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Mediated Effect of Resilience and Readiness for Change between Growth Mindset and Depression in South Korean Teachers

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Abstract

Since 2020, Korean schools have implemented teaching methods using new online platforms instead of traditional classroom settings due to COVID-19. This study confirms the direct and indirect paths through which growth mindset in teachers positively influences depression through resilience and readiness for change. Questionnaires on growth mindset, depression, resilience, and readiness for change were distributed to 308 teachers (male: 116, female: 192) in middle and high schools. The study obtained 308 complete responses using a mobile URL of Google from October 2021 to November 2021. Data were analyzed through frequency and correlation analyses using SPSS V26 and structural equation modeling. First, the results indicated that growth mindset and readiness for change levels were higher among those with a teaching career of >11 years compared with those with <10 years. Moreover, the growth mindset, resilience, and readiness for change levels were higher among natural science than liberal arts teachers. Second, depression displayed significant negative correlations with growth mindset, resilience, and readiness for change. Third, the SEM results verified the mediating effects of resilience and readiness for change on the relationship between growth mindset and depression among teachers. The independent variable, growth mindset, exerted a statistically significant effect on resilience and readiness for change but did not influence depression (dependent variable). Thus, improving resilience and readiness for change instead of only possessing a growth mindset is necessary for addressing depression. Various changes are required in educational policies and programs to improve the resilience and readiness of teachers for change according to teacher characteristics.

Keywords: Confirmatory Factor Analysis; Depression; Growth Mindset; Mediated Effect Resilience; Readiness for Change

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Introduction

Schools in Korea have implemented various teaching methods using new online platforms instead of traditional classroom settings since 2020 due to the COVID-19 pandemic. The majority of teachers have had to adapt to the new education environment and learn how to use novel educational platforms. Unfortunately, this shift has become a cause of stress among teachers, which frequently leads to depression.

The rapidly changing educational landscape requires teachers to utilize nontraditional teaching and learning methods, which has led teachers to experience professional depression. Moreover, the online teaching and relationships of teachers with students were different from those in the traditional physical school space.

Therefore, teachers who are unfamiliar with social networking services and various types of online-based learning have experienced difficulty in operating an online-based classroom and raised doubts about their teaching abilities. In addition, online classes have led to depression, such as stress, helplessness, and anxiety, due to various technical difficulties, increased workload, and introduced changes in school life such as teaching students online (Kim, 2023). In particular, research shows that teachers' depression has a direct impact on their relationships with students, so it is necessary to discuss ways to address teachers' psychological stress and depression (Kim & Chung, 2017).

During this process, teachers differently adapt, even under similar situations. Among teachers, the factors that influence this difference are growth mindset, resilience, and readiness for change. According to Dweck (2007), mindset denotes the mental attitude of an individual and is generally classified into growth and fixed mindset. Individuals with a growth mindset display high levels of confidence and motivation when addressing challenges, while people with a fixed mindset resort to familiar strategies. Therefore, when faced with changes in the educational environment, teachers with a growth mindset will continue to devise new strategies for eliminating the factors that promote depression. This research lies in being studies to directly examine the relationship between these two variables.

Alternatively, studies have been conducted to demonstrate the importance of resilience as a psychological resource that influences the academic activities and mental health of teachers. The capacity to exhibit resilience can help Korean teachers with high levels of workplace stress and improve job performance and quality of teaching, which, thereby, positively influences mental health and growth mindset (Meierdirk & Fleischer, 2022; Chu, 2017; Seaton, 2017; Lee, 2021; Brooks & Goldstein, 2008). Additionally, the readiness for change by teachers in terms of using educational technology (i.e., one used in education) can help reduce depression during the current pandemic scenario. Specifically, teachers with high levels of readiness for change will be less depressed due to their ability to actively cope with the rapidly changing educational environment. Although studies have been conducted on the relationship between readiness for change and the negative emotions of teachers, such as depression (Kondakci, Beycioglu, Sincar, & Ugurlu, 2017), few have been conducted on secondary school teachers in Korea. The reason is that teachers have paid more attention to the factors that influence the growth of students instead of focusing on their personal characteristics (Brooks & Goldstein, 2008; Haimovitz & Dweck, 2017).

Nevertheless, these concepts are significant psychological mediums for overcoming stressful situations experienced by teachers in the current pandemic situation. Varying levels of depression, which are conditioned by diverse levels of acceptance even under the same condition, can be considered as differences in the psychological mechanisms of individuals. Therefore, reviewing growth mindset, resilience, and readiness for change among teachers as elements that determine their levels of adaptation in practice is necessary.

The results of previous studies indicate that the levels of growth mindset, resilience, and readiness for change were relatively higher for men than women (Chiu, Lin & Tang, 2005; Stout & Blaney, 2018; Žilionis, 2008), for teachers with more experience than those with less (Park, 2017), and natural science teachers than liberal arts teachers (Kondakci et al., 2017).

