-consisting of *reflective toward action* (lesson design process), *reflective in action* (lesson practice process), and *reflective on action* (lesson evaluation process)-are the main components of lesson improvement.

Multilevel Modeling

Effects of professional community on lesson improvement have been discussed by several quantitative studies, as already mentioned. While these studies have treated professional community as an individual-level variable, the organizational-level effects of the professional community on lesson improvement have not been discussed enough. In order to analyze effects of professional community at the organizational level, it is appropriate to utilize a multilevel model.

As a suitable method of multilevel data analysis, the multilevel model began to be utilized in the 1990s (Bryk & Raudenbush, 1992; Kreft & Leeuw, 1998). With the increasing use of statistical software, the multilevel model has been widely used in the social sciences. The multilevel model has the following advantages: (1) it is possible to simultaneously analyze both effects of the organizational-level variables and individual-level

variables for a dependent variable; (2) it is possible to verify the differences between groups effect of independent variables on a dependent variable; (3) it is possible to suppress several statistical fallacies⁽¹⁾ (ex. Ecological fallacy, atomistic fallacy, psychologistic fallacy, and sociologistic fallacy).

In terms of statistical fallacies, we must consider that the previous models that do not take into account effects of the professional community as an organizational-level variable have some risk of falling into the psychologistic fallacy. In order to study the effectiveness of professional community, we should consider both the effects of the individual-level variables and the school-level variables. Therefore, in this study, we test the hypothesis that *the individual-level professional community has an effect on lesson improvement of a teacher, even if the school-level variables are controlled* (Research Question 1).

Moderate Effect of Principal's Leadership

If we want to clarify the relationship between professional community and lesson improvement, we cannot ignore principal's leadership. Direct effects of principal's leadership on professional community have been verified in a lot of previous studies (Bryk *et al.*, 1999; Louis *et al.*, 1996; Marks & Louis, 1997). Supovitz *et al.* (2010) have verified that principal's leadership has a direct effect on positive change in teachers' instruction. Also, Tsuyuguchi (2008) verified that principal's leadership has an indirect effect on lesson improvement through building professional community.

While previous studies have examined the *direct / indirect effects* of principal's leadership on lesson improvement, the *moderate effects* of principal's leadership on the relationship between professional community and lesson improvement have not been discussed. We assume that in a situation where the principal is able to exercise leadership, the professional community promotes teachers' lesson improvement. We focus on the leadership function that enables a connection between professional community and lesson improvement, rather than the direct / indirect effects of principal's leadership on lesson improvement. This study aims to describe a new aspect of the effects of principal's leadership.

Behaviors of a principal that affect professional community or lesson improvement are explained by the instructional leadership approach (ex. Hallinger & Heck, 1996; Leithwood & Duke, 1998). We can interpret that the instructional leadership approach assumes that a principal leads school reform. On the other hand, in recent years, the servant leadership approach that focuses on the support and service function for the subordinates / clients has been suggested.

The servant leadership approach has been studied in the academic discipline of leader philosophy since the 1970s; however, empirical research has only started recently, with a few studies on principals' leader behavior⁽²⁾ (Cerit, 2009; Taylor, Martin, Hutchinson, & Jinks, 2007).

Even if the effect of professional community builds in a school, lesson improvement would not necessarily take place for all teachers. In order to promote lesson improvement for all teachers, while respecting empowerment and autonomy in a school, leadership with a support function such as servant leadership would be effective. Therefore, we assume that *in a situation where the principal demonstrates leadership, the professional community could promote lesson improvement of a teacher* (Research Question 2).

Control Variables

We have tried to build a more accurate analysis model that would control the various individual-and school-level variables for the verification of the above hypotheses. Teachers' lesson improvement would be affected by professional community, as well as by the several individual-and school-level factors. The persuasion level of a purely analysis model to test the relationship between professional community and lesson improvement is not enough. Therefore, building on the analysis model, we have set three individual variables (gender, professional age, and type of school where employed) and four school-level variables (male teacher ratio at the school, school-level average of professional age, number of teachers at the school, and lesson improvement in the previous year) as control variables. This study aims to verify whether professional community has an effect on teachers' lesson improvement, if the influences of individual-and school-level variables are controlled.

