Developing Factors and Indicators of Growth Mindset for School Administrators in Thailand

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Abstract

The sustainability of educational administration is depending on school administrators' growth mindset. A growth mindset is detected to have a direct relationship with school achievement and success. Despite being an integral part of school leadership, the growth mindset of school administrators has been ignored by past researchers. Hence, this research is designed to investigate the growth mindset's significant factors and indicators of high school administrators in Thailand. The researchers employed a quantitative approach survey design. A total of 460 school administrators and teachers participated in a survey using a multi-stage sampling technique. The researchers intended to test whether the identified factors and indicators are fitting with empirical data as the ultimate research outcome. The results revealed that there are a total of 17 indicators derived from the six factors in a growth mindset model. The measurement model of growth mindset is corroborated to the empirical data, with χ^2=64.875, df=50, χ^2/df=1.2975, CFI=0.99, TLI=0.99, RMSEA=0.02, and SRMR=0.01. In conclusion, the developed growth mindset model for high school administrators has a goodness-of-fit with the attained data. Finally, the results of this research have successfully proposed a measurement model that would be guidelines for school administrators to grow their positive mindset as our major contribution to the educational administration field.

1. Introduction

The key success of any school is depending on school administrators' mindset because they are not only setting their growth mindset for long-term achievement, but they must ensure that their leadership will be sustainable in the future (Meador, 2019). Goldstein and Brooks (2007) defined school administrators' mindsets as the assumptions and expectations they have for themselves and others that manage their practices and dealings with others. Goldstein and Brooks further describe the factors and indicators of the mindset of effective school administrators are the ways they cultivate this mindset in their subordinates.

Elmore (2019) identified four principles to grow school administrators' positive mindset. These four principles include teaching practices that should be affixed to our core instructional schooling, systemic problems entail systemic solutions, educational leadership is a profession without practice, and powerful practices entail strategies. Elmore explained that school administrators sometimes need to spend a few years to identify the issues for developing not only their leadership mindsets but also the leadership mindsets within their subordinates. For example, those teachers who lead professional learning community activities, chair the grade-level meetings, and organize departmental activities need leadership mindsets, too. Therefore, those teachers should be a part of systemic solutions in order to strengthen the instructional core of schooling (DeWitt, 2020).

Dweck (2006) who is a popular researcher in the area of students' mindset has identified the new psychology of success in students' learning. Dweck emphasized the importance of classroom and school environment factors to motivate students' mindset. According to Dweck (2006), there are two methods to investigate students' intelligence or capability, namely a fixed mindset and a growth mindset. A fixed mindset is defined as human beings are born with a specified level of capability and it is rooted. Therefore, individuals with a fixed mindset consider that these undeveloped abilities are stationary and unchangeable. It also called entity theory (Rissanen, Kuusisto, Tuominen, & Tirri, 2019). On the other hand, a growth mindset refers to human beings' effort to develop their capabilities over time by tapping in the attempt and believing sufficient self-confidence to seek innovative strategies to obtain deeper learning through hard work. This means that individuals with a growth mindset consider that cleverness, character, and capabilities can be developed, so-called incremental theory (Rissanen et al., 2019).

Generally, the school administrator's major role is to ensure they are cultivating a culture that comprises factors and indicators associated with the anticipated behavior or outcome to assist teachers to be this best. Therefore, school administrators must help teachers to have growth mindsets and allow teachers to utilize the activities of students with a growth mindset (Guidera, 2014). Guidera found that school administrators' intentional and coordinated actions could make the growth mindset norm change. Moreover, those successful school administrators have shown their capabilities in providing teachers with targeted professional development and coaching on the norms and proposed interference training for the struggling teachers. As a result, Guidera recommended school administrators build schoolwide cultures with growth mindset norms.

High school administrators in Thailand are required to have thoughtful behaviors and a growth mindset to offer optimal learning conditions for students as elucidated in Educational Administration in Thailand 4.0 (Boonmepipit & Jiamjan, 2020). Since school administrators hold the most power in developing a school's organizational structure, teachers' beliefs in their collective ability to help all students grow and learn will be influenced by school administrators' growth mindset (Hanson, Bangert, & Ruff, 2016). Therefore, this research aims to develop a growth mindset model for high school administrators in Thailand. Ultimately, the growth mindset model can assist high school administrators to develop national youth who have the quality that equal to many civilized countries as the planning of Educational Administration in Thailand 4.0.

