KJEP 11:2 (2014), pp. 179-203

The impact of an innovative school climate on teachers' knowledge creation activities in Korean schools: The mediating role of teachers' knowledge sharing and work engagement

Ji Hoon Song
University of North Texas, U.S.A.
Woocheol Kim
Chung-Ang University, Korea
Dae Seok Chai
Texas A&M University, U.S.A.
Sang Hoon Bae
Sungkyunkwan University, Korea

Abstract

This study examined the structural relationships among innovative school climate, knowledge sharing, work engagement, and knowledge creation activities among high school teachers in Korea. It also investigated the mediating roles of teachers' organizational behaviors—knowledge sharing and work engagement—in explaining the impact of a school's innovation climate on teachers' knowledge creation practices. The authors obtained 1,125 responses from 38 Korean high schools. Structural equation modeling (SEM) and the Sobel test were mainly employed to examine empirically the proposed model and hypotheses. The results indicate that an innovative school climate positively influences teachers' knowledge sharing and work engagement and affects the outcome variable, teachers' knowledge creation practices. We also found that the two proposed behavioral factors act as mediators linking schools' innovation climate with teachers' knowledge creation.

Keywords: school innovation climate, work engagement, knowledge sharing, knowledge creation practices, Korean high school teachers

Introduction

With the rapid spread of a knowledge-based society, creation of innovative knowledge is increasingly considered to be critical to the competitiveness of the individual as well as the organization. This belief is undoubtedly pertinent to education, the major purposes of which include creation and transfer of knowledge to prepare people to be economically competitive and to be successfully socialized members. Given the key role of teachers in leading the "technical core: teaching and learning" (Hoy & Miskel, 2013, p. 29) in schools, they are perpetually expected to be knowledge workers who continue to create, develop, and share knowledge and skills in their workplace—i.e., schools (McCharen, Song, & Martens, 2011). In this regard, greater attention is now paid to increasing teachers' ability to create knowledge and developing organizational environments that encourage teachers' active involvement in knowledge creation.

Along with the growing perception of the importance of knowledge creation, creativity has become an area of interest among not only business leaders, but also educators (McCharen et al., 2011; Song, Kolb, Lee, & Kim, 2012). How to encourage teachers' creativity and thus the institutional innovation of schools has become a vital issue in improving the quality of education and thereby developing a competitive workforce, which eventually leads to competitiveness on a national level (Frost & Durrant, 2003). In the case of Korea, teachers' creative roles are presently recognized as one of the most influential factors for student achievement as well as school performance, including the development of effective and creative course materials and the productive management of courses (Bae, Song, & Kim, 2012). In its 2013 annual policy report, the Korean Education Ministry announced the development of creative talents as a top priority for education policies. The importance of teachers' creativity has become a critical issue in the Korean education setting.

From an organizational theory standpoint, an organization's innovation is greatly influenced by two factors: organizational system and climate, and employees' behaviors (Cummings & Worley, 2008). Furthermore, the culture and climate of the organization is intimately associated with employees' willingness to engage in their tasks (Garvin, 1993; McCharen et al., 2011). In particular, a supportive organizational climate is positively associated with employees' collaborative actions and work engagement, both of which lead to organizational learning activities that form the basis of knowledge creation practices in the workplace (Bae et al., 2012; Dixon, 2000; McCharen et al., 2011; Nonaka & Takeuchi, 1995).

In this context, the purpose of this study is to examine the relationships among (1) an environmental factor—innovation support of schools (IS), (2) teachers' behavioral factors—knowledge sharing (KS) and work engagement (WE), and (3) a knowledge creation performance factor—teachers' knowledge creation practices (KC) in the Korean school context. To investigate the relationships among these factors, this study employed several concepts and variables from the general management

disciplines, assuming that public schools are similar to profit-oriented organizations in that both have a complex structure with several types of stakeholders, a dynamic work process and connections with internal and external organizations (Bonner, Koch, & Langmeyer, 2004; McCharen et al., 2011).

This study is significant both on a practical and a theoretical level. First, the results will help school leaders and administrators to develop strategic plans for school innovation, taking into consideration school climate and teacher attitudes and behaviors in relation to knowledge creation practices. The results will particularly suggest practical implications to school leaders and administrators on strategic human resource management and training programs for teachers. Second, the study will contribute to understanding the multi-dimensional model for school performance on knowledge creation, incorporating both the structural system and behavioral components of school organization.

Literature review

Innovation support

The environment is a critical factor influencing individuals to think and behave in certain ways (Amabile, 1998). In particular, the physical and psychological work environments powerfully influence the behaviors and thinking of individuals in the areas of creativity and innovation in organizations (Bain, Mann, & Pirola-Merlo, 2001; Kanter, 1988; Scott & Bruce, 1994). For example, many empirical studies have confirmed the relationship between support for innovation and innovative behaviors in school settings (Creemers & Reezigt, 1999; McCharen et al., 2011; Moolenaar, Daly, & Sleegers, 2010; Smyth & Van der Vegt, 1993; Tubin, 2009).

Innovation support in this paper can be defined as psychological and physical support to encourage creative and innovative processes and behaviors, which lead to the improvement of innovative performance (Choi, Moon, & Ko, 2013; Scott & Bruce, 1994; West, 1990). A number of scholars have suggested examples of innovation support: a supportive learning culture (Watkins & Marsick, 1993); acceptance of the failure of an innovation (Cumming, 1998); leaders' support and promotion of innovative ideas and experimentation (Skerlavaj, Stembergera, Skrinjara, & Dimovskia, 2007); well-built feedback processes; recognition of personal matters achievement, and works; concern for employee satisfaction (Williams & Anderson, 1991); and perceived organizational support (Eisenberger, Fasolo, & Davis-LaMastro, 1990). Interestingly, several scholars have emphasized that perceived support is often more important than actual support (Leung, Huang, Su, & Lu, 2011; Scott & Bruce, 1994). Psychological climate theory (James & Sells, 1981) explains this phenomenon based on the assumption that people react primarily to perceived environments rather the actual environment. Lastly, while organizational

innovation is considered as innovative process or product improvement from the management perspective, school innovation is often understood as innovation in the school system, work process, and the quality of education (McCharen et al., 2011; McRoy & Gibbs, 2009).

Work engagement

Work engagement is defined as a "positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption" (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002, p. 74). School teachers work with high levels of energy, vigor and psychological resilience, are devoted to their work, and endure when they are confronted with difficulties (Hakanen, Bakker, & Schaufeli, 2006). Dedication means a "strong psychological identification with one's job" and absorption as "being fully concentrated and engrossed in one's work" (Hakanen et al., 2006, p. 498). However, Gonzalez-Roma, Schaufeli, Bakker, and Lloret (2006) define absorption as an output of work engagement. As a core dimension of engagement, vigor is the opposite of exhaustion on a continuum of work energy, and dedication is the opposite of cynicism on a continuum of identification (Gonzalez-Roma et al., 2006). More importantly, work engagement has positive relationships with extrinsic and intrinsic motivation (Bakker, Albrecht, & Leiter, 2010; Salanova & Schaufeli, 2008).