METHOD

Data Sources

The data source for this analysis is the *Teacher Survey*, which was developed for the Leader Teacher Training Projects. Thirty-three schools in Ehime Prefecture (Japan) participated in this project from April 2009 to March 2011. The *Teacher Survey* contains some items from established instruments, as well as many new items and scales. The instrument was field tested with teachers in 20 schools in Ehime Prefecture in December 2008 and January 2009. The researchers met with supervisors to review subsequent changes in the wording of the questions. The output was a 44-item survey, which took 10-15 minutes to complete.

The *Teacher Survey* documents were mailed to schools and were typically completed by the teachers

during a school staff meeting. Each survey form was accompanied by a blank envelope that could be sealed to ensure confidentiality; none of the principals had access to the teachers' responses. The surveys were carried out in February 2010 (FY2009) and February 2011 (FY2010). This study is based on survey returns from teachers in 33 schools: 638 teachers in FY2009 and 644 teachers in FY2010. All attitudinal variables used in the analysis were measured with a four-point Likert scale.

Scale Items: Individual-level Data

Lesson improvement: To address the research questions posed, we developed dependent variables through the factor analysis of 22 lesson improvement items (principal factor method with promax rotation). The lesson improvement scale was created with reference to the three perspectives of the lesson improvement process (lesson design, lesson practice, and lesson evaluation) previously described. We asked the respondents about the degree of lesson improvement for the year. Two clear factors and factor scores were computed for each of the rotated components. The same configuration factor was observed in the analysis of FY2009 and FY2010. The results of the rotated analysis (Appendix A) indicate two distinct dimensions of lesson improvement: factor I, composed of 10 items related to lesson practice, and factor II, composed of 12 items related to lesson design.

- Lesson Practice (α : FY2009=.89, FY2010=.92)
- Lesson Design (α : FY2009=.91, FY2010=.91)

However, because the correlation coefficient between factors was high (FY2009=.79, FY2010=.81), we calculated the product of the factor scores and created a new variable called *lesson improvement*.

Professional community: From our literature review (Bryk *et al.*, 1999; Louis & Marks, 1998; Louis, Marks, & Kruse, 1996; Wahlstrom & Louis, 2008), we developed a professional community scale comprising 19 items. We asked the teachers about their perception of a professional community at the school where they worked. The same configuration factor was observed in the analysis of FY2009 and FY2010. The results of the rotated analysis (Appendix B) indicate three distinct aspects of the professional community: factor I, composed of nine items related to shared norms and values for student learning; factor II, composed of five items related to deprivatized practice and reflective dialogue; and factor III, composed of five items related to the collaboration.

- Shared Norms and Values for Student Learning (α : FY2009=.89, FY2010=.88)
- Deprivatized Practice and Reflective Dialogue (α : FY2009=.86, FY2010=.85)

- Collaboration (α : FY2009=.84, FY2010=.82)

Principal's leadership: This is a scale composed of three items: the principal makes a daily contribution to the students, parents, and school staff; the principal has frequent dialogues with the school staff and shows a supportive attitude toward them; and the principal has an inspiring vision that the school staff want to achieve. This scale was developed based on the servant leadership approach (ex. Barbuto & Wheeler, 2006). The results of the factor analysis showed that the scale is a one-factor structure in both FY2009 (range of factor loadings: .56 ~ .88; α =.80) and FY2010 (range of factor loadings: .59 ~ .86; α =.80).

Other characteristics: In addition to the variables on which our analysis focused, we believed that individual characteristics might also have a significant impact on lesson improvement. We examined the effects of three characteristics,

- Gender (1=male, 0=female; 44% male in FY2010)
- Professional age (standardized score of the ordinal scale of five-year intervals in FY2010)
- Type of school in which employed (1=junior high, 0=elementary; 47% junior high in FY2010)

Scale Items: School-level Data

Professional community: We set the school-level score of a professional community by calculating the average of the individual scores (Shared Norms and Values for Student Learning, Deprivatized Practice and Reflective Dialogue, and Collaboration) in a school unit.

Principal's leadership: We set the school-level score of each principal's leadership by calculating the average of the individual scores in a school unit.