2. Method

2.1 Research Design and Research Process

The researchers employed a quantitative method using a survey. The strength of employing quantitative data is to generate deeper, and ultimately the research results will be more reliable, actionable, and useful research intuitions (Lavrakas, 2008). Therefore, researchers constructed a survey to test the structural construction between experimental examination and the hypothetical theory of quantitative associations concerning experimental data. The associations are epitomized by path coefficients or deterioration between the growth mindset factors and their indicators. Figure 1 illustrates the research process.
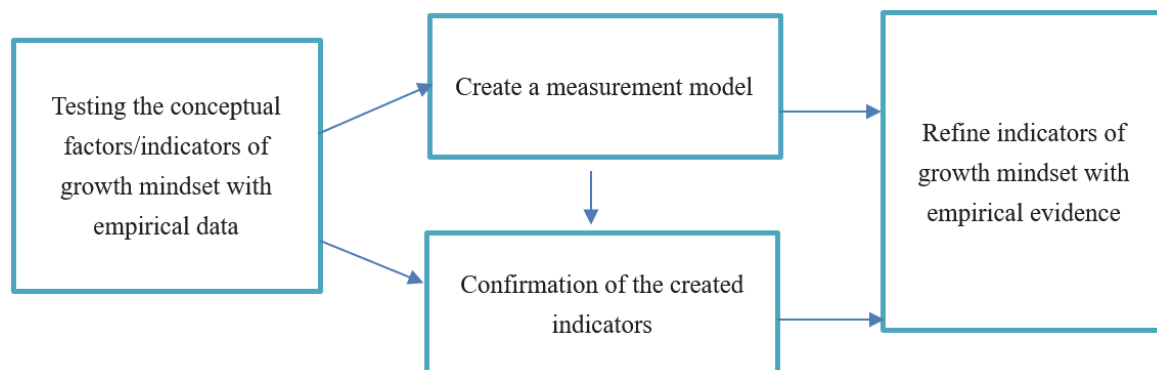

Figure 1. Research Framework

2.2 Population and Sampling

The research population was comprised of school administrators and teachers from four provinces, namely Kalasin, Khon Kaen, MahaSarakham, and Roei provinces. All the high schools located in these four provinces are allied with High School Educational Service Area 24 to 27 under the supervision of the Basic Education Commission in Thailand.   The researchers employed the rule of thumb proposed by Becker and Ismail (2016) to formulate an adequate sample size (N). The identified sample size is recognized as the presence of classified practice in reaching an adequate probability for the requisite results such as model convergence, statistical precision, and statistical power for particular confirmatory factor analysis (CFA) with empirical data. This is followed by determining the ratio of parameter and samples as 20:1 to fulfill the sample size criteria (Hair, Black, Babin, & Anderson, 2013). Owing to there were 23 parameters in this research that directed to at least 460 as required sample size.

The researchers employed Yamane's (1970) formula at a 95% confidence interval using the multistage sampling technique. Firstly, researchers divided the population into provinces and selected a small sample of relevant separate groups according to school size. This sampling method is allowed significant provinces of the selected samples are split into sub-groups, namely school administrators and teachers at various stages to make it simpler for obtaining primary data. Table 1 displays the dispersal of population and sample groups.

Table 1. Distribution of Population and Sample Groups

Province	School Size	Population (school)	Sample group (school)	Respondent		
				Administrator	Teacher	Total
Kalasin	Small	14	14	14	14	28
	Medium	24	23	23	23	46
	Large	13	12	12	12	24
	Extra large	5	5	5	5	10
	Total	56	54	54	54	108
Khon Kaen	Small	15	15	15	15	30
	Medium	50	49	49	49	98
	Large	6	6	6	6	12
	Extra large	13	13	13	13	26
	Total	84	83	83	83	166
MahaSarakham	Small	3	3	3	3	6
	Medium	19	19	19	19	38
	Large	5	4	4	4	8
	Extra large	8	8	8	8	16
	Total	35	34	34	34	68
Roei	Small	3	3	3	3	6
	Medium	34	33	33	33	66
	Large	14	14	14	14	28
	Extra large	9	9	9	9	18
	Total	60	59	59	59	118
Grand Total		234				460

