

## Effects of Tissue Properties on OJT for Japanese Elementary School Teachers

**Masaaki Murakami**  
University of Tsukuba  
Tokyo, Japan

**Abstract.** The aging of Japan's elementary school teachers has made it necessary to implement more effective on-the-job-training (OJT) for junior faculty. Several approaches have been proposed to enhance the effectiveness of OJT for teachers. This study clarifies the effects of OJT on the tissue properties for elementary school teachers with one to two years of experience. Factor analysis is applied to questionnaire data to clarify a conceptual scheme. My proposed hypothesis about types of OJT includes indirect effects and differences in work experience. The hypothesis is verified by multiple regression analysis and t-tests. Results indicate that first types of OJT show indirect effects on tissue properties. Second, differences emerging types of OJT, tissue properties and performance in the recognition of teachers who have one to two years of experience. The study clarifies the relationship between types of OJT and their effects on tissue properties.

**Keywords:** OJT type; performance; tissue property; indirect effect; difference in experience

### 1. Introduction

The number of young faculty in Japan's elementary schools has been rising as mass numbers of baby boomers retire (Ministry of Education, Culture, Sports, Science, 2011, 2012). Human resource development for teachers is a critical issue in every municipality. In addition, teachers' organizations face challenges in promoting diversity, which are complicated by current social changes in Japan. The Tokyo Metropolitan Board of Education composed a human resource development policy in 2008 to address these challenges, and on-the-job training (OJT) guidelines were formulated based on this policy(Tokyo Metropolitan Board of Education, 2012). Goals and methods specified in these guidelines include building teachers' competence, fostering their decision-making ability and enhancing their ability to contribute to their organizations. It is necessary to promote teacher development through intentional, planned and continued OJT. However, OJT is left to each organization, and neither its effect nor its effectiveness has been verified empirically.

## 2. Theoretical Framework

### 2.1 Previous Research

Studies that examine OJT and competence formation fall into three categories. The first involves research related to OJT. Jong et al. (2001) classified four types of OJT but did not demonstrate its effects. Empirical studies have examined factors that influence the effectiveness of OJT; however, its actual impact remains unmeasured. Takahashi (2011) and Koike (2005) revealed that the accumulation of OJT has been poorly demonstrated because of difficulties in measuring and distinguishing training from work. Sato (2010) showed it is difficult to understand the implementation of OJT through research conducted in offices and companies. Thus, there is insufficient validation and understanding of the actual circumstances of OJT.

The second category of research into OJT concerns the impact of guidance and support by supervisors on the formation of a novice's skills. Drawing from a free-form questionnaire targeting 46 novice teachers, Yoshizaki (1998) demonstrated that guidance and advice from senior teachers and supervisors influence competence formation. Using multiple regression analysis, Yonezawa (2011) demonstrated that a supervisor's presence enhances competence formation among novice elementary school teachers. He suggested that young teachers recognize the value of life guidance and support; that is, they value training that instils competence in building relationships, teaching human development, making lesson plans, engaging in teaching practice and responding to pupils. He also performed statistical verification through a survey of 228 newly hired young teachers two to three years earlier.

Previous studies classify several types of OJT. Jong et al. (2001) identified four types according to the roles of the subject, the person in charge or the leader of training courses: workplace instruction, apprenticeship, problem-solving instruction and feedback. Workplace learning resembles the type of OJT discussed in Sekine (2012) and Nakahara (2010). It is learning that contributes to an organization's operation and occurs through interaction with artefacts and others to deepen the experience (Nakahara, 2010). Relationships with others and with co-workers are interposed with workplace learning. It is considered to be 1-N type of OJT discussed in Saito (2010). Workplace learning can include socialization and participant observation. Feedback and problem solving (Jong et al., 2001) are included in self-learning, defined as proactive learning to establish goals and objectives (Knowles, 1975).

Previous studies examined how various items can be measured for their effect on competence formation or OJT. Van der Klink (2002) examined attitude and skills. Sakakibara (2004) analysed attitude and ability, capacity building and skills. Sekine (2012) and Yonezawa (2011) addressed competence. Matsuo (2011) studied skills. Therefore, scales for measuring the effect of OJT in prior studies can be classified into ability, skills and attitude.