Other characteristics: We set four school-level variables that might also have a significant impact on lesson improvement at the individual level.

- Male teacher ratio at the school
- School-level average professional age (aggregated individual-level scores at the school)
- Number of teachers at the school (standardized score)
- Lesson improvement in the previous year (aggregated individual-level scores at the school)

ANALYSIS AND RESULTS

In order to answer the research questions, we established a multilevel model consisting of eight individual-level variables (including a dependent variable) and eight school-level variables. These are posted in the table of descriptive statistics for FY2010 survey data (Appendix C), as FY2010 comprises the primary data for this case.

Table 1 presents the results of the multilevel analysis, wherein lesson improvement has been set

as a dependent variable. We used *SPSS Advanced Model ver.19.0* on the multilevel analysis.

In *Model 0* that do not turn on the independent variables, interesting results are shown on the ICC (Intraclass Correlation Coefficient) index. Between-school variance has statistical significance, but the ICC remained at 4.59%. Most of the variance in lesson improvement is described by within-school individual differences. The disparities in the lesson improvement were “within-school” rather than “between-school.”

Subsequently, we created four models, focusing on “individual level or school level” and “control variables or professional community variables” (*Model 1 ~ Model 4*). As mentioned above, we assumed that principal's leadership would be a moderate variable between professional community and lesson improvement. Therefore, we set the interactional variables that were multiplied by principal's leadership and professional community, and incorporated them into the analytical model. Below, we focus on *Model 4*, which showed the highest fitness index ($-2LL=2144.15$, $AIC=2148.15$) and the information for hypothesis testing.

Model 4 has shown that the school-level professional community did not have a significant effect on teachers' lesson improvement. The school-level variables with significant effects were “Number of teachers at the school” ($\gamma=-.17$, $p < .05$) and “Lesson improvement in the previous year” ($\gamma=.25$, $p < .01$). It was found that when the school size is small, lesson improvement is easily facilitated. In addition, the status of the lesson improvement of the previous year at the school level has effects on current individual lesson improvement.

With regard to professional community, both the SNVSL ($\gamma=.29$, $p < .01$) and DPRD ($\gamma=.21$, $p < .05$) as individual variables have statistically significant effects on lesson improvement.

Further, as for the effects of the independent variables (individual-and school-level) set in *Model 4* on lesson improvement, no differences between schools were observed ($ICC=0.59\%$). The variance of lesson improvement was not determined by the school where a teacher was working, rather by whether the teacher recognizes the professional community within the school.

We then examined the moderate effects of principal's leadership on the relationship between professional community and lesson improvement (*Model 4*). We found that the interaction variable (DPRD * Principal's Leadership) has a significant effect, even in the model in which the effects of other independent variables were controlled.

The moderate effect of principal's leadership is

Table 1 Multilevel Model of Lesson Improvement

	Model 0	Model 1	Model 2	Model 3	Model 4
γ_{00} Intercept	.87**	.75**	.60**	-.18	-.16
[Individual level]					
γ_{10} Gender (Dummy)		.22*	.25*	.24*	.24*
γ_{20} Professional age		.17**	.15**	.15**	.15**
γ_{30} Type of school where employed (Dummy)		.06	.08	.36	.52
γ_{40} Shared Norms and Values for Student Learning (SNVSL)			.24**	.28**	.29**
γ_{50} Collaboration			-.07	-.06	-.05
γ_{60} Deprivatized Practice and Reflective Dialogue (DPRD)			.20*	.21*	.21*
γ_{70} Principal's leadership			.01	-.06	-.09
SNVSL * Principal's leadership			.00	-.01	-.02
Collaboration * Principal's leadership			.01	.02	.02
DPRD * Principal's leadership			.29**	.29**	.29**
[School level]					
γ_{01} Male teacher ratio at the school				1.40	1.10
γ_{02} School-level average of professional age				-.25	-.08
γ_{03} Number of teachers at the school				-.19**	-.17*
γ_{04} Lesson improvement in the previous year				.18**	.25**
γ_{05} Shared Norms and Values for Student Learning (SNVSL)					.22
γ_{06} Deprivatized Practice and Reflective Dialogue (DPRD)					-.44
γ_{07} Principal's leadership					.05
SNVSL * Principal's leadership					.52
DPRD * Principal's leadership					-.38
Within-school variance	1.87**	1.84**	1.69**	1.69**	1.69**
Between-school variance	.09**	.09**	.08**	.01	.01
Intraclass correlation coefficient (ICC)	4.59%	4.66%	4.52%	0.59%	0.59%
-2 Log Likelihood (-2LL)	2202	2198	2157	2144	2144
Akaike's Information Criterion (AIC)	2206	2202	2161	2148	2148