2.3 Research Instrument

The researchers employed a survey questionnaire with 95 closed questions as a method to collect quantitative data. A continuous five-choice Likert scale was utilized to evaluate the strength of perceptions. This Thai language questionnaire has six sections, and it was intended to collect information pertaining to respondents' perceptions of growth mindset practice. There were 18 questions about the three indicators of innovative and systematics thinking skills (IST) factor in Section A. This is trailed by Section B to F that was specifically designed by the researchers to gauge information about focus on learning goals (FLG) factor, acknowledgment of success (AS) factor, open-minded on change (OMC) factor, being a resourceful and ambitious leader (RAL) factor, and commitment to personal development (CPD) factor, respectively. The following Section B to Section F consisted of three FLG indicators (18 questions), three AS indicators (13 questions), two OMC indicators (12 questions), three RAL indicators (16 questions), and three CPD indicators (18 questions).

2.4 Data Analysis

Structural Equation Modeling (SEM) were used to analyze quantitative data. The SEM is an appropriate method to analyze the structural relationship between measured variables and latent constructs because it syndicates factor loading examination and path analysis or multiple regression examination (Gay, Mills, & Airasian, 2011). Moreover, SEM can estimate the multiple and interrelated dependence in a single analysis, namely endogenous and exogenous variables. In this research, the endogenous variable refers to the growth mindset of school administrators and exogenous variables are the conceptualized factors and indicators from the first phase. Consequently, researchers utilized SEM methods to assess how meticulously a hypothetical model fits empirical data to examine the measurement model. The measurement model signifies the hypothesis that denotes how identified factors and indicators join together in corresponding to the hypothesis. Hence, researchers utilized a CFA to examine test the measurement model for its goodness-of-fit.

As mentioned by McDonald and Ho (2002), absolute fit indices mean how appropriately a measurement model fits the empirical data and verifies which projected model has the greatest fit. In this line of reasoning, researchers employed the Comparative fit index (CFI), the Chi-Square statistic (χ^2), the Tucker-Lewis index (TLI), the Standardised root mean square residual (SRMR), the Root mean square error of approximation (RMSEA), the Goodness-of-fit statistic (GFI), Normed-fit index (NFI), and the Adjusted goodness-of-fit statistic (AGFI) to analyze the maximum-likelihood estimation and multiple indices of model fit as the variance-covariance matrix.

3. Results

The preliminary results identified six key factors of growth mindset: (i) Innovative and systematic thinking skills (IST); (ii) focus on learning goals (FLG); (iii) acknowledgment of success (AS); (iv) open-minded on change (OMC); (v) being a resourceful and ambitious leader (RAL), and (vi) commitment to personal development (CPD). Moreover, there are 17 growth mindset indicators and 48 elements which derived from the six key factors with regards to fit the Thai context. Table 2 display the details of the key factors, indicators, elements of growth mindset.