The third category of research into OJT concerns how organizational conditions influence competence formation. Kikuchi et al. (1993) found from a

questionnaire-based study correlations between a novice's competence formation and organizational culture. Tokita's (2009) free-form questionnaire and interview surveys of principals revealed the importance of creating a school guidance and support system, and fostering a culture wherein all faculty nurture novice teachers. Yonezawa (2010) showed by correlation analysis that faculty guidance and organizational climate in teacher training schools significantly affect competence formation. Matsuo (2011) demonstrated the need to revise teaching methods to make them congruent with young people's stages of development. Previous empirical research revealed that guidance by supervisors and faculty promotes competence formation among novices. This study suggests that competence formation is related to conditions observed in the tissue properties.

## **2.2 Research Question**

Three issues emerge from previous studies of OJT. First, verifying conditions that enhance the effectiveness of OJT is required. Previous studies correlated competence formation and organizational conditions such as tissue culture and support systems but have revealed no causal connections. It is necessary to verify the effects of tissue factors which include tissue culture and supports systems. Then, such property of tissue means what tissue culture and how support by being planned on OJT.

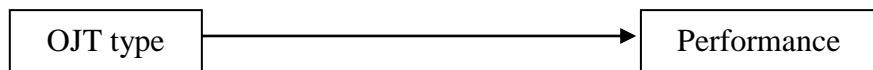
Second, competence formation through OJT warrants examination. OJT is intended for novice elementary and junior high teachers in Kikuchi (1993) and elementary school teachers with two to three years of experience in Yonezawa (2011). A study of early-career effects of OJT on competence formation among novice teachers is important for accumulating research and fostering practice.

Third, it is necessary to measure OJT's effects on performance using a reasonable scale. Previous studies proposed scales that demarcate ability, skills and attitude; however, it is impossible to objectively determine the effects of OJT by using them. This study uses performance as a measure. Takahashi (2010) defined performance as behaviour adopted to perform specific tasks in a defined period and its results. Borman and Motowidlo (1993) classified performance into task performance and contextual performance. Task performance is job behaviour adopted when conducting business and a role expected by an organization; contextual performance is behaviour that supports organizational, social and psychological environments and improves organizational functioning (Motowidlo & Van Scotter, 1994).

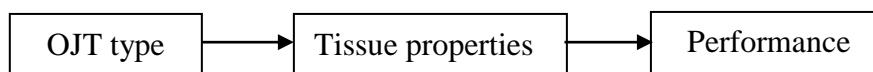
## **2.3 Hypotheses**

We propose two hypotheses raised by issues in previous studies. The first is that effectiveness of OJT is enhanced indirectly by tissue properties. It should not lead to the effect by simply implementing OJT. There should be indirect drivers to be effective in the practice. Then, following Kikuchi et al. (1993) and Yonezawa (2010), we hypothesized that teachers who receive OJT recognize the indirect effects on performance of tissue properties in the guidance provided by differing types of OJT. Figure 1 shows the direct effects model of types of OJT

and performance drawn from studies such as Yonezawa (2011) to demonstrate the indirect effects of tissue properties. In this model, types of OJT are the explanatory variable and performance is the dependent variable. Figure 2 illustrates an indirect effects model by tissue characteristics based on the hypothesis. In this model, we added the tissue properties in the direct effects model as parameter to each variable in the direct effects model.



**Figure 1. Direct effects model**



**Figure 2. Indirect effects model**

Then, we revealed how implementation of OJT affects teachers' performance during their first year after being hired. My second hypothesis is that teachers in their first year and second years recognize a difference among types of OJT, performance and tissue properties.

### 3. Methods

#### 3.1 Sample and Experimental Design

We surveyed teachers who receive OJT to locate those in their first and second years of employment in a public elementary school in Prefecture A. The survey using the same questionnaire was conducted two times, in August–September 2012 and August–September 2013. I was required to submit my request to mail the questionnaire to the targeted teachers the year before the survey was to take place. We distributed 418 copies (140 copies the first time, 278 copies the second time) to teachers extracted at random from Prefecture A. They returned questionnaires in a self-addressed envelope enclosed with the survey.

Attributes of teachers who received OJT are as follows. Of 109 responses, 58% were newly hired teachers with one year of experience and 42% had two years of experience. By age, 82% were in their 20s, 12% in their 30s and 48% in their 40s. The gender composition was 33% men and 67% women. As an indication of organizational size, 63% of schools had fewer than 18 classes and 37% had more. These measures also were analyzed by factor analysis, multiple regression and t-test by RGui.