In addition, a few studies demonstrate opposite results, which include those reporting that the levels of readiness for change (Scherer, Howard, Tondeur & Siddiq, 2021) and depression were

higher for women than men (Hyde & Mexulis, 2020). Moreover, other studies report no differences in the levels of readiness for change (Scherer, Siddiq, Tondeur & Howard, 2022), growth mindset, or depression according to sex. Taken together, the results of these studies in terms of differences in growth mindset, resilience, readiness for change, and depression were inconsistent across the sex, teaching career, and subject setting of teachers. In addition, studies on the differences among variables according to the subject setting of teachers are scarce.

Thus, the current study aims to analyze the relationships between the personal characteristics of teachers, such as gender, experience, subject setting, growth mindset; resilience and readiness for change; and depression. Hence, this study intends to confirm the influence of the growth mindset of teachers on depression and analyze the degree to which resilience and readiness for change demonstrate structural relationships. In this manner, this study suggests the necessity of a support system according to the demographic characteristics of teachers.

The specific research questions are as follows. First, do any sociodemographic differences in variables exist among teachers? Second, do correlations exist among a growth mindset, depression, resilience, and readiness for change? Third, does a structural relationship exist among a growth mindset, depression, resilience, and readiness for change?

Literature Review

Growth Mindset

The concept of mindset is built on an implicit theory of intelligence variability. It can be understood as a mental attitude and is frequently considered as the belief in the changeability or the fixed nature of intelligence. The implicit theory refers to a personal belief in intelligence, personality, and motor ability, among others. Moreover, the implicit theory on the variability of intelligence acquires considerable attention as a key concept in cognitive motivation. The theory is classified under incremental (the belief that intelligence can be changed by effort) and entity (the belief that intelligence cannot be changed by effort, because it is inherently fixed) theories (Dweck & Leggett, 1988). Dweck (2007) denotes incremental and entity theories as representing the growth and fixed mindsets, respectively, which are positioned at opposite ends of a continuous line (Kwon, 2018). Individuals with a growth mindset believe that they can and attempt to enhance their intelligence. They are perceived as people who can control the causes of failure by changing their strategy, environment, and effort, which, thereby, results in positive emotions such as confidence and motivation. In contrast, people with a fixed mindset believe that innate abilities and talents cannot be changed through effort.

Previous studies have demonstrated that teachers with a growth mindset adapt to a dynamic school environment, which positively influences professional efficacy, job commitment, and readiness for change (Lee & Kim, 2019; Dweck, 2007). Alternatively, those with a fixed mindset are more likely to experience difficulty in adapting to a dynamic professional setting (Meierdirk & Fleischer; 2022). Therefore, the growth mindset of teachers may enable them to better adapt to the rapidly changing technological school environment, which, thereby, reduces depression and stress. Conversely, previous research has illustrated that a growth mindset not only influences the role performance of teachers but is also associated with sex and depression. However, results related to growth mindset or levels of depression by sex have been inconsistent (Hermundur, Stéfan & Sigurrós, 2021; Stout & Blaney, 2018). Therefore, the current study aims to analyze the relationship between readiness for change and a sense of depression among secondary school teachers according to their sociodemographic characteristics with a focus on growth mindset (Dweck, 2000).

Resilience

With recovery and growth as core elements, resilience is defined as the capability to overcome and adapt to hardships or to engender mental tenacity toward stress (Luthar, 1991). Green (2004) proposes that a certain level of resilience was identified during the interactions of the characteristics of individuals within social contexts. Furthermore, resilience is a dynamic quality influenced by time and environmental factors or experiences instead of an innate characteristic. People with high levels of resilience respond to stress with high levels of positivity and acquire

enhanced capabilities after overcoming stress compared with those with low levels of resilience (Kim, 2011; Kim, Oh & Park, 2011; Kim & Yoo, 2014).

Previous research has demonstrated that individual resilience can be improved through optimism, trust, self-efficacy, and close bonds through which people can overcome stress (Masten & Reed, 2002). Recently, studies have been conducted on the prevention of burnout due to job stress among teachers by focusing on personal resilience and methods for improving job satisfaction. However, the majority of them consider infants and elementary school teachers (Jung & Kwak, 2021). Additionally, scholars have presented conflicting results regarding the correlation, if any, between resilience as influenced by the environment or experience and the gender or teaching career of teachers (Kwon, Lee & Chung, 2016; Lee & Ahn, 2020; Bowles & Arnup, 2016).

Therefore, the current study aims to analyze the relationship between resilience and depression among secondary school teachers with a consideration of demographic variables and suggests methods for enhancing the resilience of teachers.

Readiness for Change

The concept of readiness for change denotes personal beliefs, emotions, and willingness to participate about changes in beliefs, attitudes, and intentions of individuals when determining which types of change are necessary for an organization and whether or not the organization can adapt to such change (Armenakis, Harris & Mossholder, 1993; Weiner, 2009). Personal readiness for change could be classified as cognitive, emotional, and readiness to participate, which positively and significantly influence the implementation of change and performance (Bouckenooghe, Devos & Van den Broeck, 2009; Jeong & Choi, 2011; Woo, 2014).