Table 2. Key Factors, Indicators, and Elements of Growth Mindset

Key Factors	Indicators	Elements
Innovative and systematic thinking skills (IST)	Systematic thinking (IST1)	Welding thinking (IST1.1)
		Thinking rationally (IST1.2)
		Solving problems intelligently (IST1.3)
	Learning new things constantly (IST2)	Seeking new knowledge (IST2.1)
		Transferring new knowledge (IST2.2)
		Applying new knowledge in practices (IST2.3)
	Creating innovations (IST3)	Initiative (IST3.1)
		Find innovations (IST3.2)
		Applying and publishing innovations (IST3.3)
Focus on learning goals (FLG)	Aiming active learning (FLG1)	Focus on quality (FLG1.1)
		Standard identification (FLG1.2)
		Setting achievable goals (FLG1.3)
	Dare to face challenges (FLG2)	Taking risk of decision-making (FLG2.1)
		Generating trust and motivation (FLG2.2)
		Talent management (FLG2.3)
	Learning and development (FLG3)	Creating a learning environment (FLG3.1)
		Improving knowledge and expertise (FLG3.2)
		Appreciating good relationship (FLG3.3)
Acknowledgment of success (AS)	Self-efficacy (AS1)	Achieving goals confidently (AS1.1)
		Controlling resources for success (AS1.2)
	Inspiration (AS2)	Stimulation of internal motivation (AS2.1)
		Building confidence (AS2.2)
		Encouragement (AS2.3)
	Learning for success (AS3)	Learning from mistakes (AS3.1)
		Improvements to prevent faults (AS3.2)
Open-minded on change (OMC)	Openness to accept criticism (OMC1)	Open to listening criticism (OMC1.1)
		Learning from negative feedback (OMC1.2)
		Improvement and development (OMC1.3)
	Capability in problem-solving (OMC2)	Finding alternatives to solve the problem (OMC2.1)
		Recognizing individual differences (OMC2.2)
		Connecting different ideas for change (OMC2.3)
Being a resourceful and ambitious leader (RAL)	Managing challenges (RAL1)	Encouraging to face risk (RAL1.1)
		Looking for new opportunities (RAL1.2)
	Having strategies to keep up with change (RAL2)	Creating strategies for change (RAL2.1)
		Becoming visionary communicators (RAL2.2)
		Teacher learning together (RAL2.3)
	Building collaborative trust (RAL3)	Confidence in building partnership (RAL3.1)
		Importance of teacher collaboration (RAL3.2)
		Having trust and accepting each other (RAL3.3)
Commitment to personal development (CPD)	Realize the importance of competency development (CPD1)	Providing disciplinary training (CPD1.1)
		Expanding self-capability (CPD1.2)
		Continuous self-improvement (CPD1.3)
	Positive communicative skills (CPD2)	Positive thinking and optimism (CPD2.1)

	Good emotional control (CPD2.2)
	Creation positive working culture (CPD2.3)
Performance evaluation (CPD3)	Systematic assessment (CPD3.1)
	Personnel potential enhancement (CPD3.2)
	Improving operational efficiency (CPD3.3)

3.1 The Goodness-of-Fit of the Growth Mindset Factors and Indicators with the Empirical Data

Researchers started to examine the suitability of data for factor analysis before obtaining estimates of the parameters of the growth mindset model. Two key concerns that must take into account to decide whether the obtained data is suitable for CFA, namely the strength of the association between factors or indicators and sample size (Pallant, 2013). The strength of the association between factors or indicators is measured using Bartlett's Test of Sphericity (Bartlett, 1954) while researchers used Kaiser-Meyer-Olkin (KMO) to verify whether the sample size is sufficient or not. According to Jöreskog and Sörbom (1993), large samples are useful because it is almost impossible for us to reject the null hypothesis even though the chi-square (χ^2) is recognized as a standard statistic to evaluate the general fit of the measurement model with the empirical data.

A Bartlett Test of Sphericity is an evaluation of multivariate normality according to data distribution. This means that it is used to verify whether the unique correlation matrix is an identity matrix or not in conformity with the null hypothesis. In other words, if the significant values are more than 0.05 for both factors and indicators imply an identity matrix is produced by the obtained data. It is worth remarking that the factors or indicators have to evaluate at the interval level.

On the other hand, several specialists have recommended different rules of thumb to decide the acceptable KMO value as the measurement to confirm the adequacy of sampling. For example, Kaiser (1974) and Field (2000) determined the acceptable value as more than 0.5 while Pallant (2013) confirmed KMO value must be more than 0.6. The researchers decided to use Hutcheson and Sofroniou's (1999) rule of thumb to decide the acceptable KMO value as shown in Table 3.

Table 3. KMO Value and Its Interpretation

KMO Value	Interpretation
<0.5	Unacceptable sample size
0.5 to 0.7	Average sample size
0.7 to 0.8	Good sample size
0.8 to 0.9	Great sample size
>0.9	Excellent sample size

Results of the KMO value in Table 4 shows that the sampling size is sufficient and excellent because all the KMO values of factors and indicators are above 0.9 (Hutcheson & Sofroniou, 1999; Pallant, 2013). Besides, Table 4 also shows that collected data were nearly multivariate normal according to the result of Bartlett Test of Sphericity, and excellent sample size was obtained as reflected in KMO value (Hutcheson and Sofroniou, 1999). Therefore, the obtained data could proceed for further examination.