Note. Individual level (N=644), school level (N=33) * $p < .05$. ** $p < .01$

Model 0: $Y_{ij} = (\gamma_{00} + \mu_{0i}) + \varepsilon_{ij}$.

Model 1: $Y_{ij} = (\gamma_{00} + \mu_{0i}) + \gamma_{10} + \gamma_{20} + \gamma_{30} + \varepsilon_{ij}$.

Model 2: $Y_{ij} = (\gamma_{00} + \mu_{0i}) + \gamma_{10} + \gamma_{20} + \gamma_{30} + \gamma_{40} + \gamma_{50} + \gamma_{60} + \gamma_{70} + \gamma_{70} * \gamma_{40} + \gamma_{70} * \gamma_{50} + \gamma_{70} * \gamma_{60} + \varepsilon_{ij}$.

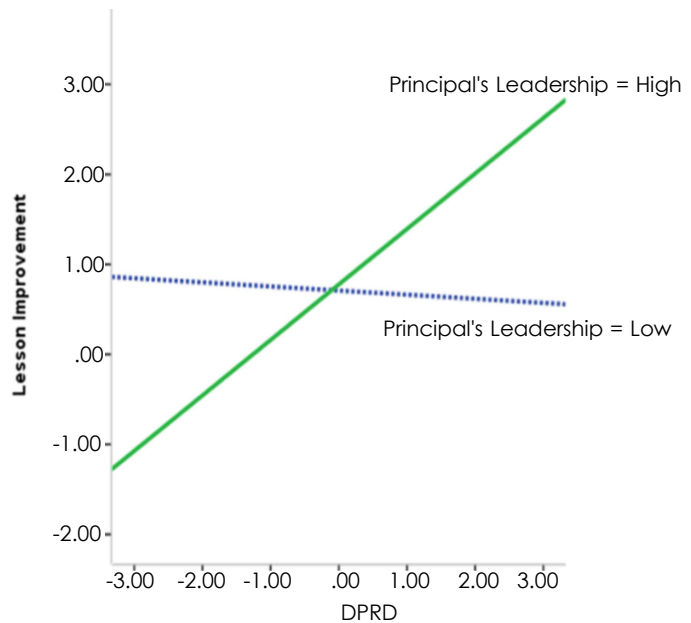
Model 3: $Y_{ij} = (\gamma_{00} + \gamma_{01} + \gamma_{02} + \gamma_{03} + \gamma_{04} + \mu_{0i}) + \gamma_{10} + \gamma_{20} + \gamma_{30} + \gamma_{40} + \gamma_{50} + \gamma_{60} + \gamma_{70} + \gamma_{70} * \gamma_{40} + \gamma_{70} * \gamma_{50} + \gamma_{70} * \gamma_{60} + \varepsilon_{ij}$.

Model 4: $Y_{ij} = (\gamma_{00} + \gamma_{01} + \gamma_{02} + \gamma_{03} + \gamma_{04} + \gamma_{05} + \gamma_{06} + \gamma_{07} + \gamma_{07} * \gamma_{05} + \gamma_{07} * \gamma_{06} + \mu_{0i}) + \gamma_{10} + \gamma_{20} + \gamma_{30} + \gamma_{40} + \gamma_{50} + \gamma_{60} + \gamma_{70} + \gamma_{70} * \gamma_{40} + \gamma_{70} * \gamma_{50} + \gamma_{70} * \gamma_{60} + \varepsilon_{ij}$.