In particular, changes in the structure, goal, and technology of the organization are dependent on the readiness for change of individual employees (Lapointe & Rivard, 2005). In this context, readiness refers to a collection of thoughts and intentions for specific changes beyond understanding or believing in changes (Bernerth, 2004). Previous studies suggest that employees with readiness for change are more likely to positively recognize and participate in the need for change and, thereby, improve performance (Dong, 2001; Eby, Adams, Russell & Gaby, 2000; Kwahk & Lee, 2008).

Due to the Fourth Industrial Revolution and the COVID-19 pandemic, teachers continue to encounter significant technological challenges, which, thus, makes them apprehensive (Seo, 2018; Yang & Park, 2012; Yoon, 2017). Therefore, readiness–psychological and technical–is essential for the analysis and acceptance of technological changes (Fiore & Jin, 2003; Mathwick, 2002).

To accept positive changes and successfully implement them in secondary schools, teachers need to rely on their beliefs and willingness to participate. However, not all teachers possess the same level of readiness for change, which can be related to negative emotions, such as disinterest or depression, according to individual characteristics. Studies on the relationship between readiness for change and the majors of teachers reveal that natural science teachers are more positive in terms of technology acceptance than liberal arts teachers are. Therefore, their level of readiness for change is relatively high, and the degree of depression associated with readiness for change is relatively low (Kondakci et al., 2017).

According to Al-Furaih and Al-Awidi (2020), men are more interested in new technologies than women, and teachers majoring in natural sciences are more interested in new technologies than those majoring in liberal arts. Therefore, measures for applying new technologies to education should be dependent on the sex or major of teachers. The research on the relationship between readiness for change and sex is classified into studies that suggest that men exhibit higher levels of readiness for change than those levels of women (Chiu et al., 2005; Lee et al., 2016; Žilionis, 2008) and those that indicate that no sex-based differences exist (Hanpachern, 1997).

However, studies that investigated secondary school teachers in Korea are few, which necessitates the analysis of such differences according to participant characteristics. The majority of studies conducted after the COVID-19 pandemic have examined the decreased job satisfaction and self-efficacy of Korean teachers due to the need to conduct online classes with little or limited knowledge of new technologies (Keris, 2020; Kwon, 2021; Lee, Yoo & Kim, 2021; Oh & Hwan, 2020).

To reduce the anxiety of teachers regarding change, previous studies have recommended the provision of training on data production and sharing platforms, improvement of content suitable for teaching and learning materials, enhancement of the IT infrastructure of schools, establishment of a copyright system for content production and data utilization, and delivery of competency education to increase the readiness for change of teachers (Ju & Chung, 2018; Keris, 2020; Rafferty, Jimmieson & Armenakis, 2013; Smith, 2005). However, these studies have focused on methods for supporting teachers in operating online classes instead of the relationship between teacher preparedness for change and depression.

Therefore, the current research proposes the necessity of the personal characteristics of teachers and institutional support measures by confirming the relationship between readiness for change and depression among teachers.

Against this background, the study proposes the following hypotheses:

H1: Differences exist in gender, teaching career, and subject setting as well as growth mindset, depression, resilience, and readiness for change.

H2: A relationship exists among a growth mindset, resilience, readiness for change, and depression.

H3: Resilience and readiness for change exert mediating effects on the relationship between growth mindset and depression among South Korean teachers.

Methodology

Research Model

This study examines the effects of a growth mindset on depression among Korean teachers and focuses on the dual mediating effects of resilience and readiness for change. This study develops a research model that considers its antecedents (Figure 1).

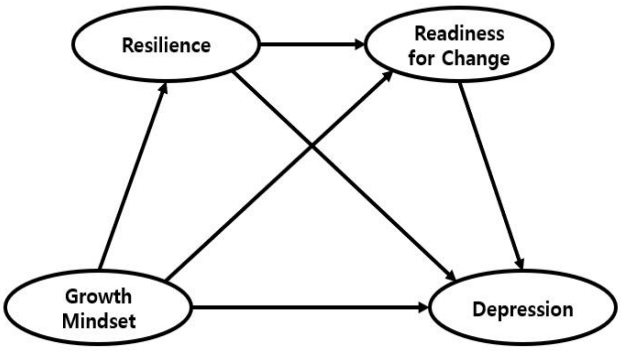


Figure 1. Research model

Research Subjects and Data Collection Procedures

The study administered a survey on middle and high school teachers in South Korea and analyzed a total of 308 complete responses using a mobile URL of Google from October 2021 to November 2021. The questionnaire consisted of 8, 25, 11, 11, and 8 items on mindset, resilience, depression, readiness for change, and sociodemographic characteristics, respectively.

Instrument and Procedures

The survey was conducted using an online questionnaire on growth mindset, resilience, depression, and readiness for change. This study used the Growth Mindset Scale by Dweck (2007), which was modified by Lee et al. (2016). The scale is composed of 8 items, which were rated using a five-point Likert-type scale (1 = very likely. 5 = very unlikely) and measures the mindset for change in terms of human intelligence and personality (Cronbach's α = .816).

