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Innovative School Climate, Teacher's Self-efficacy and Implementation of Cognitive Activation Strategies

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Abstract

This study was designed to examine teachers' self-efficacy as a potential mediator to understand the relations between innovative school climate and implementation of cognitive activation strategies during instructional practice. The data of this study are derived from the 2018 Teaching and Learning International Survey (TALIS) conducted by the OECD. This study was based on a sample of 2287 Korean teachers from 176 middle schools. Multi-level mediation analyses with Monte Carlo confidence intervals were used to measure within-subject effects at the teacher level (L1) and between-subject effects at the school level (L2). In this study, a 2-1-1 model containing a level-2 X variable and level-1 M and Y variables were designed. First, the author analyzed the relations between the variables and tested the mediation effect using the MLmed Macro for SPSS with robust standard errors (REM estimation). The results of multi-level mediation analyses were supportive of a hypothesized conceptual framework. First, the results show significant effects of the innovative school climate on the teachers' self-efficacy and implementation of cognitive activation strategies respectively at the school level. Second, the higher the innovative school climate, the more implementation of cognitive activation strategies, and this relationship were mediated by teachers' self-efficacy. Based on these results, the researcher suggested strategies for teachers to implement cognitive activation practices.

Keywords: Innovative school climate, Teachers' self-efficacy, Cognitive activation strategy, Multilevel mediation analysis.

Introduction

Providing students with cognitively activating learning opportunities that engage them in higher-order thinking and fostering in-depth learning through working on complex tasks, cognitive learning strategies have been suggested to be an effective method for high-quality education (Baumert et al., 2010; Klieme et al., 2009; Lipowsky et al., 2009; Teig et al, 2019; Von Kotzebue et al, 2020). There is a growing interest in understanding how to implement cognitive activation strategies. By the way, School climate is significant in all aspects of the performance of teachers in the school context, and it has been proved that instructional quality and teachers' self-efficacy depend on school climate (Glusac, et al, 2015; Holzberger & Schiepe-Tiska, 2021; Ismail et al, 2022). Furthermore, considerable research (Bandura, 2000; Ghaith & Yaghi, 1997; Gibson & Dembo, 1984; Fuchs et al, 1992; Tschannen-Moran et al, 1998; Tschannen-Moran & Woolfolk-Hoy, 2006) has demonstrated that teachers' self-efficacy plays a significant role in implementing instructional practices, and teachers' self-efficacy has been shown to predict the implementation of innovative teaching practices (Holzberger et al., 2014; Kunsting et al., 2016).

Therefore, teachers' self-efficacy is expected to mediate the relationship between innovative school climate and cognitive student activation strategies. Despite this accumulated knowledge on the relationship between school climate and instructional practice, none of the studies examined the relationship between innovative school climate and implementing cognitive activation strategies at the school level. There are few studies dealing with the mechanisms underlying the potential relationship between innovative school climate and implementing cognitive activation strategies. Therefore, their relationship and mechanism remain unaddressed, and this relationship's nature received little attention.

Specifically, it is worth noting that innovative school climate was a group-level (Level 2) variable. In contrast, teachers' self-efficacy and cognitive activation strategies were individual-level (Level 1) variables, leading to multi-level data structures. Therefore, multi-level mediation analyses, allowing researchers to explain how Level-2 variables such as school climate affect the individual-level variables, are appropriate because data in this study were collected at multiple levels simultaneously. Nevertheless, few studies have investigated their relationship. To my knowledge, the literature that concerns the mediating role of teachers' self-efficacy in the relationship between school climate and implementing cognitive activation strategies at the cluster level is also quite limited. This multi-level perspective received little attention

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in previous studies of innovative school climate and the implementation of cognitive activation strategies. Therefore, in the present research, the author aims at integrating the school and individual level perspectives by proposing a multi-level framework for studying the relationship between innovative school climate and the implementation of cognitive activation strategies at school level. In addition, the author aims to explore the mediation effect of teachers' self-efficacy in the relationship between an innovative school climate and the implementation of cognitive activation strategies at school level.