Knowledge sharing

Skills to facilitate knowledge sharing and creation have become a critical domain for educational leadership across the world (Walker, Bryant, & Lee, 2013). Defined as "a fluid mix of framed experience, values, contextual information, and expert insight" (Davenport & Prusak, 1998, p. 5), knowledge is a critical resource providing a competitive advantage for the sustainability of an organization (Wang & Noe, 2010). Knowledge sharing is the process of exchanging task information and expertise to solve problems, create knowledge, and achieve common goals (Cummings, 2004; Gagné, 2009; Van den Hooff & De Ridder, 2004). Social exchange theory (Blau, 1964) is commonly used to explain knowledge sharing behaviors because it clarifies the motivation for the exchange. According to this theory, school teachers exchange knowledge with other teachers as they analyze the costs and benefits of the interactions, with the purpose of maximizing benefits and minimizing costs (Molm, 2001). They share knowledge with the expectation of reciprocity in the future, and the benefits can be tangible or intangible (Davenport & Prusak, 1998; Gouldner, 1960). To maximize these benefits, they develop their social networks by sharing their knowledge. Several studies support the idea that, in a school setting, teachers who share their expertise in an autonomous and collaborative environment

perform well (Fullan, 2002; Timperley & Robinson, 2000). Of course, individual (e.g., trust and empathy), organizational (e.g., sharing opportunities and relationships), and technological factors (e.g., appropriate information technology systems and communication channels) must be maintained to allow school teachers to share their knowledge (Gagné, 2009). In particular, motivation plays a critical role in knowledge sharing because it is related to voluntary actions (Gagné, 2009).

Knowledge creation

Knowledge creation is a spiraling process of interactions between explicit and tacit knowledge in four conversion modes, called SECI modes: socialization (S), externalization (E), combination (C), and internalization (I) (Nonaka, 1994). Whereas explicit knowledge is easy to formalize and communicate, tacit knowledge is not and requires additional tools, such as personal interaction, technical skills, and experience. The socialization mode refers to sharing tacit knowledge among individuals through joint activities, such as apprenticeships and shadowing (Nonaka, 1994). The externalization mode refers to converting tacit to explicit knowledge for creating applicable concepts through the continued dialogues and collective reflections among the members using the metaphor and analogy approaches (Nonaka & Konno, 1998). The combination mode converts explicit knowledge to more complex sets, and internalization mode then converts more complex sets of explicit knowledge into tacit knowledge (Nonaka & Konno, 1998). This tacit knowledge could be individual, organizational, or both. In addition, Von Krogh, Ichijo, and Nonaka (2000) suggested the five knowledge creation enablers that are the basic components for creating a supportive climate for knowledge creation: (a) instilling the organizational mission, (b) managing conversation, (c) mobilizing knowledge activists, (d) creating a supportive context, and (e) leveraging local knowledge. The five climate-oriented enablers above are known to enhance the dynamic and effective activities of teachers' knowledge creation in school systems. According to the SECI theory, the interactions among the environmental supports and knowledge creation practices are determinants of the level of organizational knowledge and financial performance (Nonaka & Konno, 1998).

Korean high school administrators and teachers

According to the 2013 Statistical Yearbook of Education (Korean Educational Development Institute [KEDI], 2013), the number of high schools in Korea has steadily increased since 1965. With the decreasing number of students, along with the increasing number of teachers in high schools since the end of 1990s, class size has continued to decrease (KEDI, 2013). Nonetheless, the number of students per teacher, 15.8, in Korean high schools, is still slightly higher than the OECD average,

13.9 (KEDI, 2014). While high school administrators and teachers have high job demands due to the various stakeholders (e.g., students, parents, supervisors, and government agents) and various tasks (e.g., teaching, documenting, leading, and mentoring), it is widely accepted that the decrease in class size has contributed to improving teaching and working conditions and thus enhancing the quality of education.

On the organizational behavior perspective, despite the improvement of the school supports perceived by teachers in high schools, the perceived level of autonomy, cooperation on work, and engagement of teachers are still considered mediocre when compared to other OECD countries (Chung, Kim, Park, & Lee, 2007; Namgung, Kim, Im, & Kim, 2013). In addition, teachers point out that their ideas and opinions are often ignored as policy makers or school administrators carry out their plans for innovation or change (Chung et al., 2007). Above all, the most salient problem for Korean high school teachers may be strong pressure to enhance test scores of students. Teachers complain that they have to prepare students for college entrance examinations and they feel powerlessness.

To deal with the issues and create better school environments, greater efforts have been made by Korean central governments and provincial offices of education (J. Park, 2012), particularly the improvement of teachers' autonomy and work engagement. An individual teacher who secures autonomy through job control and innovativeness may become more vigorous and dedicated (Chung et al., 2007; Hakanen et al., 2006). Likewise, engaged teachers actively participate in teaching, mentoring, and school activities, and take more opportunities to work with other teachers, share their know-how, and learn from others such as experts. In this context, both the central and local levels have implemented a variety of policies to stimulate teachers' autonomy and engagement to achieve the collective goals of the school, while providing opportunities to develop competencies for teaching and problem solving (Chung et al., 2007). Lastly, teachers in Korean high schools are expected to take part in interactive and collaborative learning and teaching. They are encouraged to build close relationships with the local community, working together develop the curriculum together and sometimes teach together. In Korea's school context, however, it is not easy to do this, because teachers have their own physical classrooms and are allowed to teach subjects in their own way.

At any rate, autonomy and engagement, cooperation among teachers, and building school environments to promote these organizational factors are becoming increasingly important in Korean high schools. We argue that all of these factors are associated with the notion of teachers as knowledge workers in the knowledge based society.

Conceptual framework

The conceptual framework for this study is shown in Figure 1. It was developed by the integration of related theories and concepts, including self-determination theory, knowledge conversion theory, the theory of intrinsic and extrinsic motivation, and the job demands-resource model.

We developed the following research questions, based on our conceptual model: To what extent are the hypothesized constructs (innovation support, knowledge sharing, work engagement, and knowledge creation of teachers) associated? Provided below are specific research hypotheses, including the relationships between research variables suggested by previous studies and the relevant theories.

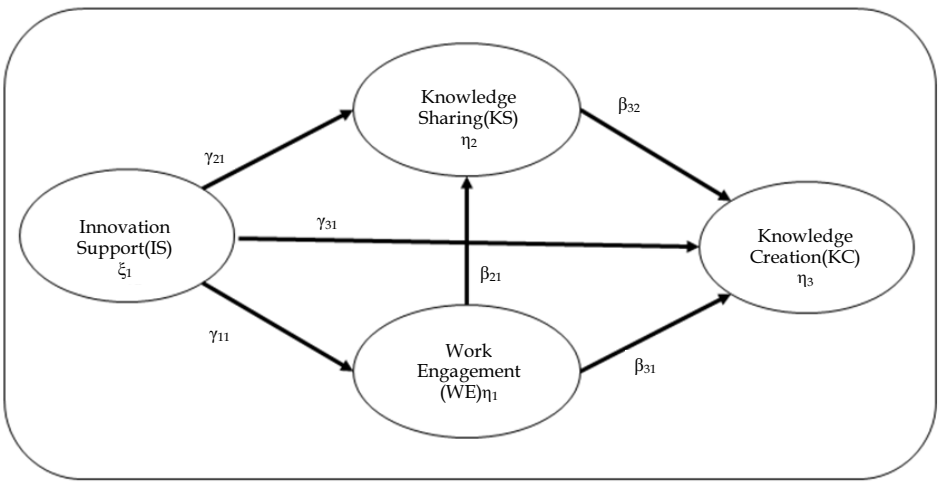

Figure 1. The study's conceptual framework

The effect of innovation support

Self-determination theory (Deci & Ryan, 1985) explains the relationship between innovation support and voluntary and innovative behaviors in that a supportive climate for innovation motivates people internally, which is an effective way to add to the innovation process (Kaufmann & Tödtling, 2002; McLean, 2005). According to Deci and Ryan, intrinsic motivation is important driver of human behavior and is clearly different from extrinsic motivation. For example, reward and recognition must be used differently because a reward is an extrinsic motivator while recognition improves intrinsic motivation under certain conditions (Hansen, Hansen, & Smith, 2002). Based on this theory, school teachers are motivated by the environment, and autonomy, competence feedback, and relatedness are the primary