Connor and Davidson (2003) developed the Connor-Davidson Resilience Scale, which was modified by Baek, K. U. Lee, Joo, M. Y. Lee and Choi (2010) for adaptation in the Korean context. This measure comprises 25 items, which were rated using a five-point Likert-type scale (1 = very likely. 5 = very unlikely) (Cronbach's α = .913).

The study assessed depression using the Center for Epidemiologic Studies Depression Scale (Hoe, Lee & Kim, 2017). This measure consists of 11 items rated using a four-point Likert-type scale (1 = very likely. 5 = very unlikely) (Cronbach's α = .883).

The Readiness for Change Scale, which was developed by Bouckenooghe et al. (2009) and later adapted by Jeong and Choi (2011), was used to measure the cognitive, emotional, and intentional readiness for change. This measure comprises 11 items rated using a five-point Likert-type scale (1 = very likely. 5 = very unlikely) (Cronbach's α = .910).

Two experts in the educational field reviewed and validated the modified instruments and verified the questions and the checklist of the reorganized instrument, which were finalized after two meetings. The online questionnaires were distributed to teachers using the mobile URL as part of the convenience sampling process. The participants were allocated a time limit of 15 min to complete the survey.

Characteristics of the Participants

According to the Korea Educational Statistics Service (2021), the number of teachers in Korean middle and high schools is 244,358. Out of these, 90,531 (37.0%) are male, and 153,827 (63.0%) are female, which indicates a 1:1.7 ratio. Hence, this study was designed to survey 0.1% (308 persons) of the total number of teachers without exceeding the ratio between men and women, that is 1:2 by quota sampling. The study classified teaching careers into five-year groupings to ensure even sampling. Finally, 308 teachers (0.126% of the population) participated in the survey with a sex ratio of 1:1.7 (male: 116 [37.7%], female: 192 [62.3%]), which reflects the corresponding sex ratio in the population. The distribution of the subjects according to teaching career is as follows 1 year to <5 years (51; 16.6%), 5 years to <10 years (67; 21.8%); 11 years to <15 years (73; 23.7%); 16 years to <20 years (43; 14.0%); and >21 years (74; 24.0%), which demonstrated a balanced overall distribution, although the group of 11 years to <15 years was slightly higher. As suggested by Chou and Bentler (1995), 200 cases are reasonable; thus, the sample size for structural equation modeling satisfies the subject size requirement for this research. Following a planned schedule, the researchers collected the surveys after three weeks of distribution. The data collection process lasted for one month. The participants were assured of anonymity and voluntarily consented verbally or in writing. Based on extant research, the study created a checklist for evaluating the effect of a growth mindset on depression.

Statistical Analysis

The results were analyzed using SPSS (ver. 26.0 for Windows), and p-values < 0.05 were considered statistically significant. The study conducted factor and reliability analyses to reformulate the scales as well as descriptive statistics analysis to identify sociodemographic characteristics. Furthermore, one-way ANOVA was performed to identify differences in growth mindset, resilience, readiness for change, and depression according to sociodemographic characteristics. Additionally, correlation and hierarchical regression analyses were used to identify the effects of growth mindset, resilience, and readiness for change on depression. To investigate the validity of the observed and latent variables, the study conducted confirmatory factor analysis using Amos 25.0.

Results

Demographic Data

The age distribution of the participants was as follows: 19, 103, 112, 66, and 8 teachers were in their 20s (6.2%), 30s (33.4%), 40s (36.4%), 50s (21.4%), and 60s (2.6%), respectively; the age groups with the highest proportions are those in their 30s and 40s. In terms of teaching career, 118 and 190 teachers have been teaching for <10 years (38.3%) and >10 years (61.7%), respectively.

Regarding institution type, 131 and 177 teachers worked in middle schools (42.5%) and high schools (57.5%), respectively. In terms of the composition of students, 227, 37, and 44 worked in a co-ed environment (73.7%), boys' schools (12.0%), and girls' schools (14.3%), respectively. For the subject setting, 200 and 108 teachers taught liberal arts (64.9%) and natural sciences (35.1%), respectively. Liberal arts include Korean language, moral education, ethics, social studies, Korean history, music, fine arts, physical education, English, French, Chinese, Japanese, design, career guidance, special education, and classical Chinese. Natural sciences include mathematics, science, technology and home economics, computer science, and plant resource landscaping.

Differences according to Sociodemographic Characteristics

The study observed statistically significant differences in growth mindset, resilience, readiness for change and depression according to teaching career, and subject setting (Table 1). First, given the differences in growth mindset and readiness for change by teaching career, the growth mindset and readiness for change of respondents with a longer teaching career were the most positive. Second, in terms of differences in growth mindset, resilience, and readiness for change by subject setting, the variables were reported to be significantly higher for natural science teachers than for liberal arts teachers. However, the study found no statistically significant differences between sex and variables, between teaching careers with resilience and depression, or between subject setting and depression.