To sum up, the primary purpose of this study is to analyze the relationship between innovative school climate and cognitive student activation strategies, and to test mediation effects of teachers' self-efficacy in the relationship between innovative school climate and cognitive student activation strategies at school level. In this study, because innovative school climate is a cluster-level predictor, it can predict only cluster-level variability in teachers' teaching practices at school level. Therefore, the question of interest is not simply whether teachers' self-efficacy mediates the effect of innovative school climate on implementing cognitive activation strategies but whether cluster-level variability in teachers' self-efficacy serves as a mediator in the relationship between innovative school climate and implementation of cognitive activation strategies at school level.

The author seeks to answer the following questions:

- First, at the school level, do innovative school climates influence the implementation of cognitive activation strategies in the Korean secondary school context?
- Secondly, Is the relationship between an innovative school climate and the implementation of cognitive activation strategies mediated by teachers' self-efficacy at the school level?

This research contributes to the educational literature in two ways. First, it explores the direct effect of an innovative school climate and the mediate effects of teachers' self-efficacy. Second, the author offers a more complete account of how school contextual factors affect teachers' self-efficacy and, subsequently, their teaching practices. In sum, this study sheds light on how school climate influences teaching practices at school level. This study can make an essential contribution to high educational quality by offering suggestions on how to design school climate in a way that promotes implementing cognitive activation strategies.

Theoretical background of the Research and Conceptual Framework

The researcher pursued theories and frameworks that would promote both an understanding of cognitive activation strategies and strategies to improve implementing cognitive activation strategies. To meet this dual purpose, the author reflect on the conceptualization of the core constructs under investigation: cognitive activation strategies, their critical factors, and review prior research on their relations. The conceptual framework for this study is grounded in the focus theory of norms, social exchange perspective, and the social cognitive theory, which has the potential to guide educational approaches that help teachers to implement cognitive activation strategies.

School climate and Innovative Teaching Practices

Based on the social cognitive theory, the school climate directly or indirectly impacts teaching practices. It developed into the SCT in 1986 and posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior. Social cognitive theory (SCT) holds that the process of knowledge acquisition or learning is directly correlated to the observation of models. People can witness and observe a behavior conducted by others, and then reproduce those actions. This is often exhibited through the "modeling" of behaviors. If individuals see a successful demonstration of behavior, they can also complete the behavior successfully (Bandura, et al, 1961).

A school climate is a pattern of shared perceptions of the characteristics and atmosphere, including the norms, values, and expectations of an organization with its members (Glusac, et al, 2015; Ismail et al, 2022). Thus, each school has its characteristics that shape its climate. Not only does the school community share the perception of school climate, but they are also directly influenced by it (Hoy & Hannum, 1997). While climate most directly affects the members of the school community who spend most of their day within the school (Balfanz & Maciver, 2000; Conner & Krajewski, 1996). Hence, school climate reflects the overall atmosphere in which these factors exist and how the practices of people involved influence the general atmosphere (Okar & Aydin, 2020; Wang & Degol, 2016). School culture influences what people pay attention to, how they identify with the school, how hard they work, and the degree to which they achieve their goals. Therefore, the school climate is significant for giving teachers perception of all aspects of performance in the school context. In a school culture that values innovativeness, there is an innovative school climate for the social and professional exchange of ideas, the enhancement and spread of effective practices, and widespread professional problem-solving (Deal & Peterson, 1999).

Also, information exchange through the sharing of work-related data, ideas, and knowledge among team members is a critical team process linking team properties and outcomes (Johnson et al., 2006). Similarly, teachers' innovative practices can send cues to other teachers as to expected performance, and, through the social influence process, give rise to a supportive climate for the norms of innovativeness and facilitate for implementation of improved instructional practices. Therefore, it can be guessed that the innovative

school climate can contribute to, in turn, enhancing teachers' collective endeavors and heightening innovative instructional practices. Therefore, it can be guessed that the innovative school climate can contribute to, in turn, enhancing teachers' collective endeavors and heightening innovative instructional practices. Once it emerges, a climate has a reality that is partly independent of the individual actions that gave rise to it, and, as collective property, it guides individual and collective actions (Morgeson & Hofmann, 1999).