Table 4. Results of Validation of the Correlation Matrix between Factors and Indicators

Factors/Indicators	KMO	Bartlett's test
Intercorrelation analysis of growth mindset factors	0.952	$p = 0.00$
Intercorrelation analysis of growth mindset indicators	0.962	$p = 0.00$

This was followed by seeking to attain estimates of the parameters of the growth mindset model, the validity of the identified factors, and their factor loading of the growth mindset. In short, factor loading means the 'relative importance' of the identified indicators that collectively form a specifically identified factor in the growth mindset model of high school administrators that had been considered. The co-variance with the growth mindset factors ranged from 94.30 to 99.10 percent. As illustrated in the following Table 5, the factor loading of all the growth mindset factors are ranged from 0.971 to 0.995 and is statistically significant at 0.01. The factor with the highest factor loading value is innovative and systematic thinking skills. This is followed by open-minded on change,

commitment to personal development, being a resourceful and ambitious leader, and acknowledgment of success. The factor that has the lowest factor loading value is the focus on learning goals. In conclusion, all the key factors are found to be essential constructs of growth mindset for school administrators in high schools.

Table 5. Results of CFA for Key Factors of Growth Mindset

Factors	λ	SE	t	R^2	FS
Innovative and systematic thinking skills	0.995	0.007	136.517	0.991	0.001
Open-minded on change	0.993	0.003	352.126	0.986	0.001
Commitment to personal development	0.989	0.003	333.600	0.977	0.002
Being a resourceful and ambitious leader	0.979	0.004	272.434	0.959	0.001
Acknowledgment of success	0.975	0.004	268.807	0.950	0.000
Focus on learning goals	0.971	0.006	156.546	0.943	0.000

In addition, the co-variance with the growth mindset indicators is in the range of 20.60 to 95.00 percent. As demonstrated in the following Table 6, the factor loading of all the growth mindset indicators are ranged from 0.454 to 0.976 and is statistically significant at 0.01. In this line of reasoning, all the identified indicators are considered important constructs for the growth mindset model.

Table 6. Results of CFA for Indicators of Growth Mindset

Indicators	Elements	λ	SE	t	R^2	FS
Systematic thinking	IST1.1	0.877	0.015	59.674	0.769	0.119
	IST1.2	0.859	0.016	54.499	0.738	0.095
	IST1.3	0.916	0.012	76.771	0.839	0.191
Learning new things constantly	IST2.1	0.947	0.024	39.974	0.898	0.318
	IST2.2	0.459	0.039	11.900	0.210	-0.006
	IST2.3	0.560	0.034	16.448	0.314	-0.014
Creating innovations	IST3.1	0.870	0.019	46.089	0.757	0.095
	IST3.2	0.811	0.020	41.384	0.658	0.070
	IST3.3	0.852	0.020	41.917	0.725	0.077
Aiming active learning	FLG1.1	0.885	0.016	55.895	0.783	0.080
	FLG1.2	0.873	0.014	62.232	0.762	0.029
	FLG1.3	0.926	0.013	70.360	0.858	0.098
Dare to face challenges	FLG2.1	0.881	0.014	64.786	0.777	0.030
	FLG2.2	0.959	0.010	92.657	0.920	0.358
	FLG2.3	0.722	0.024	30.605	0.521	-0.035
Learning and development	FLG3.1	0.934	0.011	84.580	0.872	0.106
	FLG3.2	0.918	0.012	78.552	0.842	0.065
	FLG3.3	0.454	0.039	11.579	0.206	0.054
Self-efficacy	AS1.1	0.828	0.018	46.001	0.686	0.043
	AS1.2	0.791	0.020	39.546	0.626	0.075
Inspiration	AS2.1	0.872	0.015	59.092	0.761	-0.111
	AS2.2	0.867	0.014	62.667	0.751	0.047
	AS2.3	0.870	0.014	63.708	0.756	0.051
Learning for success	AS3.1	0.941	0.009	103.88	0.886	0.545
	AS3.2	0.795	0.018	44.289	0.631	0.157
Openness to accept criticism	OMC1.1	0.948	0.007	138.516	0.899	-0.526
	OMC1.2	0.957	0.006	162.135	0.916	-0.468
	OMC1.3	0.962	0.006	157.578	0.925	-0.397
Capability in problem-solving	OMC2.1	0.856	0.013	66.084	0.733	0.975
	OMC2.2	0.913	0.009	98.841	0.833	1.394
	OMC2.3	0.852	0.016	52.755	0.726	0.169
Managing challenges	RAL1.1	0.842	0.016	54.196	0.709	-0.058