Table 1. Differences according to sociodemographic characteristics (n = 308)

IV			**N**	**M (SD)**	**t**
Gender	Growth mindset	Male	116	3.47 (.728)	.876
		Female	192	3.40 (.623)	
	Resilience	Male	116	3.71 (.526)	.366
		Female	192	3.69 (.425)	
	Readiness for change	Male	116	3.80 (.636)	1.283
		Female	192	3.71 (.516)	
	Depression	Male	116	1.47 (.466)	.203
		Female	192	1.46 (.476)	
Teaching career	Growth mindset	1–10	118	3.31 (.645)	2.503*
		>11	190	3.50 (.666)	
	Resilience	1–10	118	3.64 (.512)	1.791
		>11	190	3.74 (.431)	
	Readiness for change	1–10	118	3.65 (.617)	2.338*
		>11	190	3.80 (.523)	
	Depression	1–10	118	1.49 (.492)	–.718
		>11	190	1.45 (.459)	
Subject setting	Growth mindset	Liberal arts	200	3.37 (.658)	2.189*
		Natural sciences	108	3.54 (.663)	
	Resilience	Liberal arts	200	3.65 (.459)	2.777**
		Natural sciences	108	3.80 (.462)	
	Readiness for change	Liberal arts	200	3.66 (.554)	3.539***
		Natural sciences	108	3.90 (.556)	
	Depression	Liberal arts	200	1.49 (.516)	–1.632
		Natural sciences	108	1.41 (.373)	

*p < .05, **p < .01, and ***p < .001

Correlation between Variables

To examine the correlation between variables (i.e., growth mindset, resilience, readiness for

change, and depression), this study conducted a correlation analysis and deduced that the correlations among all variables were statistically significant (Table 2). Focusing on depression as the dependent variable, the study deduced that the higher the levels of growth mindset, resilience, and readiness for change, the greater the negative correlations of depression among teachers. Additionally, as the correlation coefficient varied from −.355 to .615, the study found no risk of multicollinearity between the variables.

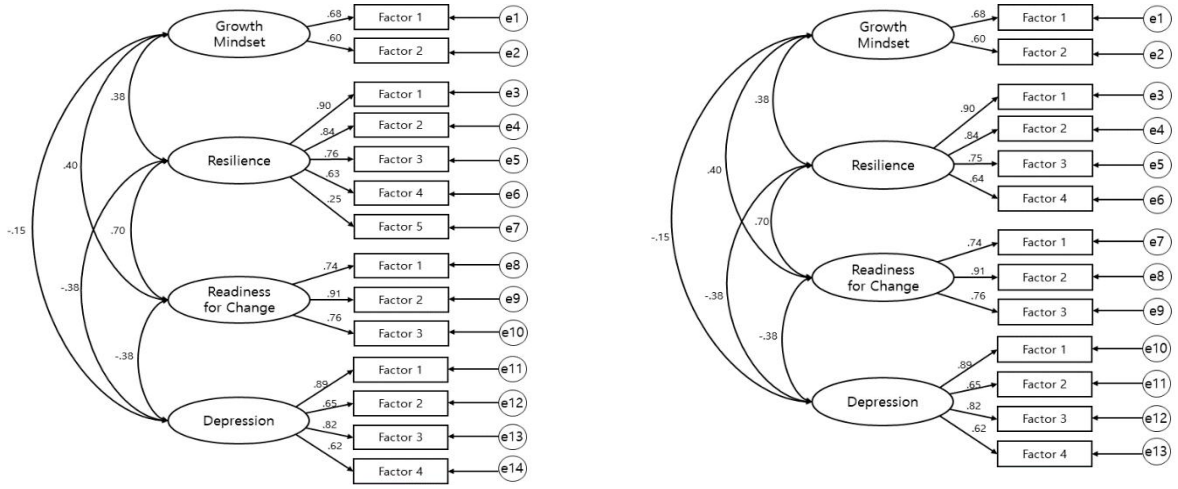
Table 2. Correlation between variables (n = 308)

	Growth mindset	**Resilience**	**Readiness for change**
Resilience	.278**		
Readiness for change	.295**	.615**	
Depression	−.129*	−.355**	−.338**

*p < .05 and **p < .01

Confirmatory Factor Analysis

To investigate the validity of the observed and latent variables, the study performed confirmatory factor analysis using Amos 25.0. Figure 2 and Tables 3 and 4 present the results. To estimate the research model, structural equation modeling (SEM) outperforms it can deal with multivariate normality, sample size, model complexity, and uncertain variables.



Before modification After modification

Figure 2. Path coefficients of the measurement model

To verify the goodness-of-fit of the measurement model, the χ2 value is 128.416 (p < .001), which displayed a significant difference; therefore, the study was unable to verify model fit according to the χ2 statistics. However, sample size easily influences the χ2 value, which becomes meaningless when the sample size exceeds 200 (Hong, 2000). Thus, we evaluated the model fit by considering other fitness indices. The relative fitness indices were tested using the normed fit index (NFI), the Turker-Lewis index (TLI), and the comparative fit index (CFI); moreover, absolute fitness indices were tested through the goodness-of-fit-index (GFI) and root mean square error of approximation (RMSEA). The NFI, TLI, CFI, and GFI met the standard value of ≥.9, and RMSEA was .051, which was favorable. Therefore, the measurement model was considered suitable. However, as the factor loading of the [Resilience → Factor 5] path is .25, which is <.5, the measurement model was modified by omitting the observed variable.