#### 3.2 Measures

To investigate the hypothesis, we established three scales for measuring types of OJT, performance and tissue properties performance. Types of OJT were configured into job instruction, workplace learning and self-directed learning. We set three constructs and 19 measurement scales based of Knowles (1975),

Jong et al.(2001), OJT guidelines (Tokyo Metropolitan Board of Education, 2012), Sakakibara (2004) and Yonezawa (2011). We asked respondents for evaluations ranging from strongly disagree (1) to strongly agree (5) for each item.

We used task performance and contextual performance to construct a scale measuring the effect of OJT. Task performance was examined as the lower dimension based on four job performance criteria that teachers must meet (Sakakibara, 2004; Tokyo Metropolitan Board of Education, 2008) and the six criteria for job performance in Nakahara (2010).I constructed 14 measurements on the basis of improvement in skills and knowledge, goal-setting, information collection and analysis, judgment and decision making and situational awareness. We constructed 13 measurements for contextual performance on the basis of two concepts—cooperation with colleagues and devotion to duties—found in Ikeda (2010). We constructed 16 measurements on the basis of two concepts concerning tissue properties in Kikuchi et al. (1993), Yonezawa (2010) and Tokyo Metropolitan Board of Education (2012). The two concepts are atmosphere and planning of OJT.

#### 4. Results

This section explains the factor analysis of data concerning types of OJT, task performance, contextual performance and tissue properties. We performed multiple regression analysis and t-tests for each factor according to the hypothesis.

##### 4.1 Configuration of Scale

Table 1 shows results of factor analysis (Varimax rotation) using the maximum likelihood method for data related to type of OJT. Four factors were extracted. The first is *guidance by participant observation* because it features items concerning guidance in problem solving, devising improvement plans and opportunity to observe work. Cronbach's alpha ( $\alpha$  coefficient), obtained by reliability analysis, is 0.919. The second factor is *guidance in self-directed learning* ( $\alpha$  coefficient = 0.964). It primarily features items related to self-evaluation and goal setting on the job. The third factor is *guidance in improving teaching skills*( $\alpha$  coefficient = 0.67), because it primarily features items related to guidance in developing teachers' knowledge and skills, students' life skills and school affairs. The fourth factor is *guidance in socialization* ( $\alpha$  coefficient = 0.891). It features items related to collaboration with colleagues and the transmission of significant information.

**Table 1 Results of Factor Analysis on Scale of OJT Type**

Item	I	II	III	IV
I was given the opportunity to observe the nature of the job and classes by my OJT supervisor.	.703	.15	.378	.144
I received guidance when observing the state of work and classes.	.628	.48	.309	.113
I have been consideration to be received guidance from colleagues and senior workers.	.568	.264	.19	.227

My OJT instructor shared with members of the workplace situation.	<b>.442</b>	.358	.347	.368
I received guidance in collecting information needed to advance the work.	<b>.616</b>	.438	.242	.191
I received instructions in thinking the improvement plan at work.	<b>.664</b>	.343		.376
I was given responsibility for a particular task.	<b>.589</b>	.194	.255	.215
I received guidance in problem solving.	<b>.565</b>	.416	.185	.315
I received guidance on setting professional and personal goals.	.322	<b>.832</b>	.157	.32
I received guidance about planning work for personal growth.	.353	<b>.824</b>	.166	.296
I received guidance in self-evaluation for professional and personal growth.	.27	<b>.782</b>	.249	.353
I received instructions in the knowledge and skills related to teaching.	.548		<b>.655</b>	.138
I received instructions in the knowledge and skills related to lifestyle guidance of children.	.536	.101	<b>.729</b>	.109
I received instructions in knowledge and skills related to school affairs.	.196	.288	<b>.682</b>	.499
I received instructions in knowledge and techniques related to external negotiations.	.18	.334	<b>.643</b>	.365
I received advice on attitudes about life and work.	.16	.263	<b>.444</b>	<b>.688</b>
I was told the meaning and significance of the work.	.348	.342	.158	<b>.789</b>
I received guidance about sharing and performing duties in cooperation with colleagues.	.308	.359	.21	<b>.624</b>
Square sum of the load amount	4.31	3.67	2.91	2.82
Proportion Var	.227	.193	.153	.148

Table 2 shows the results of factor analysis (Varimax rotation) using the maximum likelihood method for data concerning questions about task performance. Three factors were extracted. The first is *goal setting* ( $\alpha = .917$ ). It mainly features items corresponding to goals. The second factor is *improving teaching skills* ( $\alpha = .868$ ). It features items about planning, providing appropriate guidance and responsibility for duties. The third factor is *information collection and analysis* ( $\alpha = .875$ ). It features items related to collecting and analysing information.