To synthesize above, it is expected that an innovative school climate will lead to higher cognitive student activation strategies because in an innovative school the inflow of diverse ideas and perspectives would be higher. Based on these probabilities, it is hypothesized that an innovative school climate will positively influence cognitive activation strategies (H1).

School climate and Teachers' self-efficacy

Since self-efficacy is the outcome of the interaction of the person's beliefs, actual abilities, and his/her environment, one can claim that it is related to school climate (Holzberger & Schiepe-Tiska, 2021; Ismail et al, 2022). Self-efficacy, the belief that they are competent to successfully accomplish a task, plays a central role in the exercise of personal agency by its strong impact on thought, affect, motivation, and action and is one of the strongest factors that drive one's motivation in social cognitive theory.

Self-efficacy comes from four sources: mastery experience, vicarious experience, persuasion, and physiological states (Bandura, 1977). Likewise, Hosford and O'Sullivan (2016) found a positive relationship between teachers' perceived school climate and their self-efficacy in performing challenging tasks in classrooms. In a similar context, a recent study by Wilson et al. (2020) in Scottish inclusive schools found that school climate, collective efficacy, and mastery experiences were essential factors in predicting teachers' self-efficacy. In the international literature, these school context factors are described as variables that influence teachers' self-efficacy.

A study conducted in Australia with high school teachers found that teachers perceived school climate as related to teacher self-efficacy and teaching practices; further, there was a positive relationship between teachers' self-efficacy and teaching practices (Bandura, 2000; Ghaith & Yaghi, 1997; Gibson & Dembo, 1984; Fuchs et al, 1992; Sukidin, et al., 2022; Tschannen-Moran et al, 1998; Tschannen-Moran & Woolfolk-Hoy, 2006). Therefore, it is hypothesized that innovative school climate will positively influence the teachers' self-efficacy across school. (H2)

Self-efficacy and Teaching Practices

It is argued that teacher self-efficacy is generally important in the implementation of innovative teaching. Compared to the low-efficacy teachers, the high-efficacy teachers were more likely to implement or try new ideas or teaching strategies to better meet the learning needs of their students (Tschannen-Moran, & Woolfolk-Hoy, 2006). Therefore, it is hypothesized that: Teachers' self-efficacy will positively influence the implementation of cognitive activation strategies. (H3)

School climate, Self-efficacy, and Innovative Teaching Practices

Further, teachers' self-efficacy beliefs are also postulated as mediators between school climate and implementing cognitive activation strategies. Besides these direct links, it is expected an additional indirect relationship between innovative school climate and cognitive student activation strategies. Social learning theory (Bandura, 1977) explains how individuals learn in a team through direct and observed experiences even in the absence of direct reinforcement. Direct experiences come from one's own work, and observed experiences occur when one models others' behavior.

Thus, the learning of the team based on their own direct experiences and observed experiences of other members of the team improves the quality of ideas. The possibility of both direct experience and observational experience is present in an innovative school climate. An innovative school climate can stimulate teachers' self-efficacy by improving the quality of ideas shared in the group. Furthermore, past research suggests that Self-efficacy can lead to teachers' instructional practice. Therefore, it is hypothesized that: Teachers' self-efficacy would mediate the relationship between innovative school climate and implementing cognitive activation strategies (H4).

Hypothesized Conceptual Framework

lt was hypothesized that innovative school climate led to teachers' self-efficacy, which led to their cognitive activation practices. In this study, innovative school climate (X) is from Level 2 but the other two variables, teachers' self-efficacy (M) and implementing cognitive activation strategies (Y) are from Level-1 variables, so this research is a 2-1-1 mediation model (Krull & MacKinnon, 2001). The conceptual framework for this study is shown in Figure 1, including the relationships between research variables suggested by previous studies and the relevant theories.