As a result of verifying the fit after modifying the measurement model, the $\chi 2$ value reached 120.108 (p < .001), which exhibited the same significant difference observed before the correction. However, NFI, TLI, CFI, and GFI met the standard value of ≥.9. RMSEA was .058, which was favorable; therefore, the measurement model was deemed suitable for the study.

Table 3. Goodness-of-fit indices of the measurement model

	χ2	**df**	**NFI**	**TLI**	**CFI**	**GFI**	**RMSEA (LO90–HI90)**
Measurement Model	128.416***	71	.933	.960	.969	.943	.051 (.037–.065)
Modified Model	120.108***	59	.937	.956	.967	943	.058 (.043–.073)

***p < .001

All standard factor loadings of the measurement model after modification reached ≥.5, and all Z values were statistically significant. The average variance index, which is used to confirm concentration validity, reached ≥ .5, and conceptual reliability (CR) was .7. Thus, the study confirmed concentrated validity and CR.

Table 4. Verification of the measurement model after modification

Variables		**Factor loading**		***Z* value**	**Dispersion**	**AVE**	**CR**
		B	β				
Growth mindset	Factor 1	1.000	.677	–	–	.538	.699
	Factor 2	.892	.604	4.219***	.212		
Resilience	Factor 1	1.000	.905	–	–	.842	.955
	Factor 2	.983	.843	19.073***	.052		
	Factor 3	.724	.755	16.025***	.045		
	Factor 4	.708	.635	12.449***	.057		
Readiness for change	Factor 1(C)	1.000	.741	–	–	.811	.927
	Factor 2(E)	1.618	.907	14.577***	.111		
	Factor 3(R)	1.498	.756	12.870***	.116		
Depression	Factor 1	1.000	.886	–	–	.789	.936
	Factor 2	.919	.648	11.991***	.077		
	Factor 3	.849	.823	15.796***	.054		
	Factor 4	.579	.619	11.340***	.051		

***p < .001

Research Model Verification

As a result of checking the fit of the research model while controlling for gender, age, teaching career, type of institution, composition of students, education, and subject setting, Table 5 indicates that the $\chi 2$ value was 194.970 (p < .001), which displayed a significant difference, such that the model fit according to the χ 2 statistics was not verified. However, the χ 2 value is extremely sensitive to the influence of the sample size and becomes meaningless when the sample exceeds 200 (Hong, 2000). Therefore, we evaluated the model fit by considering other fitness indices (NFI = .920, TLI = .950, CFI = .968), which satisfies the standard value of ≥.9. Moreover, RMSEA reached .044, which was favorable; therefore, the research model was considered suitable and was selected as the final model.

Table 5. Fit index of the research model

Classification	**χ^2**	**df**	**NFI**	**TLI**	**CFI**	**RMSEA (LO90 ~ HI90)**
Research model	194.970***	122	.920	.950	.968	.044 (.032~.055)

***p < .001

Figure 3 and Table 6 present the results of verifying the path coefficients as estimated by the research model. Growth mindset (the independent variable) exerted a significant positive effect on resilience (β = .354, p < .001) but not on readiness for change (β = .131, p > .05) and depression (the dependent variable; β = .045, p > .05).Resilience exerted a significant positive effect on readiness for change (β = .631, p < .001), and a significant negative effect on depression (β = −.235, p < .05). Moreover, readiness for change exerted a significant negative effect on depression (β = −.233, p < .05).