motivational factors (Deci & Ryan, 1985). In line with this theory, the study by McCharen et al. (2011), with data from 2,400 public school teachers, showed the strong relationships between innovation support and knowledge sharing and knowledge creation. In addition, the Job Demands–Resources Model (Bakker, Demerouti, De Boer, & Schaufeli, 2003) maintains that workforces can be intrinsically and extrinsically motivated by job resources, which can be defined as "physical, psychological, social, or organizational aspects of the job" (Hakanen et al., 2006, p. 497) that reduce costs, assist in achieving work goals, and encourage individual development. Researchers (Y. K. Park, Song, Yoon, & Kim, 2013; Saks, 2006) empirically proved that individuals in organizations are more likely engaged when provided with psychological and physical support from their organizations.

Therefore, we propose that innovation support—whether physical, psychological, social, or organizational—motivates school teachers and may ultimately be related to WE, KS, and KC. Furthermore, Alavi and Leidner (2001) and Chou and Wang (2003) proposed that individual, organizational, and technological innovation support are clearly related to knowledge creation. Hence, we propose our first hypothesis:
Hypothesis 1: Innovation support in high schools positively influences teachers' work engagement, knowledge sharing, and knowledge creation.

The effect of work engagement

According to Wrzesniewski, McCauley, Rozin, and Schwartz (1997), engaged employees tend to decrease job demands and increase job resources to improve their innovative behaviors and performance proactively. Y. K. Park et al. (2013) also found strong relationships between work engagement and innovative behaviors. Engaged teachers were more likely to generate creative ideas and behave in creative ways, which in turn improve teaching abilities and instructional performance (Saunders, 2006). In addition, several scholars maintain that work engagement is contagious, based on their empirical studies (e.g., Barsade, 2002; Sy, Cote, & Saavedra, 2005). Therefore, engaged school teachers create a positive and proactive team or organizational work climate, which strongly impacts others' work engagement and ultimately builds a culture to encourage sharing and creating knowledge proactively. Thus, we propose our second hypothesis:
Hypothesis 2: Teachers' work engagement positively influences their knowledge sharing and knowledge creation.

The effect of knowledge sharing

Knowledge creation would be limited if individuals did not share their knowledge (Schulz, 2001). School teachers might share their knowledge to develop relationships and maximize benefits, based on social exchange theory. Ultimately,

they build and strengthen relationships with others, which could be identified as social capital. Social capital refers to the aggregation of relationships themselves and the resources embedded in the relationships (Nahapiet & Ghoshal, 1998). Interestingly, several scholars have proposed that the quantity and quality of relationships, which could be built by knowledge sharing behaviors, strongly impact knowledge creation (McFadyen & Cannella, Jr., 2004; Pérez-Luño, Medina, Lavado, & Rodriguez, 2011). In addition, as proposed in the organizational knowledge creation theory (Nonaka, Von Krogh, & Voelpel, 2006), the strong relationship between knowledge sharing and knowledge creation has been empirically demonstrated in several studies (e.g., O'Neill & Adya, 2007; Rosen, Furst, & Blackburn, 2007). Therefore, we propose our third hypothesis:
Hypothesis 3: Teachers' knowledge sharing positively influences their knowledge creation.

The mediating effect of work engagement

As explained earlier, both psychological and physical innovation support can improve the workforce's intrinsic and extrinsic motivation. These types of motivation seem to have a positive relationship with work engagement (Bakker et al., 2010; Salanova & Schaufeli, 2008). In this vein, Salanova and Schaufeli (2008) implemented work engagement as an indicator of intrinsic motivation at work because it "refers to a more persistent affective–motivational state that is not focused on any particular object, event, or behavior" (p. 118). In addition, engaged employees stimulate their own intrinsic motivation while decreasing job demands and increasing job resources to improve their innovative behaviors and performance (Wrzesniewski et al., 1997). Therefore, work engagement could moderate the relationships between innovation support and knowledge sharing and knowledge creation. Thus, we hypothesize the following:
Hypothesis 4: Teachers' work engagement plays a mediating role in the relationship between high schools' innovation support and teachers' knowledge sharing and knowledge creation.

The mediating effect of knowledge sharing

Based on the SECI model (Nonaka, 1994), knowledge sharing is a necessary condition for knowledge creation. In the processes of knowledge sharing, a collaborative environment is created and encouraged, and ultimately leads to cooperative learning among employees (Janz & Prasarnphanich, 2003). According to cooperative learning theory (Johnson & Johnson, 1989), when teachers work together, they learn cooperatively while sharing tacit knowledge and ultimately develop knowledge to maximize their performance with the required conditions, such as

positive interdependence, interaction, and group processes (Johnson, Johnson, & Holubec, 1989). Therefore, it is expected that the positive effects of innovation support and climate on knowledge creation would be stronger when school teachers share knowledge. On the other hand, engaged teachers might improve the school and teaching environment in more innovative ways because work engagement contagiously influences others' work engagement, builds a proactive work environment, and finally creates knowledge (Bakker et al., 2010; Wrzesniewski et al., 1997). In this relationship model, engaged teachers who work collectively and share knowledge would acquire a greater quantity and quality of social capital, which then leads to knowledge creation (McFadyen & Cannella, Jr., 2004; Nahapiet & Ghoshal, 1998; Pérez-Luño et al., 2011). Therefore, our last hypothesis is:
Hypothesis 5: Teachers' knowledge sharing plays a mediating role in the relationships among high schools' innovation support and teachers' work engagement and knowledge creation.

Methods

Sample

To identify the relationships among innovative support, knowledge sharing, and work engagement for teachers' knowledge creation, our sample was selected from teachers at 17 general high schools and 21 career technical high schools across South Korea.[2)] Having contacted the principals, around 40 teachers were randomly selected from each school.[3)] 1,680 surveys were distributed.

Instruments

Five items were used to examine the level of the school's innovation support as part of its overall climate. This measure was developed and validated by Skerlavaj et al. (2007) and Skerlavaj, Song, and Lee (2010) in the Korean context. This instrument primarily measures how schools support and encourage innovative activities by members. Skerlavaj et al. (2010) found the innovation climate measure shows acceptable construct validity (factor loadings range from .76 to .85) and item reliability (CRI = .88 and AVE = .79). A sample item is "Innovation proposals are welcome in the organization." Each item was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Five items were used from the study by Bock, Zmud, Kim, and Lee (2005) to measure two different types of knowledge sharing intentions. Two items were intended to capture teachers' intentions to share tacit knowledge, which is related to know-how and strategic knowledge to perform tasks. Three items were designed to

measure the intention of explicit knowledge sharing, including basic work knowledge and technical-level knowledge. To measure knowledge sharing intention, it is important to consider both of these types of knowledge because work performance is critically related to the combination of these two types of human knowledge. Bock et al. (2005) found that the measure showed a high level of reliability (α = .93). A sample item of this measure is "My knowledge sharing with other organizational members is good."