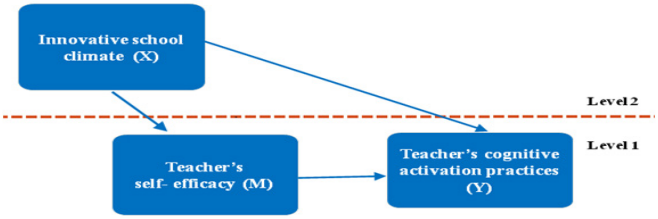


Fig. 1: Conceptual model: Innovative school climate, Teachers' self-efficacy and teacher's cognitive activation practices

In 2-1-1 model, a researcher has two options to center the mediator that would lead to two separate interpretations: (a) CWC2 centering within cluster and (b) CGM2 centering at the grand mean). CWC2 is appropriate when the individual level mediator variable is used to measure a cluster level construct and thus the focus of research is at the cluster level (Fang et al, 2019; Krull, & MacKinnon, 2001; Tofighi & Thoemmes, 2014; van Mierlo et al., 2007; Zhang, et al, 2009).

Also, in this study, it is worth noting that one cannot directly test for the effect of innovative school climate on teachers' self-efficacy or their cognitive activation practices since it is a group-Ievel (Level 2) variable. The strategy for relating the Level 2 predictor across levels is to relate it to the random intercept terms for the mediator and outcome using two separate multilevel regression models.

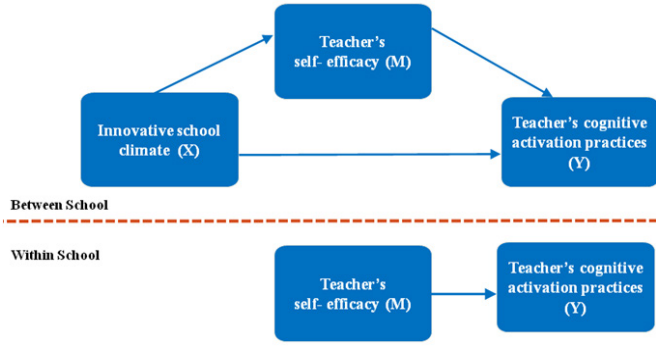
Additionally, there is no direct way to test for the mediated effect of innovative school climate on teachers' cognitive activation practices via their self-efficacy. Thus, the statistical strategy was applied to regress teachers' cognitive activation practices onto (a) teachers' self-efficacy centered within cluster (L1), (b) the cluster means for teachers' self-efficacy (L2), and the innovative school climate (L2) as shown in Figure 2.

Method

Data Collecting

Taking advantage of a large, high-quality dataset from Teaching and Learning International Survey (TALIS), the researcher took research data from the 2018 TALIS, which is conducted by the Organization for Economic Cooperation and Development and is the latest international large-scale database containing a nationally representative sample of teachers. 2018 TALIS data set was downloaded from http://www.oecd.org/education/talis/talis-2018-data.htm. TALIS 2018 was released for public use on 4th. December, 2019. It is essential to use the most updated data to identify the educational phenomena associated with teachers' instructional beliefs and practices.

The TALIS sampling is a stratified two-stage probability sampling design and contains nationally representative samples of teachers (OECD, 2019). After eliminating cases with missing data, the 2287 Korean school teachers were selected as the valid sample for this research, consisting of 177 schools. The more detailed demographic information of samlple is displayed in Table 1.



Fi. 2: The 2-l-I multilevel mediation model

Variables and Measurement Instruments

Teacher job satisfaction is measured by T3COGAC, measured on a four-point Likert scale ranges from 1 (strongly disagree) to 4 (strongly agree). Teacher self-efficacy is measured by

Table 1: Teacher Demographics

		Frequency	*Percent*
Gender	Female	1584	69.3
	Male	703	30.7
Highest level of forma l education completed	ISCED 2011 Level 6	1410	61.6
	ISCED 2011 Level 7	845	36.9
	ISCED 2011 Level 8	32	1.6
Teacher Age Groups	Under 25	5	0.2
	25~29	188	8.2
	30~39	612	26.8
	40~49	719	31.4
	50~59	720	31.5
	60 and above	43	1.9
School location	A rural area (up to 3,000 people)	93	4.1
	Small town (3,001 to 15,000 people)	117	5.1
	Town (15,001 to 100,000 people)	140	6.1
	City (100,001to 1,000,000 people)	873	38.2
	Large city (more than 1,000,000 people)	1064	46.5
Type	Publicly managed school	1952	85.4
	Privately managed school	335	14.6
Experiences As a teacher in total	Under 5 year (s)	443	19.4
	6~10 years	329	14.4
	11~20 years	646	28.2
	21~25 years	236	10.3
	26 years and above	633	27.7
			100.0

T3SELF, measured by thirteen items on a four-point Likert scale ranges from 1 (not at all) to 4 (a lot). Innovative School climate is measured by T3TEAM, measured on a four-point Likert scale ranges from 1 (strongly disagree) to 4 (strongly agree). All the scales of the ISCED 2 teachers have high internal consistency with Omega reliability coefficients. Measured items and analysis results for all variables are presented in Table 2.