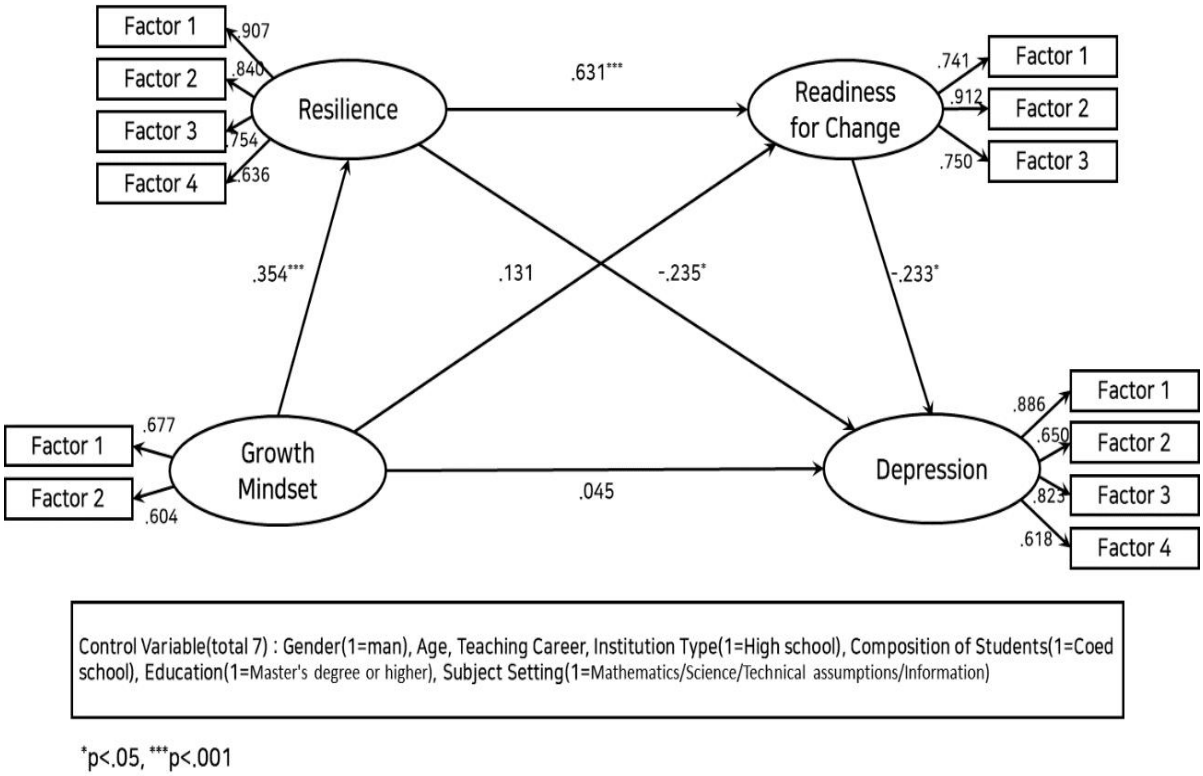


Figure 3. Path coefficients of the research model

Table 6. Path of analysis

Paths between variables			B	β	SE	*t*-Value
Growth mindset	→	Resilience	.392	.354	.101	3.891***
Gender			.007	.007	.063	.116
Age			−.108	−.193	.058	−1.875
Teaching career			.038	.102	.039	.965
Institution type			.039	.037	.063	.611
Composition of students			−.035	−.030	.070	−.508
Level of Education			.130	.124	.063	2.063*
Subject setting			.096	.089	.066	1.454
Growth mindset	→	Readiness for Change	.107	.131	.060	1.781
Resilience			.468	.631	.051	9.149***
Gender			−.056	−.071	.038	−1.479
Age			.038	.093	.035	1.108
Teaching career			−.010	−.037	.023	−.430
Institution type			.038	.048	.038	.994
Composition of students			.006	.007	.041	.146
Level of Education			.037	.048	.038	.974
Subject setting			.060	.075	.040	1.511
Growth mindset	→	Depression	.049	.045	.097	.511
Resilience			−.231	−.235	.094	−2.449*
Readiness for change			−.310	−.233	.131	−2.363*
Gender			−.018	−.017	.061	−.298
Age			−.041	−.074	.056	−.726

Paths between variables			B	β	SE	*t*-Value
Teaching career			.001	.002	.038	.020
Institution type			−.015	−.015	.061	−.251
Composition of students			.057	.049	.067	.855
Level of Education			.071	.069	.062	1.151
Subject setting			−.024	−.022	.064	−.366

$^{*}p < .05$, $^{***}p < .001$

The study decomposed the causal relationship among the variables into direct, indirect, and total effects and verified significance using the bootstrap method with the maximum likelihood method. Table 7 presents the results.

Table 7. Decomposition of direct, indirect, and total effects

Path between variables			Direct effect		Indirect effect		Total effect	
			B	*β*	B	*β*	B	*B*
Growth Mindset	→	Resilience	.392	.354**	–	–	.392	.354**
Growth Mindset	→	Readiness for Change	.107	.131	.183	.224**	.291	.354**
Resilience	→		.468	.631**	–	–	.468	.631**
Growth Mindset	→	Depression	.049	.045	−.181	−.166**	−.131	−.120
Resilience	→		−.231	−.235*	−.145	−.147*	−.376	−.382**
Readiness for Change	→		−.310	−.233*	–	–	−.310	−.233*
R^2		Resilience				18.6%		
		Readiness for Change				53.1%		
		Depression				18.0%		

*p < .05, **p < .01

First, the direct effect of growth mindset on resilience was .354 (p < .01), and the total effect on readiness for change was .354 (p < .01), out of which the indirect effect was .224 (p < .01). The total effect of growth mindset on depression was −.120 (p > .05), which was not significant, and the indirect effect was −.166 (p < .01), which was significant. However, the direct effect was not significant. Second, the direct effect of resilience on readiness for change was .631 (p < .01), and the total effect on depression was −.382 (p < .01), among which the indirect effect was −.147 (p < .05). Third, the direct effect of readiness for change on depression was −.233 (p < .05). In terms of the total effect, the total explanatory power of resilience was 18.6% (R2 = .186); the total explanatory power of readiness for change was 53.1% (R2 = .531), and the total explanatory power of depression was 18.0% (R2 = .180).

In conclusion, the study found that the mediating effects of resilience and readiness for change in the relationship between growth mindset and depression were significant effects in terms of growth mindset and depression.

Discussion

This study aimed to establish the basis for addressing the educational situation of South Korean teachers by identifying the path through which a growth mindset can negatively influence depression through resilience and readiness for change.