To examine the work engagement levels of the teachers, the short version of the Utrecht Work Engagement Scale (UWES-9) was used (Schaufeli, Bakker, & Salanova, 2006). This scale includes three key dimensions of work engagement—vigor, dedication, and absorption—each of which is captured by three items. Schaufeli et al. (2006) found that UWES-9 had acceptable and high internal consistency (α ranged from .85 to .92) across 10 national samples. An example of the UWES-9 is "At my job, I feel strong and vigorous."

To measure teachers' knowledge creation practices, we used 10 items of the knowledge creation inventory developed and validated by Song, Uhm, and Yoon (2011). Studies (Song & Kolb, 2009; Yoon, Song, Lim, & Joo, 2010) have shown this measure to have acceptable item internal consistency (α ranged from .91 to .94). An example item of this measure is "We develop new ideas through constructive dialogue by using figures and diagrams."

Data analysis

This study employed structural equation modeling (SEM) with descriptive analyses (i.e., reliability, correlation, and normality) and a common method bias test to ensure basic assumptions. To examine the model–data fit of the structural model, we examined the Satorra-Bentler (SB) scaled chi-square for robust maximum likelihood (ML) estimation, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) with cutoff criteria (CFI > .95, RMSEA < .08, SRMR < .08) as essential model–data fit indices (Hu & Bentler, 1999; Kline, 2011; Lei & Wu, 2007). To examine indications of possible improper solutions of the model, we examined individual parameter estimates and their estimated standard errors by assessing parameter estimates with standard errors and error magnitudes (Lei & Wu, 2007). Furthermore, to test our research hypotheses, we used standardized path coefficients (SPCs) with *t*-value, decomposition of effects, and Sobel tests.

Results

Sample

1,142 surveys were returned, representing a 67.9% response rate. We excluded 17 incomplete responses; thus, a total of 1,125 responses were analyzed. Approximately 52% of respondents were female. About 25% were ages 35 years or younger, 27% were 36 to 45 years old, and 48% were 46 years or older. About 32% had been working for 10 years or fewers; 22%, 11 to 20 years; and 46%, 21 years or more. With regard to education level, 56% had college-level degrees, and about 44% had graduate-level degrees.

Normality

To test for univariate normality of the variables, we assessed skewness and kurtosis, which revealed mild univariate non-normality. Similarly for multivariate normality, based on the results for multivariate normality shown in Table 1 and the relative multivariate kurtosis (1.282), we confirmed a mild non-normality of the data.

Reliability and correlation

Table 1. Test of multivariate normality

Skewness			Kurtosis			Skewness and Kurtosis	
Value	*z*-score	*p* value	Value	*z*-score	*p* value	Chi-square	*p* value
66.163	57.280	.000	1152.76	40.315	.000	4906.258	.000

Item internal consistency was measured using Cronbach's alpha. As listed in Table 2, all items showed an acceptable level of reliability (α ranged from .88 to .94). In addition, Pearson correlations indicated no issues of multicollinearity in that all bivariate correlations were less than .85 ($|r| < .85$).

Table 2. Basic descriptive statistics and correlations among latent variables

	M	*SD*	α	1	2	3	4
Innovation support	3.441	0.677	.881	1			
Work engagement	3.650	0.603	.928	.378**	1		
Knowledge sharing	3.632	0.615	.887	.404**	.493**	1	
Knowledge creation	3.366	0.589	.941	.677**	.479**	.550**	1

Note. α = Cronbach's alpha, $^{**}p < .01$.

In addition, to check for any possible common method bias issues of the data, we ran Harman's single factor test. The results show that the items composing each measurement did not load onto one common factor, indicating no critical common method bias issue existed in our observed data. This analysis demonstrated four latent factors in our research model, corresponding to our four constructs of interest, which collectively explained 42.5% of the total variance.

Model estimation

Given that the standard ML estimation in SEM requires normality of data, robust ML estimation was employed to handle the slight non-normality of the data for this study, using the covariance matrix and the asymptotic covariance matrix (Kline, 2011).

Parceling of knowledge creation

Since the measurement model included a large number of variables, we assessed a model of knowledge creation in the measurement model to reconstruct it by item parceling. The overall fit is shown in Table 3. The SB scaled chi-square of the CFA model was statistically significant, $\chi^2(30) = 133.201$, $p < .001$. Thus, the exact-fit hypothesis was rejected, indicating that the model was not consistent with the covariance data. However, RMSEA and SRMR were .055 and .027 respectively, both of which were acceptable because they were less than the cutoff criterion (< .08); CFI was .995, which was larger than the desired criterion value (> .95). Therefore, the measurement model of knowledge creation was found to be statistically acceptable.

Table 3. Overall fit of the CFA model of knowledge creation

	SB scaled Chi-square(*df*)	CFI	RMSEA	SRMR
Knowledge creation	$\chi^2(30) = 133.201$, $p < .001$	.995	.0553	.0237

All factor loadings in the measurement equations were statistically significant because all $|t|$ values were larger than 1.96 ($p < .05$). In addition, all of the path coefficients in the structural equations were statistically significant ($|t| > 1.96$, $p < .05$). Signs and magnitudes of parameter estimates in both measurement and structural equations made sense, and there were no out-of-range (i.e., $r < 1$) or negative variances. Standard errors of factors in the measurement equations were smaller than the standard deviations of their indicators; standard errors of predictors in the structural equations were also smaller than the standard deviations of their outcome variables. This indicated that the standard errors were reasonable, so we can assume that there were no indications of possible improper solutions. Thus, we

can use the parceling model of knowledge creation (Matsunaga, 2008). Figure 2 shows the research structural model based on the item parceling results.

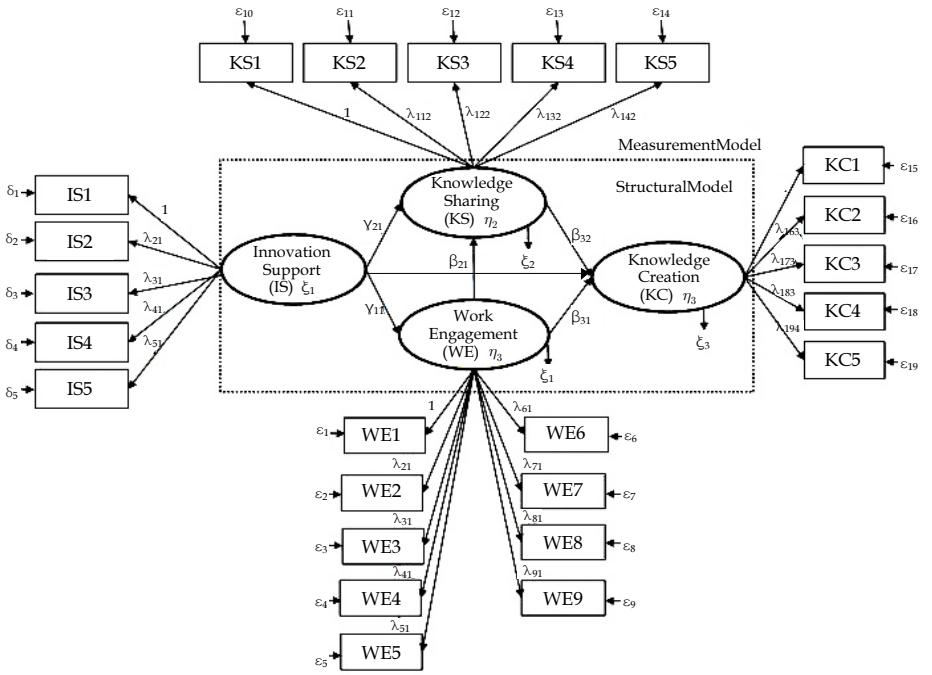

Figure 2. Structural equation model with item parceling

Because we used the parceling model of knowledge creation, we rechecked the normality of the model. The results of univariate normality and multivariate normality (see Table 4) including the relative multivariate kurtosis (1.278) indicate that, overall, the data had a mild form of non-normality, which we handled by using robust ML.