γ_{00} : Intercept, ε_{ij} : error term of individual level, μ_{0i} : error term of individual level.

shown in **Fig1**. In situations where principal's leadership is not exerted, the implementation of DPRD does not explain the lesson improvement. On the other hand, in situations where principal's leadership is exerted, the implementation of DPRD explains the lesson improvement.

However, a moderate effect of principal's leadership was observed in the individual-level variables, and not in the school-level variables. Therefore, in interpreting the results, we should consider that the moderate effect of principal's leadership has occurred in the relationship between variables at the individual level as follows: If teachers perceive principal's leadership, professional community recognition would likely lead to lesson improvement. However,

**Fig 1. Moderate effect of principal's leadership**

if teachers do not perceive principal's leadership, professional community recognition is less likely to lead to lesson improvement.

DISCUSSION

Conclusions and Implications for Practice

The purpose of this study was to clarify the effects of the professional community on lesson improvement of a teacher in school organizations, utilizing multi-level analysis.

The research questions of this study aimed to test the following two hypotheses: (1) the individual-level professional community has an effect on teachers' lesson improvement, even if the school-level professional community was controlled; (2) in a situation where the principal demonstrates leadership, the professional community could promote teachers' lesson improvement.

The first hypothesis was supported by the multilevel analysis. We found that the variance in individual teacher's lesson improvement was in the teachers' recognition of professional community (SNVSL and DPRD) rather than the level of the professional community built at the school. In order to increase teachers' recognition of professional community, organizing small lesson study teams to continue lesson improvement would be preferable to all teachers working in one group. School organizations could facilitate continued lesson improvement by forming some small lesson study teams classified by grade, subject, and so on. The effects of small lesson study teams on lesson improvement have been discussed in several studies (Scribner, Sawyer, Watson, & Myers, 2007; Tsuyuguchi & Kuramoto, 2011). This suggestion is consistent with the result in **Table 1** that small schools are more likely to facilitate teachers' lesson improvement.

The second hypothesis is supported only in the analysis of individual-level variables. We discovered that, in a situation where the principal is able to exercise leadership, the professional community (DPRD) promotes teachers' lesson improvement. The concept of DPRD as one component of the professional community is formed by some subordinate factors, such as: the reflective dialogue after open classroom and class observation, the practices of open classroom and observation, effective feedback from colleagues, and exchange of knowledge about teaching techniques. A teacher that receives effective support from the principal as a servant leader tends to facilitate lesson improvement, in situations where a teacher experiences deprivatized practice and reflective dialogue. On the contrary, a teacher that does not receive effective support from the principal has difficulty facilitating lesson improvement, even in situations where a teacher

experiences deprivatized practice and reflective dialogue. Tsuyuguchi and Kuramoto (2011) described the characteristics of the schools where lesson improvement did not occur, in spite of the ongoing deprivatized practice and reflective dialogue within the schools. The principals of these schools were observed to have a passive attitude—for instance, they undertook classroom observation, filled in lesson evaluation sheets, and advised teachers. We could interpret that the passive behaviors of the principals who are not recognized as servant leaders leads a phenomenon whereby some habits of deprivatized practice and reflective dialogue do not lead to lesson improvement. These findings are important managerial knowledge in order to promote teachers' lesson improvement in school organizations.

Limitations and Future Research

Finally, we should point out the limitations of this study and possibilities for future research.

First, the survey target of this study is schools that participated in the Leader Teacher Training Project in Ehime Prefecture; this investigation is not intended to be a random sampling. Therefore, in interpreting the analysis results, it is necessary to consider the sample bias. Further, the sample population level of the study was not adequate (school level $N=33$). In future research, school-level samples in future research should be expanded, through further cooperation with school boards and schools. The second issue is the measurement scale. The scales of professional community and lesson improvement utilized in this study are reliable measures that are confirmed by the same dimension structure by multi-year. The internal consistency indicated by *Cronbach's α* coefficient has met the criteria score (above .70) in all variables. However, one problem that has emerged in this study is that we cannot use some variables in the analysis model because this can cause the problem of multicollinearity. The correlation coefficients between the extracted factors are high, as shown in Appendix C. The scales of professional community and lesson improvement have been built by cooperating with the board of education and referencing previous studies; however, the scales require further review. In addition, the measurement scale of servant leadership is a three-item configuration; the number of questions is very few. Improvements are needed.