Analysis Method and Analysis Tools

The author argues that the isolated study of either team or individual level design does not suffice to understand how innovative school climate may affect teachers to implement cognitive activation strategies. Moreover, traditional single-level mediation analyses on nested data might produce biased standard errors. Therefore, a multi-level mediation approach is suitable for gaining insight into this process when data have been collected at multiple levels simultaneously. Any mediation of the effect of a Level-2 X must also occur at a between-group level, regardless of the level at which M and Y are assessed (Krull & MacKinnon, 2001).

Therefore, the indirect effect of innovative school climate (X) on cognitive activation practices (Y) through teachers' self-efficacy (M) may function only through the between-group variance in M and Y. In other words, a between-group indirect effect is the effect of the group differences in X on Y through M. The author tested the relations between the variables and the mediational hypotheses using the MLmed macro for SPSS (Rockwood & Hayes, 2017), with robust standard errors (REM estimation).

Findings

A descriptive analysis was carried out to examine the distribution of teachers' responses. Table 3 summarizes the descriptive statistics and the bivariate correlations of all the variables. As shown in Table 3, the skewness and kurtosis for each of the variables were adequate. Also, the predictor variable (innovative school climate), mediation variable (teacher's self-efficacy), and dependent variable (implementing cognitive activation practices) were all significantly correlated, fulfilling the first condition for the test of a mediation effect. None of the correlations exceeded 0.80 able 3).

This research model is a 2-1-1 mediation model, hypothesizing that an innovative school climate led to teachers' self-efficacy, which led to teachers' cognitive activation practices. The more innovative the school climate, the higher teachers' self-efficacy. In addition, higher levels of teachers' self-efficacy were hypothesized to predict higher levels of implementing cognitive activation practices. To test the hypothesis, a multilevel mediation analysis was performed. Table 4 shows the results of a multilevel analysis investigating the effects of innovative school climate and teachers' self-

Table 2: Variables and Measurements

Variable	*Measured items*
Teacher's cognitive activation practices (T3COGAC)	How often do you do the following? I present tasks for which there is no obvious solution. I give tasks that require students to think critically. I have students work in small groups to come up with a joint solution to a problem or task. I ask students to decide on their own procedures for solving complex tasks.
Innovative school climate (T3TEAM)	Thinking about the teachers in this school, how strongly do you agree or disagree with the following statements? Most teachers in this school strive to develop new ideas for teaching and learning. Most teachers in this school are open to change. Most teachers in this school search for new ways to solve problems. Most teachers in this school provide practical support to each other for the application of new ideas.
Teachers' self-efficacy (T3SELF)	In your teaching, to what extent can you do the following? Get students to believe they can do well in school work Help students value learning Craft good questions for students Control disruptive behavior in the classroom Motivate students who show low interest in school work Make my expectations about student behavior clear Help students think critically Get students to follow classroom rules Calm a student who is disruptive or noisy Use a variety of assessment strategies Provide an alternative explanation, for example, when students are confused Vary instructional strategies in my classroom Support student learning through the use of digital technology

Table 3. Descriptive Statistics

					Correlation	
Variable	*Mean*	*SD*	*Skewness*	*Kurtosis*	*B*	*C*
Implementing cognitive activation practices (A)	9.97	2.81	0.33	-0.29	0.132**	0.363**
Innovative school climate (B)	11.41	2.13	-0.46	0.64		0.222**
Teacher's self-efficacy (C)	12.74	2.49	-0.11	0.21		

Table 4: Multilevel mediation effect of teachers' self-efficacy in relationship between innovative school climate and implementation of cognitive activation practices