**Table 2 Results of Factor Analysis on Scale of Task Performance**

Item	I	II	III
I can find the goal at work.	<b>.857</b>	.257	.153
I can now consider concrete methods for achieving an objective.	<b>.824</b>	.253	.269
I can now address achievement of a target independently.	<b>.752</b>	.311	.266
I am now better at planning and implementation of teaching.	.568	<b>.428</b>	.317
I can have a better life through guidance.	.379	<b>.499</b>	.373

I can now participate in school affairs.	.243	<b>.627</b>	.29
I can support parents, community and outside agencies better than before.	.252	<b>.615</b>	.228
I now grasp the progress of work.	.28	<b>.773</b>	.175
I am more able to tackle the job on the basis of understanding the situation.	.246	<b>.711</b>	.425
I can extract the problem by considering the contents of the work.	.177	.377	<b>.774</b>
I became able to collect and analyze information necessary to work	.371	.324	<b>.71</b>
I can now determine the severity or urgency of problems.	.242	.501	<b>.453</b>
<u>I can now make decisions with respect to issues</u>	<u>.438</u>	<u>.226</u>	<u><b>.478</b></u>
Square sum of the load amount	3.13	3.08	2.29
Proportion Var	.24	.237	.176

Table 3 shows the results of factor analysis (Varimax rotation) using the maximum likelihood method for data concerning questions about contextual performance. Two factors were extracted. The first is *dedication and cooperation* ( $\alpha = .88$ ). It features items concerning efforts to improve duties, share information and collaborate with senior colleagues. The second factor is *independence* ( $\alpha = .88$ ). It features items related to work commitment, management and self-discipline.

**Table 3 Results of Factor Analysis on Scale of Contextual Performance**

Item	I	II
I became able to complete my duties responsibly without supervision and instruction.	<b>.504</b>	.24
I began to undertake self-development at all times.	<b>.604</b>	.219
I began to be able to enthusiastically tackle the improvement of business and difficult business.	<b>.761</b>	.128
I began to continue to overcome the obstacles to achieve the object.	<b>.704</b>	.208
I began to solve work problems proactively.	<b>.669</b>	.372
I began to pay closer attention to the important duties.	<b>.54</b>	
I was able to cooperate with colleagues and seniors.	<b>.522</b>	.28
I now react and feel the sensitivity of requests by colleagues and seniors.	<b>.677</b>	.256
I am able to share information about duties in the workplace.	<b>.718</b>	.211
I began to tackle positively difficult work.	.56	<b>.458</b>
I began to work harder than expected.	.151	<b>.986</b>
<u>I have begun practice self-management and self-discipline.</u>	<u>.54</u>	<u><b>.417</b></u>
Square sum of the load amount	4.02	2.03
Proportion Var	.335	.169

Table 4 shows the results of factor analysis (Varimax rotation) using the maximum likelihood method for data concerning questions about the tissue properties. Three factors were extracted. The first is *integral atmosphere* ( $\alpha = .93$ ). It features items related to guidance and evaluation of colleagues, the recognition of group consciousness and pride in work. The second factor is

*planned implementation* ( $\alpha = .898$ ). It features items related to creation of OJT program documents, determination of content and ongoing implementation. The third factor is *cooperative atmosphere* ( $\alpha = .631$ ). It features items related to awareness of educational objectives, opportunities for consultation and lively discussion.