Finally, this study was not able to include students' academic performance in the analysis model. This study set lesson improvement as a performance indicator. However, as far as possible, it is also desirable for a professional community study to analyze academic performance. We would like to carry out such a study in the future.

Note

(1) The four types of statistical fallacies have been defined as follows (Diez-Roux, 1998). Ecologic fallacy: a fallacy caused by making individual-level inferences based on group-level analysis. Atomistic fallacy: a fallacy caused by making group-level inferences based on individual-level analysis. Psychologicistic fallacy: a fallacy caused by making of individual-level inferences based on individual-level analysis without considering group-level effects. Sociologicistic fallacy: a fallacy caused by making group-level inferences based on group-level analysis without considering individual-level effects.

(2) Barbuto & Wheeler (2006) have developed the SLQI (the Servant Leadership Questionnaire), and have extracted the following five dimensions of servant leadership: (a) altruistic calling: leaders act in favor of the interests of clients and staff rather than their own interests; (b) emotional healing: leaders demonstrate listening behavior, so that staff can expect the leader to solve their emotional problems; (c) wisdom: leaders understand the status quo and foresee the future; (d) persuasive mapping: leaders persuade the staff to actively follow the selected direction; (e) organizational stewardship: leaders persuade the staff that the organization must strive to contribute to society.

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Appendix A Lesson Improvement Component Matrix

Survey Items	FY2009		FY2010	
	I	II	I	II
• I can understand the reaction of students and respond appropriately.	.80	-.07	.77	-.04
• I can help students come up with good opinions.	.73	.01	.74	.03
• I can create a situation where students listen well to the talk of teachers or friends.	.70	-.03	.80	-.10
• In the individual tutoring practices, I can grasp the learning situation of individual students and respond appropriately.	.69	-.03	.56	.16
• I can configure (reconfigure) lessons by utilizing the reaction of students.	.68	.06	.60	.09
• I can explain the learning contents to students in an easy-to-understand manner.	.66	.12	.70	.05
• I can create an atmosphere in which students can speak with confidence.	.64	.08	.73	.01
• I can establish the learning discipline of students.	.64	.09	.69	.05
• I can ask appropriate questions promoting better thinking activities for students.	.50	.24	.56	.22
• I can increase the interest of students and motivate them to learn.	.44	.35	.53	.28
• I can investigate the teaching materials from various perspectives.	-.10	.83	-.08	.81
• I can select suitable teaching materials and tools to achieve the aim of the lessons.	-.01	.71	-.07	.77
• I have a lot of knowledge about materials and units.	.01	.68	.19	.51
• I can plan the lesson depending on its goal and the situation of the students.	.14	.64	.14	.59
• I can devise the teaching-learning process by introducing methods such as problem-solving learning or experiential learning.	.08	.59	.29	.41
• I can understand the characteristics of the personality and thinking style of the students and utilize them in constructing the lesson plan.	.12	.57	.21	.58
• I can utilize information-communication technology effectively in the lesson.	-.06	.55	-.08	.62
• I can understand accurately the academic achievement and learning motivation of students.	.17	.55	.13	.54
• I can evaluate the academic performance of students properly.	.18	.47	.27	.45
• I can manipulate the learning forms (concurrent learning, group learning, and individualized learning) according to the situation.	.15	.44	.37	.34
• I can utilize the blackboard for promoting the students' comprehension.	.25	.43	.33	.36
• I can establish a classroom environment that motivates learning among students.	.30	.30	.27	.47

Note. N: FY2009=638,FY2010=644. Correlation coefficient between factors: FY2009=.786,FY2010=.806