		Teachers' self-efficacy				Implementation of cognitive activation practices			
		Estimate	SE	LL	UL	Estimate	SE	LL	UL
Between level	Innovative school climate (X)	0.16*	0.07	0.03	0.30	0.21**	0.06	0.09	0.34
	Teachers' self-efficacy (M)					0.36***	0.07	0.21	0.50
	Indirect Effect					0.06*	0.03	0.01	0.12
Within level	Intercept	10.87***	0.80	9.29	12.46	3.02**	1.10	0.87	5.19
	Teachers' self-efficacy (M)					0.40***	0.02	0.35	0.44

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

efficacy on implementing cognitive activation practices between schools, as well as the effect of teachers' efficacy on implementing cognitive activation practices within schools.

As shown in Table 4, the results of a multilevel model demonstrated that an innovative school climate had a positive effect on the implementation of cognitive activation strategies (H1, $p < 0.01$) and teachers' self-efficacy (H2, $p < 0.05$) respectively at the school level. Furthermore, a hypothesis predicting teachers' self-efficacy will positively influence the implementation of cognitive activation strategies was supported (H3, $p < 0.001$) at the school level, too. The between-indirect effect of innovative school climate on implementation of cognitive activation strategies via teachers' self-efficacy was significantly positive (B: 0.06, $p < 0.05$), showing the distribution of the product of the coefficients 95% CI for the indirect effect [0.01, 0.12]. This indicates that the between-school indirect effect of innovative school climate on implementing cognitive activation practices via teachers' self-efficacy was significantly different from zero.

Therefore, results suggest that an innovative school climate is indeed related to implementing cognitive activation via teachers' self-efficacy. Furthermore, the relationship between innovative school climate and implementing cognitive activation was partially mediated by teachers' self-efficacy. Finally, a hypothesis predicting the mediate effect (H4) was supported. To sum, all hypotheses (H1, H2, H3, H4) were supported.

Discussion and Conclusion

This research focused on revealing the effect of an innovative school climate on the implementation of cognitive activation strategies and clarifying the mechanism of how innovative school climate work. Specifically, the author aimed at integrating the school and individual level perspectives by proposing a multi-level framework for studying the relationship between innovative school climate and the implementation of cognitive activation strategies at the school level. Furthermore, this study's core proposition is the relationship between an innovative school climate and the implementation of cognitive activation strategies is mediated by teachers' self-efficacy at the school level.

Therefore, the primary purpose of this study is to analyze the relationship between innovative school climate and cognitive student activation strategies and to test the mediation effects of teachers' self-efficacy in the relationship between innovative school climate and cognitive student activation

strategies at school level. For these research aims, the author applied multilevel mediation analysis. Research findings showed that three hypotheses predicting the direct effects between variables and a hypothesis predicting the mediate effect (H4) were supported. Therefore, the school climate has a direct effect on implementing cognitive activation, and the relationship between these variables is mediated by teachers' self-efficacy.

Research findings provide several implications for research and practice. First, the findings reported in this article have provided empirical evidence for the structural relations between school climate, teacher self-efficacy, and implementing cognitive activation. Proper understanding of this relationship is very crucial to the sustainability of effective teachers and high-quality instructional practices. A strength of these findings lies in the large sample involved coupled with the multilevel mediation analysis used, unlike mere correlational studies. In addition, such knowledge could represent an important contribution to instructional practice by offering suggestions as to how to facilitate school climate in a way that promotes cognitive activation strategies among teachers.

Secondly, teachers' efficacy serves as an accelerator for innovative teaching practices such as cognitive activation teaching practices. At the same time, it is crucial for a school climate to be innovative in the long term. this research deepened and expanded our understanding of the mechanism of school climate on teachers' cognitive activation teaching practices. Therefore, the results will help school leaders and administrators to develop strategic plans for teachers' instructional practices, taking into consideration school climate and teacher self-efficacy. Continual feedback on school climate can afford school leaders the information necessary to provide direction for high-quality education and classroom-based efforts. Also, this study implies that principals should be cognizant of the fact that teaching practices are more innovative when the school is conducive to norms and practices that promote innovation.

Finally, based on these findings, the author suggests that more detailed knowledge of the relationship between innovative school climate and implementation of cognitive activation strategies is needed to advance theory building on the instructional practices.

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