**Table 4 Results of Factor Analysis on Tissue Property**

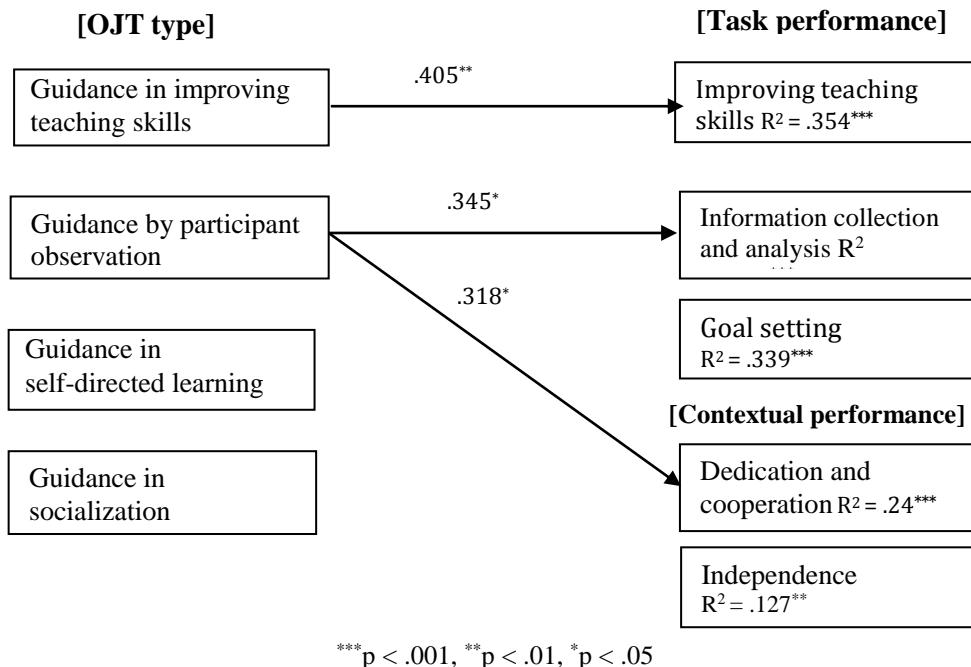
Item	I	II	III
There was an atmosphere of positive evaluation for the efforts of others.	.743		.272
Guidance and advice about school affairs and educational activities has been carried out each other.	.708	.212	.502
Teachers are talking about the growth of children in various situations.	.643	.314	.159
There was a collective sense of 'we' among teachers.	.729	.177	.454
Teachers were proud to work for the school.	.522	.249	.656
The general atmosphere was one of extending knowledge and skills required for work.	.637	.225	.47
Teachers was working area and guardians would appreciate the policy of guidance.	.645	.319	.384
A plan document has been created.	.136	.729	.188
The person in charge of OJT and its subject had been determined.	.335	.555	
The specific content and duration of OJT has been established.		.926	.196
OJT was implemented in stages.	.105	.85	.238
OJT has been continuously implemented.	.4	.748	.142
Staff was aware of the school's goals in their respective duties.	.334	.272	.526
It is possible to exchange ideas freely at meetings.	.234		.836
Faculty can discuss personal troubles with each other.	.328	.159	.487
Square sum of the load amount	3.68	3.48	2.72
Proportion Var	.225	.144	.122

#### 4.2 Relation of various factors in OJT

In this section, the path analysis was a repeated using multiple regression analysis on two or three levels. The explanatory variable was the higher variable in the two-level context, and the objective variable was the lower variable. We use multiple regression analysis by successive selection. We sought combinations of variables having the highest degrees of freedom, adjusting the contribution rate by increasing or decreasing the variable from the maximum model. Figures 3 and 4 show the results. Results from the path analysis are as follows.

First, we consider direct effects, which represent the impact of types of OJT on performance, to compare with the indirect effects in Figure 3. Figure 3 shows the direct effects of OJT on performance. This supports previous studies of the

implementation of OJT and its effects. *Guidance in improving teaching skills* showed a significant positive path to *improving teaching skills*. *Guidance by participant observation* showed a significant positive path to *information collection and analysis* and to *dedication and cooperation*. Thus, these types of OJ are found to be effective without mediation by tissue properties. However, several factors do not show a significant path.