Table 4. Retest of multivariate normality

Skewness			Kurtosis			Skewness and Kurtosis	
Value	*z*-score	*p* value	Value	*z*-score	*p* value	Chi-square	*p* value
41.647	47.905	.000	797.589	36.061	.000	3595.274	.000

Assessment of model fit

The overall fit of the proposed model is shown in Table 5. The SB scaled chi-square of the model was statistically significant, $\chi^2(246) = 1297.665$, $p < .001$,

indicating that the model was not consistent with the covariance data. However, all other model–data fit indices were satisfied in terms of RMSEA (.061, less than cutoff criterion .08), SRMR (.044, less than cutoff criterion .08), and CFI (.981, larger than the desired criterion .95).

Table 5. Overall fit of proposed model

	SB scaled Chi-square(*df*)	CFI	RMSEA	SRMR
Proposed model	$\chi^2(246) = 1297.665$, $p < .001$	.981	.0617	.0445

Furthermore, the indications of possible improper solutions of the proposed model were checked through parameter estimates with reasonable signs and magnitudes and reasonable standard errors. In these parameter estimates, all factor loadings (standardized factor loadings ranged from .55 to .89) in the measurement equations were statistically significant based on the *t*-value criteria ($|t| > 1.96$, $p < .05$). In addition, all path coefficients in the structural equations were statistically significant ($t > 1.96$, $p < .05$; see Figure 4). Moreover, squared multiple correlations (R^2) in the structural equations (i.e., reduced-form equations due to mediators) indicated that, based on Cohen's evaluations of effect sizes for different values of R^2 (i.e., .0196 as small effect size, .130 as medium effect size, and .260 as large effect size; Kotrlik & Williams, 2003), work engagement ($R^2 = .160$) and knowledge sharing ($R^2 = .196$) had medium to large effect sizes, and knowledge creation ($R^2 = .545$) had a large effect size. Signs and magnitudes of parameter estimates in both measurement and structural equations made sense, and there were no out-of-range (i.e., $r < 1$) or negative variances. The standard errors of factors in the measurement equations were smaller than the standard deviations of their indicators, and the standard errors of predictors in the structural equations were smaller than the standard deviations of their outcome variables. This indicated that the standard errors were reasonable. The results of the overall fit and the estimation solution indicated that the proposed model reasonably fit the data (see Figure 3).

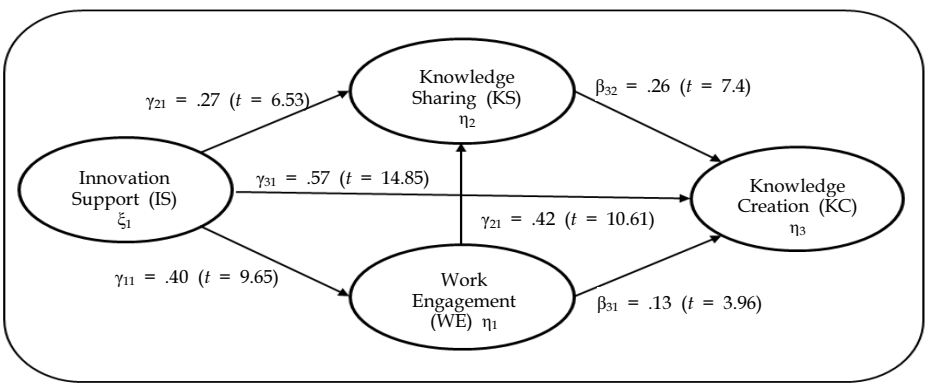

Figure 3. Structural relationships and standardized path coefficient estimates

Hypothesis testing

We tested all proposed hypotheses, based on the results of the model estimation. Standardized path coefficient (SPC) estimates and Sobel tests were primarily considered to measure the magnitudes of the paths and examine the mediating effects among the proposed variables (see Tables 6 and 7).

Table 6. Decomposition of effects in the structural model

Path	Standardized path coefficient (*t*-value)		
	Direct effect	Indirect effect	Total effect
Innovation support → Work engagement	.40 (9.65)	-	.40 (9.65)
Knowledge sharing	.27 (6.53)	.17 (7.60)	.44 (10.43)
Knowledge creation	.57 (14.85)	.17 (8.31)	.74 (17.35)
Work engagement → Knowledge sharing	.42 (10.61)	-	.42 (10.61)
Knowledge creation	.13 (3.96)	.11 (5.93)	.24 (7.34)
Knowledge sharing → Knowledge creation	.26 (7.44)	-	.26 (7.44)

Note. All direct and indirect effects are statistically significant at the .01 level ($|t| > 2.58$).

All hypotheses were supported by the data. For hypothesis 1, the direct effects of innovation support by high schools on teachers' work engagement (SPC = .40, t = 9.65), knowledge sharing (SPC = .27, t = 6.53), and knowledge creation (SPC = .57, t = 14.85) were statistically significant. Thus, hypothesis 1 was supported. For hypothesis 2, the results show that the direct effects of teachers' work engagement on their knowledge sharing (SPC = .42, t = 10.61) and knowledge creation (SPC = .13, t = 3.96) were statistically significant, supporting hypothesis 2. For hypothesis 3, the direct impact of teachers' knowledge sharing on their knowledge creation (SPC = .26, t = 7.44) was statistically significant. Thus, hypothesis 3 was supported. For hypotheses 4 and 5, to test the mediating effects of work engagement and knowledge sharing, Sobel tests (Sobel, 1982) based on approximate standard errors (Kline, 2011) were conducted (see Table 7).

Table 7. Sobel tests for mediating effects of work engagement and knowledge sharing

Path: IV → MV→ DV	a	SEa	b	SEb	z
IS → WE → KS	0.333	0.0345	0.429	0.0405	7.13**
IS → WE → KC	0.333	0.0345	0.0965	0.0244	3.66**
IS → KS → KC	0.234	0.0358	0.195	0.0262	4.91**
WE → KS → KC	0.429	0.0405	0.195	0.0262	6.09**

Note. IV = independent variable; MV = mediating variable; DV = dependent variable; IS = innovation support; WE = work engagement; KS = knowledge sharing; KC = knowledge creation; a = unstandardized path coefficient for the path IV → MV; SEa=standard error of the path IV→MV; b = unstandardized path coefficient for the path MV→ DV; SEb=standard error of the path MV→ DV; z = Sobel test statistic. $^{**}p < .01$.

The indirect effects of innovation support on both knowledge sharing and knowledge creation through work engagement were statistically significant at the .01 level ($|z|$ ranges from 3.66 to 7.13). Thus, hypothesis 4 was supported. The indirect effect of innovation support on knowledge creation through knowledge sharing was also statistically significant at the .01 level (z = 4.91) and the indirect effect of work engagement on knowledge creation through knowledge sharing was statistically significant at the .01 level (z = 6.09). Thus, hypothesis 5 was supported.

Discussion and implications

The purpose of this research was to examine the relationships among innovative school climate, teachers' knowledge sharing, and work engagement, with knowledge creation activities of teachers. Samples include 1,125 students from 39 schools across the nation—17 general high schools and 21 career technical high schools. The following are the key findings and practical implications for policy leaders and school administrators.