	RAL1.2	0.976	0.010	97.104	0.954	0.073
Having strategies to keep up with change	RAL2.1	0.805	0.017	47.151	0.648	0.055
	RAL2.2	0.918	0.008	110.583	0.842	0.069
	RAL2.3	0.933	0.007	131.793	0.871	0.035
Building collaborative trust	RAL3.1	0.953	0.006	172.71	0.908	0.129
	RAL3.2	0.910	0.009	103.439	0.827	0.055
	RAL3.3	0.972	0.004	231.578	0.945	0.241
Realize the importance of competency development	CPD1.1	0.853	0.013	64.581	0.727	0.038
	CPD1.2	0.938	0.008	112.082	0.880	0.085
	CPD1.3	0.935	0.008	115.794	0.875	0.187
Positive communicative skills	CPD2.1	0.929	0.007	129.798	0.863	-0.172
	CPD2.2	0.965	0.006	151.298	0.931	0.080
	CPD2.3	0.975	0.006	167.694	0.950	0.258
Performance evaluation	CPD3.1	0.922	0.008	109.390	0.850	0.089
	CPD3.2	0.934	0.007	130.298	0.872	0.206
	CPD3.3	0.949	0.006	149.889	0.900	-0.004

According to Ullman (2001), the overall model whether is acceptable or not in SEM depending on the fit indices. The goodness-of-fit result exposed that the growth mindset model fits between the attained values of collected data and the expected values under the growth mindset model as follow, $\chi^2 = 64.875$, df = 50, $\chi^2/df = 1.2975$, CFI = 0.99, TLI = 0.99, RMSEA = 0.02, and SRMR = 0.01. These tests were employed to determine how associated real values were fitting to the expected values in the growth mindset model. The researchers referred to the following specialists' rules of thumb and their recommended cut-off values for evaluating fit indices in SEM as elucidated in Table 7.

Table 7. Interpretation of Goodness-of-fit Indexes for Growth Mindset Model

Goodness-of-fit Indexes	Real values	Rules of thumb or cut-off values	Specialists	Interpretation
χ^2/df	1.2975	<2	Ullman (2001)	Pass
		<5	Schumacker and Lomax (2004)	
CFI	0.99	≥ 0.95	Hu and Bentler (1999)	Pass
GFI		CF = 0.95	Diamantopoulos and Siguaw (2000)	
AGFI		≥0.90		
TLI	0.99	≥ 0.95	Hu and Bentler (1999)	Pass
RMSEA	0.02	<0.06	Hu and Bentler (1999)	Pass
		<0.07	Steiger (2007)_	
SRMR	0.01	<0.05	Byrne (1998); Diamantopoulos and Siguaw (2000)	Pass

In this line of reasoning, it is finalized that the growth mindset model is approved with the empirical data. Hence, the measurement model is accepted according to the above rules of thumb and cut-off values. Therefore, the researchers established precise and significant paths of the growth mindset model as illustrated in Figure 2. Table 8 shows the results of indicators that are attached to the factors of the growth mindset model.