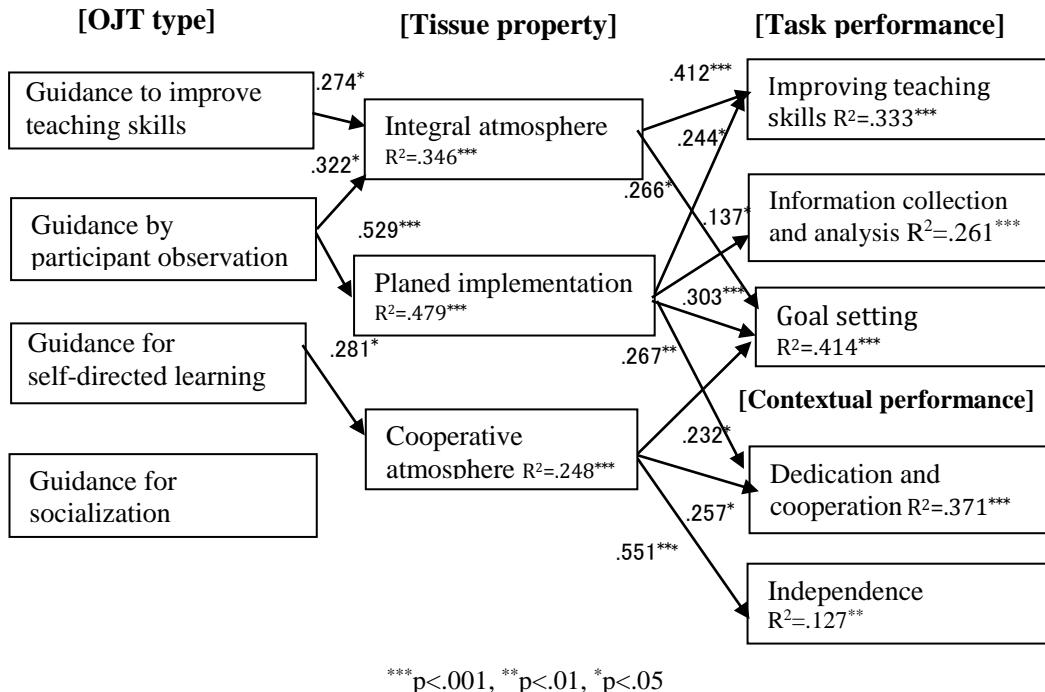


**Figure 3. Path diagram showing the direct effects model of OJT**

From the results in Figure 4, we considered two points. First, we considered indirect effects, which represent the impact of types of OJT by mediating the tissue properties towards performance. Three types of OJT displayed significantly positive paths relative to five performance factors by mediating three tissue properties. *Guidance by participant observation* and *Guidance in improving teaching skills* show indirect effects on *goal setting* and *improving teaching skills* by mediating integral atmosphere of tissue properties. Teachers receiving OJT recognize the effects of these three tissue properties on the organization. Further, *guidance by participant observation* indicates the indirect effects of *improving teaching skills*, *information collection and analysis*, *goal setting*, *dedication and cooperation* by mediating the planned implementation. This shows that teachers receiving OJT recognize the effects of *guidance by participant observation* on *improving teaching skills*, *information collection and analysis*, *goal setting*, *dedication and cooperation*. Only *guidance by participant observation* showed an indirect and significantly positive path to *information collection and analysis* such as task performance mediated by planned implementation. *Guidance in self-directed learning* showed an indirect effect by mediating the cooperative atmosphere of tissue properties, to *goalsetting*, *dedication and cooperation* and *independence*. The effect of a cooperative atmosphere is acknowledged by teachers who receive guidance in self-

evaluation and setting growth goals. Only *guidance in self-directed learning* showed a significant positive path to *independence*. Goal-setting showed indirect effects mediated by all tissue properties. It is important in performing duties and is apparently emphasized in OJT.

The second point concerns factors that show no path. *Guidance in socialization* shows no path to *performance*, although other factors might relate to it.



**Figure 4. Path diagram showing the indirect effect model by tissue property**

Table 5 shows the results of t-tests using means for each factor rated by teachers in their first and second years of experience. We considered the following points. Among the factors related to types of OJT, differences emerged in *guidance by participant observations*, *guidance in self-directed learning* and *guidance in socialization*. This indicates that first-year teachers receiving OJT are more aware than second-year teachers of implementation in three types of OJT.

Among tissue property factors, a difference emerged in *planned implementation*. This indicates that OJT for first-year teachers is better planned than for second-year teachers. Among performance factors, a difference emerged in *goal-setting* under task performance and *dedication and cooperation* under contextual performance. This indicates that *goal-setting* and *dedication and cooperation* are recognized by first-year teachers receiving OJT. Their recognition of each factor was higher than among second-year teachers. This result indicates that OJT for first-year teachers affects performance. Recognition by second-year teachers was below that of first-year teachers. It is considered the effect of factors other than OJT and the required contents changed through improved performance, which

is effectiveness of OJT in the first year.