School innovation climate was found to be significant in affecting teachers' organizational behaviors. Namely, the innovation climates of schools played a key role in enhancing knowledge sharing and knowledge creation activities among Korean teachers, which ultimately influence students' performance outcomes. These results are consistent with previous findings that suggest that an organization's support for innovation encourages creative, collaborative, and innovative behaviors of workers in the business setting (Bain et al., 2001; Choi et al., 2013; Kanter, 1988; Scott & Bruce, 1994). On the theoretical side, the results are also in line with self-determination theory, which indicates that innovation support promotes workers' intrinsic motivation and therefore voluntary and innovative behaviors (Deci & Ryan, 1985).

Supporting hypotheses 2 and 3, teachers' work engagement is critical in increasing knowledge sharing among teachers and encouraging their active knowledge creation practices. Teachers who show greater engagement in their work were found to be more likely to share knowledge with their peers. These findings are consistent with the results of a previous study conducted by Hakanen et al. (2006). Using a sample of Finnish teachers, they found that teachers' engagement has a mediating effect on the relationship between job resources and organizational commitment that leads to improved dynamic interactions with other members in schools, such as possibly sharing knowledge among teachers. In addition, as found in previous studies (O'Neill & Adya, 2007; Rosen et al., 2007), sharing knowledge was essential for encouraging knowledge creation practices in the Korean school setting.

These findings provide practical implications to school leaders and administrators who attempt to promote knowledge sharing among teachers. First, schools need to develop more supportive and safe climates (e.g., systems, policies,

and environments) to encourage teachers to be engaged in their day-to-day school activities. Second, more physical and mental support should be provided to promote collaborative and harmonious school systems so that teachers can safely share their ideas and suggest new directions. Third, school leaders should encourage teachers to share their tacit and explicit knowledge with one another. Once this interactive and collaborative climate is created among the teachers, it can be transferred to the entire school climate to create a collaborative school culture among teachers, students, parents, and administrators.

This study empirically supported hypotheses 4 and 5, which explain the mediating roles of knowledge sharing and work engagement of teachers in the relationship between schools' innovation climate and teachers' knowledge creation activities. As stated earlier, the supportive and innovation climates of schools were found to be important factors in teachers' knowledge creation. However, teachers' organizational behaviors—in this study, work engagement and knowledge sharing—should also be considered to have strong effects on innovative school climate and on their knowledge creation. One implication of this finding is that administrators' leadership and mutual trust among school members are of great importance because care-based leadership will help school organizations develop safer school environments where teachers have greater work engagement and mutual trust, which will influence the quality and quantity of their knowledge sharing practices.

This study found that school climate, organizational behaviors, and teachers' knowledge creation activities are all critically related. These findings are supported by organization behavior theories such as organizational knowledge creation theory, social exchange theory, and cooperative learning theory. From a policy standpoint, to build stronger school innovation climates in which individual teachers work together by sharing their knowledge, it is important for school leaders to endeavor to improve coherence, collaboration, caring, and work engagement among teachers (McCharen et al., 2011). By developing school innovation climates, which affect teachers' work engagement and knowledge sharing, and thus knowledge creation among teachers, schools ultimately promote teachers' creativity and competencies for effective teaching as well as student guidance, and thereby improve overall school performance (Bae et al., 2012).

Our proposed model, relying on concepts from the organization and management disciplines, is valid and can be applied in the Korean school context. Namely, schools in Korea have many similarities with business organizations in terms of the system, structure, and processes used to achieve better performance outcomes, which in this study were teachers' active knowledge creation activities. Therefore, to encourage teachers' innovative behaviors—knowledge sharing and knowledge creation activities in this study—school administrators may develop a school climate supportive of innovation. Examples of this include a supportive learning environment (Watkins & Marsick, 1993), acceptance of the failure (Skerlavaj et al., 2007); organizational recognition of personal matters, achievement, and works, (Williams & Anderson, 1991), and perhaps most importantly, perceived organizational support (Eisenberger et al., 1990).

However, our findings may conflict with arguments by education researchers who maintain that the school as a social institution has different institutional features from business and industry. Some scholars (e.g., Bae, 2007; Tyack & Cuban, 1995) suggest that given the long-established institutional characteristics of schools, business-oriented solutions may not work well in the school setting.

Taking both perspectives into account, this study suggests that business-driven practices may affect teachers' organizational behaviors not by directly intervening in the "technical core: teaching and learning" (Hoy & Miskel, 2013, p. 29) in schools, but by indirectly supporting or changing the environments and climates of schools. Although a business practice, as proved in this study, works well in some areas of public schooling, it may be worth mentioning that it is critical to understand a long-established mindset and culture of teachers when school leaders attempt to transplant business practices into classrooms.

Limitations and future research

This study has several limitations in terms of sampling and applicability. First, the data rely on the results of a self-reported perception-based survey. Thus, the possibility of response bias should be considered when the results are interpreted. For future research, alternative approaches to overcome this problem may be employed, particularly in measuring the outcome variable. In addition, a cross-rating survey (e.g., administrators measure teachers' work engagement levels) could be considered to increase response reliability. Second, the generalizability of the study results may be acceptable due to the large sample size and diversity of the sample from the 38 schools in different regions of Korea. However, the theoretical applicability should be critically examined since the original model and theoretical foundations were adapted from management and organizational theories. In future research, theories and concepts from educational research should also be employed to compare these findings to those of organizational studies. Finally, from a methodological standpoint, the effect differences among the unit of schools has not been considered in this study. For future research, the hierarchical linear model (HLM) approach could be employed to capture the effect differences among the variables depending on the school unit. This effort would shed light on future interdisciplinary studies, which, in turn, could lead to mutual advantages for the different disciplines.

2) 16 general high schools were randomly chosen from 16 regions, including 7 metropolitan cities and 9 provinces, respectively. 5 schools were additionally chosen from the capital area because a greater number of schools are located in this area. Then, 21 career technical high school were selected nearby the each selected general high school. Among the total of 42 selected schools, 4 general high schools, three from the capital area and one from one metropolitan city, did not respond to the survey request.

3) As the number of teachers in sampled schools ranged between 60 and 100, we sent around 40 questionnaires to each school.

Address for correspondence

Sang Hoon Bae
Professor
Department of Education
Sungkyunkwan University
25-2, Sungkyunkwan-ro, Jongno-gu
Seoul, 110-745, Korea
Tel: 82 2 760 0564
Email: sbae@skku.edu

References

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107−136. doi: 10.2307/3250961

Amabile, T. M. (1998). How to kill creativity. *Harvard Business Review*, *76*(5), 77−87.

Bae, S. H., Song, J. H., & Kim, H. K. (2012). Teachers' creativity in career technical education: The mediating effect of knowledge creation practices in the learning organization. *The Korean Social Science Journal, 39*(1), 59−81.

Bain, P. G., Mann, L., & Pirola-Merlo, A. (2001). The innovation imperative: The relationships between team climate, innovation, and performance in research and development teams. *Small Group Research, 32*(1), 55−73. doi:10.1177/104649640103200103

Bakker, A. B., Albrecht, S. L., & Leiter, M. P. (2010). Key questions regarding work engagement. *European Journal of Work and Organizational Psychology, 20*(1), 4−28. doi:10.1080/135943 2X.2010.485352

Bakker, A. B., Demerouti, E., De Boer, E., & Schaufeli, W. B. (2003). Job demands and job resources as predictors of absence duration and frequency. *Journal of Vocational Behavior, 62*(2), 341−356. doi:10.1016/S0001-8791(02)00030-1

Barsade, S. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly, 47*(4), 644−675. doi:10.2307/3094912

Blau, P. (1964). *Exchange and power in social life*. New York, NY: Wiley.