Table 8. Results of Goodness-of-fit for Each Key Factor of Growth Mindset Model

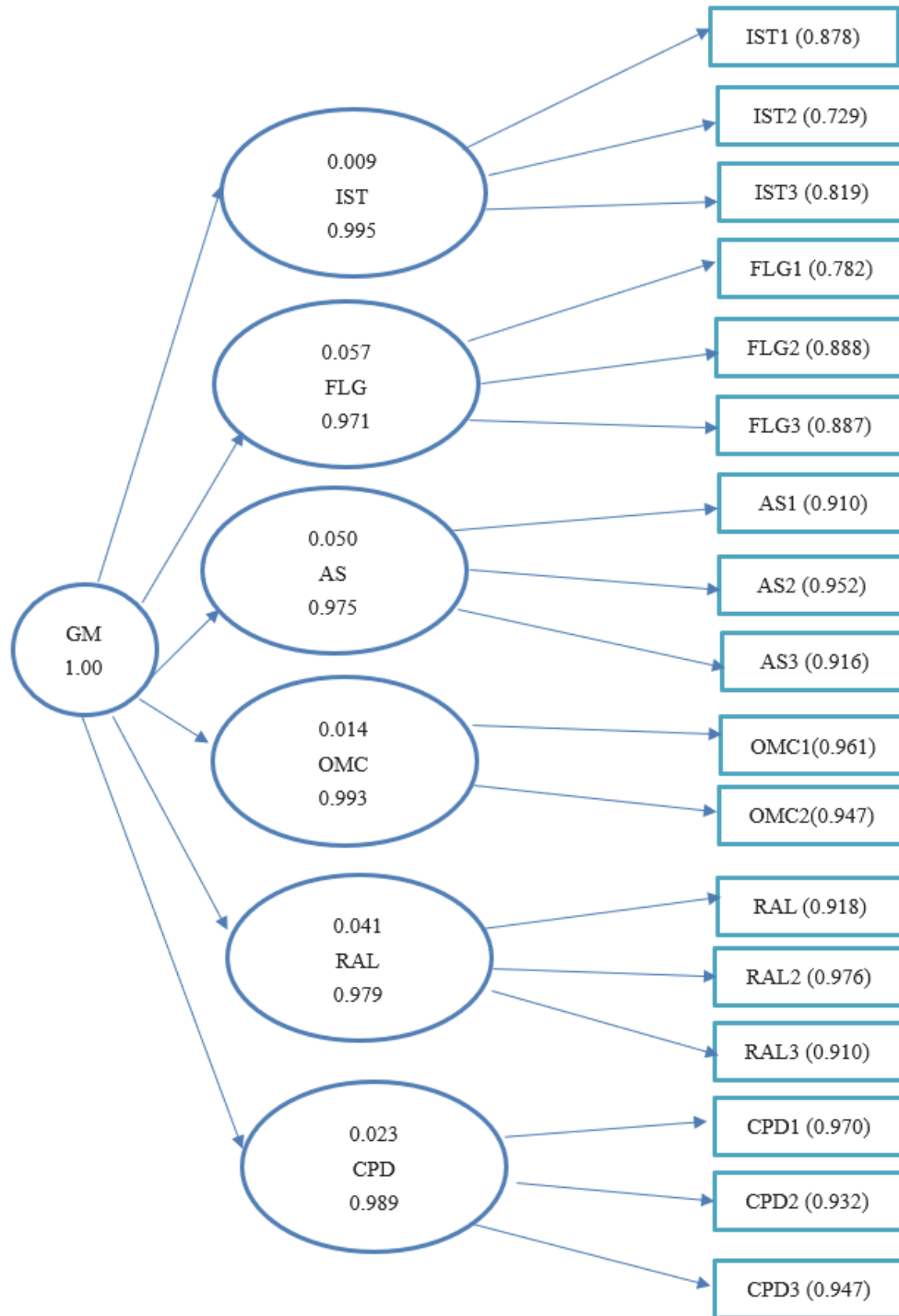| Key Factors	χ^2	df	χ^2/df	p	CFI	TLI	RMSEA	SRMR
IST	14.002	11	1.273	0.03	0.99	0.99	0.02	0.01
FLG	21.114	14	1.508	0.09	0.99	0.99	0.03	0.01
AS	8.837	7	1.262	0.26	0.99	0.99	0.03	0.01
OMC	1.734	1	1.734	0.18	0.99	0.99	0.04	0.01
RAL	13.206	7	1.886	0.06	0.99	0.99	0.04	0.01
CPD	17.823	11	1.620	0.08	0.99	0.99	0.04	0.01

Figure 2. Growth Mindset Model

4. Discussion

A growth mindset model was projected and verified its goodness-of-fit. The results indicated that all six factors have a solid, positive, and significant influence on the growth mindset of school administrators. Moreover, the measurement model revealed that the highest prediction influence is the innovative and systematic thinking skills factor. The second highest prediction influence is open-minded on the change factor. This is followed by the commitment to personal development, being a resourceful and ambitious leader, and acknowledgment of success factors, in this descending order. However, the least capacity of prediction influence is focused on learning goals factor. As a result, good school administrators must grow their expectations through the identified factors and

indicators to cultivate teachers' and students' mindset in their schools, as emphasized by Goldstein and Brooks (2007). Besides, this result is consistent with results from previous research (DeWitt, 2020; Elmore, 2019; Meador, 2019). In conclusion, the goodness-of-fit results can assist us to predict future trends and patterns while school administrators are using the growth mindset model.