The results indicate that no significant differences exist in the variables by gender. This finding contradicts those of Stout and Blaney (2018), that is, the growth mindset of intellectual belonging in computing differed by sex, and of Hyde and Mezulis (2020), who cited that levels of

depression were higher for women than men. A possibility exists that the respondents in these studies belonged to the relatively low-difference group by gender (Hanpachern, 1997; Kim, Ha, & Park, 2021).

The current results revealed a difference in variables according to teaching career and subject setting. Consistent with the results of previous studies, the levels of growth mindset and readiness for change were higher for more experienced teachers than less experienced ones (Park, 2017). Compared with highly experienced teachers accustomed to school life, the current study asked the teachers with less teaching experience to adapt themselves not only to the changing educational environment due to the COVID-19 pandemic but also to various school projects and situations, which may explain their low levels of perception of growth mindset and readiness for change (Lee & Kim, 2019; Tak, 2021). In line with the results of previous studies, levels of growth mindset, resilience, and readiness for change were relatively higher for natural science teachers than those for liberal arts teachers (Kondakci et al., 2017). Natural sciences teachers have received the education that primarily focuses on science and technology (Al-Furaih & Al-Awidi, 2020). Thus, the study inferred that vitalizing training that can enhance the growth mindset, resilience, and readiness for change for less experienced teachers is necessary through educational support that aims to increase the "edutech" ability of liberal arts teachers.

Moreover, the study observed no significant differences in depression by teaching career and subject setting, which contradicts the findings of Hyde and Mezulis (2020) that levels of depression were higher for women than men. Thus, the current study deemed that teachers experience less depression in school situations that are currently required for edutech (Kim et al., 2021). Such results may have originated from the occupational characteristics of teachers. In other words, they belong to an equal group with less discrimination according to teaching experience, such that the differences in depression must be relatively low. In particular, the respondents exhibited low mean values of depression, which indicates positive psychological health.

Second, high levels of growth mindset, resilience, and readiness for change were found to lead to negative correlations with depression among teachers. This finding is consistent with those of studies that suggest that the growth mindset and resilience of teachers exert a positive effect (Meierdirk & Fleischer, 2022; Chu, 2017; Seaton, 2017; Lee, 2021; Brooks, & Goldstein, 2008). The current study derived a positive result when analyzing the correlation between a growth mindset and resilience on the basis of studies that suggest that people with high levels of readiness for change possess the ability to positively accept change (Seo, 2018; Yang & Park, 2012; Yoon, 2017). Thus, a potential basis for the rationale is that a growth mindset and resilience as the individual characteristics of teachers can be increased through institutional support of leadership for change due to COVID-19. Additionally, growth mindset, resilience, and readiness for change were found to be negatively correlated with depression, which is consistent with the results of previous studies (Meierdirk & Fleischer; 2022; Kim, 2011; Kim et al., 2011; Kim & Yoo, 2014; Kondakci et al., 2017; Masten & Reed, 2002). Therefore, to positively address depression among teachers, support measures for increasing the levels of growth mindset, resilience, and readiness for change should be implemented, especially as the psychological characteristics of teachers could be increasing through the accumulation of experiences. This scenario points to the need to discuss various coping measures through teaching/learning communities.

Third, the result of the mediating effect of resilience and readiness for change exerted a positive and significant effect on depression. The study revealed that the growth mindset of teachers does not directly affect depression; instead, it affects depression through resilience and readiness for change. Therefore, to reduce depression, first addressing resilience and readiness for change is necessary instead of improving a growth mindset.

The results demonstrate that Korean teachers can overcome the depression associated with the process of adapting to the drastically changed school environment in the context of the COVID-19 pandemic through a growth mindset, resilience, and readiness for change. Furthermore, the finding highlights that growth mindset, resilience, and readiness for change as the personal characteristics of teachers are related to the characteristics of teaching experience and majors. Thus, psychological and technical support for inexperienced teachers and the development of training programs that consider the characteristics of majors are required. The current study suggests that low levels of depression among Korean teachers can exert a positive impact on

students; nevertheless continued support for the psychological well-being of teachers in a changing environment is important.

Conclusion

The results were similar to those of previous studies that examined the factors related to depression among teachers. Overcoming depression in academics requires improving a growth mindset through resilience and readiness for change by developing and implementing educational programs to change the perceptions of teachers. This approach is more applicable to teachers with less experience or liberal arts teachers than to those with more experience or natural sciences teachers. Accordingly, future research should identify other factors that could influence depression among teachers. Various changes are required in educational policies and programs to improve teachers' resilience and readiness for change. In particular, establishing an edutech training program according to the characteristics of the subject setting will be beneficial. The current study performed quota sampling in terms of the sex ratio of teachers in Korea and observed an even distribution in teaching career as a variable, which was structured to allow for greater was found in the teaching career, which showed the generalization. Nonetheless, special care is needed to generalize the results to the total population of Korean teachers due to the limitations of the study such as difficulty in identifying representative data based on probability sampling. Moreover, further studies are needed to utilize nationwide data or data from the Korean Education Office, which would permit a larger sample to compare differences in levels of depression among teachers.

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