Bock, G. W., Zmud, R. W., Kim, Y. G., & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS Quarterly: Management Information Systems*, *29*(1), 87−111.

Bonner, M., Koch, T., & Langmeyer, D. (2004). Organizational theory applied to school reform: A critical analysis. *School Psychology International*, *25*(4), 455−471.

Choi, B. K., Moon, H. K., & Ko, W. (2013). An organization's ethical climate, innovation, and performance: Effects of support for innovation and performance evaluation. *Management Decision, 51*(6), 1250−1275. doi:10.1108/MD-Sep-2011-0334

Chou, S., & Wang, S. (2003). Quantifying "ba": An investigation of the variables that are pertinent to knowledge creation. *Journal of Information Science, 29*(3), 167–180. doi:10.1177/01655515030293004

Chung, K., Kim, B., Park, S., & Lee, Y. (2007). *A study on the characteristics of highly professional committed teachers in Korea*. Seoul: Korean Educational Development Institute. (In Korean)

Creemers, B. P. M., & Reezigt, G. J. (1999). The role of school and classroom climate in elementary school learning environments. In H. J. Freiberg (Ed.), *School climate: Measuring, improving and sustaining healthy learning environment* (pp. 30–47). London, England: Falmer Press.

Cumming, B. S. (1998). Innovation overview and future challenges. *European Journal of Innovation Management, 1*(1), 21–30.

Cummings, T. G., & Worley, C. G. (2008). *Organization development and change* (9th ed.). Mason, OH: South-Western Cengage Learning.

Cummings, J. N. (2004). Work groups, structural diversity, and knowledge sharing in a global organization. *Management Science, 50*(3), 352–364. doi:10.1287/mnsc.1030.0134

Davenport, T. H., & Prusak, L. (1998). W*orking knowledge: How organizations manage what they know*. Boston, MA: Harvard Business School Press.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.

Dixon, N. M. (2000). *Common knowledge: How companies thrive by sharing what they know*. Boston, MA: Harvard Business School Press.

Eisenberger, R., Fasolo, P., & Davis-LaMastro, V. (1990). Perceived organizational support and employee diligence, commitment, and innovation. *Journal of Applied Psychology, 75*(1), 51–59. doi:10.1037/0021-9010.75.1.51

Frost, D., & Durrant, J. (2003). Teacher leadership: Rationale, strategy and impact. *School Leadership & Management, 23*(2), 173–186. doi:10.1080/1363243032000091940

Fullan, M. (2002). The role of leadership in the promotion of knowledge management in schools. *Teachers and Teaching: Theory and Practice, 8*(3), 409–419.

Gagné, M. (2009). A model of knowledge-sharing motivation. *Human Resource Management, 48*(4), 571–589. doi:10.1002/hrm.20298

Garvin, D. (1993). Building a learning organization. *Harvard Business Review, 71*(4), 78–91.

Gonzalez-Roma, V., Schaufeli, W. B., Bakker, A. B., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior, 68*(1), 165–174. doi:10.1016/j.jvb.2005.01.003

Gouldner, A. W. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review, 25*(2), 161–178. doi:10.2307/2092623

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*(6), 495–513. doi:10.1015/j.jsp.2005.11.001

Hansen, F., Hansen, R. B., & Smith, M. (2002). Rewards and recognition in employee motivation. *Compensation & Benefit Review*, *34*, 64–72. doi:10.1177/0886368702034005010

Hoy, W., & Miskel, C. (2013). *Educational administration: Theory, research, and practice* (9th ed.). New York, NY: McGraw-Hill.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1−55. doi:10.1080/10705519909540118

James, L., & Sells, S. (1981). Psychological climate: Theoretical perspectives and empirical research. In D. Magnussen (Ed.), *Toward a psychology of situations: An interactional perspective* (pp. 275−295). Hillsdale, NJ: Erlbaum.

Janz, B. D., & Prasarnphanich, P. (2003). Understanding the antecedents of effective knowledge management: The importance of a knowledge-centered culture. *Decision Sciences, 34*(2), 351−384. doi:10.1111/1540-5915.02328

Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Edina, MN: Interaction.

Johnson, D. W., Johnson, R. T., & Holubec, E. (1989). *Circles of learning: Cooperation in the classroom* (3rd ed.). Edina, MN: Interaction.

Kanter, R. (1988). When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organizations. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 10, pp. 169−211). Greenwich, CT: JAI Press.

Kaufmann, A., & Tödtling, F. (2002). How effective is innovation support for SMEs? An analysis of the region of upper Austria. *Technovation*, *22*(3), 147−159. doi:10.1016/S0166-4972(00)00081-X

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: Guilford Press.

Korean Educational Development Institute. (2013). *Statistical yearbook of education*. Seoul: Author. Retrieved from http://kess.kedi.re.kr/publ/view;jsessionid=cJNnIFalmA11FEc8ZGP7cTJ219164n13pnPxsaM1pI1iSiUdqPn3XXgJgu4Vpifm?survSeq=2013&publSeq=2&menuSeq=3894&itemCode=02#

Korean Educational Development Institute. (2014). *Educational statistics: The number of students per teacher according to OECD educational statistics*. Seoul: Author. Retrieved from http://edpolicy.kedi.re.kr/EpnicForum/Epnic/EpnicForum02Viw.php?Ac_Num0=16313&Ac_Code=D0010203

Kotrlik, J. W., & Williams, H. A. (2003). The incorporation of effect size in information technology, learning, and performance Research. *Information Technology, Learning, and Performance Journal*, *21*(1), 1−7.

Lei, P.-W., & Wu, Q. (2007). Introduction to structural equation modeling: Issues and practical considerations. *Educational Measurement: Issues and Practice*, *26*(3), 33−43. doi:10.1111/j.1745-3992.2007.00099.x

Leung, K., Huang, K., Su, C., & Lu, L. (2011). Curvilinear relationships between role stress and innovative performance: Moderating effects of perceived support for innovation. *Journal of Occupational and Organizational Psychology, 84*(4), 741−758. doi:10.1348/096317910X520421

Matsunaga, M. (2008). Item parceling in structural equation modeling: A primer. *Communication Methods and Measures*, *2*(4), 260−293. doi:10.1080/19312450802458935

McCharen, B., Song, J., & Martens, J. (2011). School innovation: The mutual impacts of organizational learning and creativity. *Educational Management Administration & Leadership, 39*(6), 676−694. doi:10.1177/1741143211416387

McFadyen, M. A., & Cannella, Jr., A. A. (2004). Social capital and knowledge creation: Diminishing returns of the number and strength of exchange relationships. *Academy of Management Journal, 47*(5), 735−746.

McLean, L. (2005). Organizational culture's influence on creativity and innovation: A review of the literature and implications for human resource development. *Advances in Developing Human Resources, 7*(2), 226−246. doi:10.1177/1523422305274528

McRoy, I., & Gibbs, P. (2009). Leading change in higher education. *Educational Management and Administration*, *37*(5), 687−704.

Molm, L. D. (2001). Theories of social exchange and exchange networks. In G. Ritzer & B. Smart (Eds.), *Handbook of social theory* (pp. 260−272). London, England: Sage.