**Table 5 Mean and standard deviation of OJT subject teachers' group about each factor**

Factor name / Experience		1st year (N:63)	2nd year (N:46)	t-values
OJT type	Guidance by participant observation	4.25 (.69)	3.95(.82)	<b>2.05</b> *
	Guidance for self-directed learning	3.96(.95)	3.58(.98)	<b>2.02</b> *
	Guidance to improve teaching skills	4.39(.77)	4.29(.81)	0.65
	Guidance for socialization	4.29(.75)	3.85(1.02)	<b>2.58</b> *
Tissue property	Integral atmosphere	4.11(.75)	4.09(.76)	0.17
	Planned implementation	3.96(.92)	3.57(.94)	<b>2.17</b> *
	Cooperative atmosphere	3.81(.70)	3.62(.85)	1.31
Performance	Goal setting	4.06(.73)	3.73(.77)	<b>2.29</b> *
	Improving teaching skills	3.98(.56)	3.82(.61)	1.41
	Information collection and analysis	3.77(.61)	3.64(.58)	1.05
	Dedication and cooperation	3.93(.45)	3.7 (.55)	<b>2.39</b> *
	Independence	3.57(.58)	3.42(.57)	1.34

\*\*\*p<.001, \*\*p<.01, \*p<.05 () Standard deviation

## 5. Discussion

This study seeks to reveal which types of OJT affect elementary school teachers. Previous studies of competence formation among teachers such as Yonezawa (2011) focused on teachers' awareness. Those studies employed guidance in competence formation as an explanatory variable and competence to be formed as the dependent variable. This study is the first based on an indirect effects model according to tissue properties such as atmosphere and planned implementation. In this model, the type of OJT is an explanatory variable, tissue properties are parameters and performance is the dependent variable. We examined the indirect effects hypothesis on the basis of the indirect effects model by tissue properties. In addition, we analysed the recognition of OJT factors by years of experience. We verified the difference in types of OJT, tissue properties and performance as recognized by first- and second-year teachers.

Results of the analysis supported the indirect effects hypothesis. Among teachers receiving OJT, *guidance by participant observation* and *guidance in*

*improving teaching skills* showed indirect effects on two performance measures mediated by the integral atmosphere. *Guidance by participant observation* showed an indirect effect on three measures of task performance and one measure of contextual performance by mediating systematic implementation. *Guidance in self-directed learning* showed an indirect effect on one task performance measure and two measures of contextual performance by mediating the collaborative atmosphere. *Guidance in improving teaching skills* and *guidance by participant observation* also show a direct effect on the three performance measures. The direct effects showed three paths and the indirect effects nine paths. These results establish that varying types of OJT enhance effectiveness by mediation by tissue properties. Thus, this study reveals that performance is enhanced through the indirect effects of tissue characteristics in the practice of OJT.

Further, in the results of t-tests a difference is observed among first- and second-year teachers in recognising the types of OJT, tissue properties and performance. First-year teachers showed a high recognition of each factor. Therefore, the hypothesis regarding differences in years of experience with OJT was supported. These findings suggest three implications with regard to OJT in Japan's elementary schools. The first is that content planning, particularly as it concerns problem solving and observation of classes, is heavily required of faculty in charge of OJT. Doing so will improve teaching skills, goal setting, dedication to duties and cooperation with colleagues.

Second, development of the workplace atmosphere is effective in implementing OJT. An organization that shares a commitment to duties cooperates and displays a sense of unity, leads to improved task and contextual performance. The third finding is that responsiveness to OJT corresponds to work experience. First-year subject teachers showed a high recognition of three types of OJT. On the other hand, no difference was found in *guidance in improving teaching skills*, which was constant across teachers with one and two years of experience. We considered other types of OJT to be effective by intensive implementation in the first year. Implementation of OJT is effective with the plan of organization for teachers in the first year.

This study's limitations reveal issues for future research. Firstly, 109 observations is an insufficient sample. An examination of differences due to personal attributes (e.g. job level and organizational size) would be possible by increasing the sample size. Surveys of only individual researchers are a very difficult period. It is necessary to secure cooperation by schools and boards of education to expand the number of samples by conducting a usefulness study. This study's second limitation concerns its measurement scale. Articulating factors of OJT made it impossible to establish a path via multiple regression analysis. There is a need to study factors not included in this study.

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