Appendix B Professional Community Component Matrix

Survey Items	FY2009			FY2010		
	I	II	III	I	II	III
• Teachers have understood the need for lesson improvement.	.77	.06	-.11	.79	-.09	.05
• Teachers have shared the mission to be achieved in our school.	.76	-.07	.03	.75	-.01	.00
• Teachers have shared the responsibility for school improvement.	.75	-.08	.13	.49	.36	-.04
• Teachers have set a high-level instructional goal.	.73	.03	.05	.56	.16	.12
• This school has set a vision that teachers would like to achieve.	.70	.04	-.11	.59	.02	.05
• Teachers have understood the methods for the academic development of students.	.67	.04	.00	.89	-.15	-.09
• This school has built a trust relationship among teachers; therefore, we can work in peace.	.53	-.08	.25	.45	.28	.32
• Teachers have conversations with colleagues about the key goals of this school.	.51	.30	-.08	.34	.11	.32
• Teachers have shared the academic achievement score of students with their colleagues.	.35	.05	.20	.36	.05	.17
• We observe the lessons of colleagues and have discussions after the observation.	-.02	.98	-.12	-.03	.91	-.05
• Lesson study has become a habit in this school.	-.05	.85	-.04	-.00	.91	-.11
• Teachers provide effective feedback to colleagues.	.02	.68	.08	.04	.68	.04
• Teachers exchange with their colleagues the knowledge gained from external training.	.15	.42	.24	.03	.30	.42*
• Teachers exchange with their colleagues the knowledge of new teaching techniques.	.11	.42	.28	.04	.39	.35
• Teachers discuss lesson practices with colleagues even during rest time.	-.09	-.10	.84	-.13	-.03	.84
• Teachers discuss issues of classroom management with colleagues.	-.10	.05	.81	-.12	.04	.81
• Teachers discuss with colleagues how to help students who need special support.	.16	.10	.50	.14	.21	.32
• Teachers always interact with colleagues in good faith.	.34	-.02	.48	.37	-.12	.46
• Teachers support colleagues spontaneously.	.36	-.04	.47	.21	-.11	.68

Note. N: FY2009=638, FY2010=644. The result of the factor analysis of FY2010, ".423*", was included in factor III. However, in the process of measuring the items' configuration, we decided to include them in the group items of factor II by respecting the results of the analysis on FY2009. Correlation coefficient between factors on the FY2009 data: I & II=.630, I & III=.768, II & III=.521. Correlation coefficient between factors on the FY2010 data: I & II=.761, I & III=.568, II & III=.629.

Appendix C

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
[Individual level]																	
1 Lesson improvement	.86	1.41															
2 Gender (Dummy)	.44	.50	.08*														
3 Professional age	.00	1.00	.11**	-.08*													
4 Type of school where employed (Dummy)	.47	.50	-.03	-.26**	.03												
5 Shared Norms and Values for Student Learning	.07	.85	.22**	-.06	.00	.00											
6 Collaboration	.04	.87	.13**	-.12*	-.02	-.01	.69**										
7 Deprivatized Practice and Reflective Dialogue	.07	.86	.23**	.00	.03	-.06	.66**	.57**									
8 Principal's leadership	.00	1.00	.13**	-.01	.03	.08*	.58**	.49**	.39**								
[School level]																	
9 Male teacher ratio at the school	.44	.15	.09*	.31**	-.05	-.84**	.00	-.01	.07	-.07							
10 School level average of professional age	.02	.17	-.01	-.09*	.16**	.18**	-.02	-.04	-.03	-.01	-.28**						
11 Number of teachers at the school	.00	.98	-.10*	-.02*	-.02	.24**	.03	.02	.05	-.16**	-.07	-.10**					
12 Lesson improvement in the previous year	.02	1.04	.13**	-.06	.03	.34**	-.01	-.02	-.04	.19**	-.22**	.20**	-.04				
13 Shared Norms and Values for Student Learning	.05	.47	.07	-.08*	.02	.37**	-.02	-.04	-.04	.47**	-.27**	.13**	-.17**	.56**			
14 Collaboration	.03	.40	.07	-.09*	.02	.42**	.01	-.04	-.01	.44**	-.30**	.13**	-.12**	.43**	.92**		
15 Deprivatized Practice and Reflective Dialogue	.02	.52	.00	-.19**	.06	.70**	.00	-.02	-.03	.30**	-.61**	.39**	.11*	.64**	.74**	.68**	
16 Principal's leadership	.07	.56	.06	-.04*	.00	.15	.05	.05	.04	.57	-.13**	-.01	-.27*	.34**	.82**	.77**	.53**