Moolenaar, N. M., Daly, A. J., & Sleegers, P. J. C. (2010). Occupying the principal position: Examining relationships between transformational leadership, social network positions, and schools' innovative climate. *Educational Administration Quarterly, 46*(5), 623−670. doi:10.1177/0013161X10378689

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review, 23*(2), 242−266. doi:10.2307/259373

Namgung, J., Kim, Y., Im, J., & Kim, W. (2013). *Analysis of the actual status and qualities of school education in Korea: A study on the high schools*. Seoul: Korean Educational Development Institute. Retrieved from https://www.kedi.re.kr/khome/main/research/selectPubForm.do

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14−37. doi:10.1287/orsc.5.1.14

Nonaka, I., & Konno, B. (1998). The concept of "Ba": Building a foundation for knowledge creation. *California Management Review*, *40*(3), 40−54. doi:10.2307/41165942

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company: How Japanese companie create the dynamics of innovation*. New York, NY: Oxford University Press.

Nonaka, I., Von Krogh, G., & Voelpel, S. (2006). Organizational knowledge creation theory: Evolutionary paths and future advances. *Organization Studies, 27*(8), 1179−1208. doi:10.1177/0170840606066312

O'Neill, B. S., & Adya, M. (2007). Knowledge sharing and the psychological contract. *Journal of Managerial Psychology*, *22*(4), 411−436.

Park, J. (2012). The effects of a principal's leadership style on support for innovation: Evidence from Korean vocational high school change. *Asia Pacific Education Review, 13*(1), 89−102. doi:10.1007/s12564-011-9182-9

Park, Y. K., Song, J. H., Yoon, S. W., & Kim, J. (2013). Learning organizations and innovative behavior. *European Journal of Training and Development*, *38*(1/2), 75−94.

Pérez-Luño, A., Medina, C. C., Lavado, A. C., & Rodriguez, G. C. (2011). How social capital and knowledge affect innovation. *Journal of Business Research, 64*(12), 1369−1376. doi:10.1016/j.jbusres.2011.01.014

Rosen, B., Furst, S., & Blackburn, R. (2007). Overcoming barriers to knowledge sharing in virtual teams. *Organizational Dynamics*, *36*(3), 259−273.

Saks, A. M. (2006). Antecedents and consequences of employee engagement. *Journal of Managerial Psychology*, *21*(7), 600−619.

Salanova, M., & Schaufeli, W. B. (2008). A cross-national study of work engagement as a

mediator between job resources and proactive behavior. *International Journal of Human Resource Management, 19*(1), 116–131. doi:10.1080/09585190701763982

Saunders, L. (2006). Teachers' engagement in and with research: Supporting integrity and creativity in teaching. *Forum*, *48*(2), 131–144. doi:10.2304/forum.2006.48.2.131

Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire: A cross-national study. *Educational and Psychological Measurement, 66*(4), 701–716. doi:10.1177/0013164405282471

Schaufeli, W. B., Salanova, M., Gonzalez-Roma, V., & Bakker, A. (2002). The measurement of burnout and engagement: A confirmatory factor analytic approach. *Journal of Happiness Studies, 3*(1), 71–92. doi:10.1023/A:1015630930326

Schulz, M. (2001). The uncertain relevance of newness: Organizational learning and knowledge flows. *Academy of Management Journal, 44*(4), 661–681. doi:10.2307/3069409

Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, *37*(3), 580–607. doi:10.2307/256701

Skerlavaj, M., Song, J. H., & Lee. Y. M. (2010). Organizational learning culture, innovative culture and innovations in South Korean firms. *Expert Systems with Applications*, *37*(9), 6390–6403.

Skerlavaj, M., Stembergera, M. I., Skrinjara, R., & Dimovskia, V. (2007). Organizational learnin g culture: The missing link between business process change and organizational performan ce. *International Journal of Production Economics, 106*(2), 346–367. doi:10.1016/j.ijpe.200 6.07.009

Smyth, L. F., & Van der Vegt, R. (1993). Innovation in schools: Some dilemmas of implementation. *Educational Management & Administration*, *21*(2), 115–122.

Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equation models. In S. Leinhart (Ed.), *Sociological methodology* (pp. 290–312). San Francisco, CA: Jossey-Bass.

Song, J. H., & Kolb, J. A. (2009). The influence of learning culture on perceived knowledge conversion: An empirical approach using structural equation modeling. *Human Resource Development International*, *12*(5), 529–550.

Song, J. H., Kolb, J. A., Lee, U. H., & Kim, H. K. (2012). Role of transformational leadership in effective organizational knowledge creation practices: Mediating effects of employees' work engagement. *Human Resource Development Quarterly*, *23*(1), 65–101. doi:10.1002/hrdq.21120

Song, J. H., Uhm, D., & Yoon, S. W. (2011). Organizational knowledge conversion practices: Comprehensive and systematic processes for scale development. *Leadership and Organization Development Journal, 32*(3), 243–259. doi:10.1108/01437731111123906

Sy, T., Cote, S., & Saavedra, R. (2005). The contagious leader: Impact of leader's affect on group member affect and group processes. *Journal of Applied Psychology, 90*, 295–305. doi:10.1037/0021-9010.90.2.295

Timperley, H., & Robinson, V. (2000). Workload and the professional culture of teachers. *Educational Management Administration & Leadership*, *28*(1), 47–62.

Tubin, D. (2009). Planning an innovative school: How to reduce the likelihood of regression toward the mean. *Educational Management Administration & Leadership*, *37*(3), 404–421.

Tyack, D., & Cuban, L. (1995). *Tinkering toward utopia: A century of school reform*. Cambridge, MA: Harvard University Press.

Van den Hooff, B., & De Ridder, J. A. (2004). Knowledge sharing in context: The influence of organizational commitment, communication climate, and CMC use on knowledge sharing. *Journal of Knowledge Management, 8*(6), 117−130. doi:10.1108/13673270410567675

Von Krogh, G., Ichijo, K., & Nonaka, I. (2000). *Enabling knowledge creation: How to unlock the mastery of tacit knowledge and release the power of innovation*. New York, NY: Oxford University Press.

Walker, A., Bryant, D., & Lee, M. (2013). International patterns in principal preparation: Commonalities and variations in pre-service programmes. *Educational Management Administration & Leadership*, *41*(4), 404−434. doi:10.1177/1741143213485466

Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review, 20*(2), 115−131. doi:10.1016/j.hrmr.2009.10.001

Watkins, K. E., & Marsick, V. J. (1993). *Sculpting the learning organization: Lessons in the art and science of systemic change*. San Francisco, CA: Jossey-Bass.

West, M. A. (1990). The social psychology of innovation in groups. In M. A. West & J. L. Farr (Eds.), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 4−36). Chichester, England: Wiley.

Williams, L. J., & Anderson, S. E. (1991). Job satisfaction and organizational commitment as predictors of organizational citizenship and in-role behaviors. *Journal of Management, 17*(3), 601−617. doi:10.1177/014920639101700305

Wrzesniewski, A., McCauley, C., Rozin, P., & Schwartz, B. (1997). Jobs, careers, and callings: People's reactions to their work. *Journal of Research in Personality, 31*(1), 21−33. doi:10.1006/jrpe.1997.2162

Yoon, S. W., Song, J. H., Lim, D. H., & Joo, B. (2010). Structural determinants of team performance: The mutual influences of learning culture, creativity, and knowledge. *Human Resource Development International*, *13*(3), 249−264. doi:10.1080/13678868.2010.483815