The crucial results of the current research support our hypothesis that all the six identified factors and 17 indicators of growth mindset accord with state-of-the-art conceptions of positive mindset for school administrators. If school administrators lack knowledge about the mindset phenomenon can hinder them from understanding the consequences of their practices or from rendering teachers and students' performance appropriately (Rissanen et al., 2019). Evidently, a good consideration of the associations between the factors and indicators is important for school administrators to implement the growth mindset model. This is because these research results have successfully provided preliminary indications about their causal associations. Therefore, the researchers recommended that school administrators with a growth mindset are able to make efforts to develop teachers' and students' capabilities and seek innovative strategies to obtain deeper learning according to incremental theory (Rissanen et al., 2019).

The results of factor loading of identified factors and their indicators in the growth mindset model imply that all the factors and indicators are important constructs to grow school administrators' positive mindset. Hence, all the key factors and their indicators are fit well with empirical data at a statistically significant level (Tuksino, 2009). In this line of reasoning, researchers concluded all the factors and indicators appear to be consistent with either growth mindset theory (Dweck, 2006) or previous research studies (DeWitt, 2020; Elmore, 2019; Meador, 2019).

Lastly, researchers suggested to the Thailand Ministry of Education so that the growth mindset model will be included in educational administrators' preparation training program. However, it can be developed as a critical instrument by helping as a reasonable yardstick for professional training development, and for advancing more desirable experimental research on how organizational development in terms of growth mindset can be done.

Acknowledgments

References

Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximation. *Journal of Royal Statistical Society, 16*(Series B), 296-298. https://doi.org/10.1111/j.2517-6161.1954.tb00174.x

Becker, J. M., & Ismail, I. R. (2016). Accounting for sampling weights in PLS path modeling: Simulations and empirical examples. *European Management Journal, 34*(6), 606-617. https://doi.org/10.1016/j.emj.2016.06.009

Boonmepipit, P., & Jiamjan, J. (2020). Educational administration in Thailand 4.0. *SVIT Journal, 6*(2). Retrieved from https://so04.tci-thaijo.org/index.php/svittj/article/view/240031

Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS and SIMPLIS: Basic concepts, applications and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

DeWitt, P. (2020). *Why leaders need to develop their own growth mindset*. Retrieved from https://www.edweek.org/education/opinion-why-leaders-need-to-develop-their-own-growth-mindset/2020/11

Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.

Diamantopoulos, A., & Siguaw, J. A. (2000). *Introducing LISREL*. London, UK: Sage. https://doi.org/10.4135/9781849209359

Elmore, R. F. (2019). The future of learning and the future of assessment. *ECNU Review of Education, 2*(3), 328-341. https://doi.org/10.1177/2096531119878962

Field, A. (2000). *Discovering statistics using SPSS for Windows.* London, UK: Sage.

Gay, L. R., Mills, G. E., & Airasian, P. W. (2011). *Educational Research.* New Jersey: Pearson Education.

Goldstein, S., & Brooks, R. B. (2007). *Understanding and managing children's classroom behavior: Creating sustainable, resilient schools* (2nd ed.). New York: John Wiley & Sons.

Guidera, I. A. (2014). *Principals implementing growth mindset norms: Insights on school culture reform* (Doctoral

dissertation). University of California, Los Angeles.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis* (7th ed.). London, UK: Pearson Education.

Hanson, J., Bangert, A., & Ruff, W. (2016). Exploring the relationship between school growth mindset and organizational learning variables: Implications for multicultural education. *Journal of Educational Issues, 2*(2), 222-242. https://doi.org/10.5296/jei.v2i2.10075

Hu, L. T., & Bentler, P. M. (1999). Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Hutcheson, G. D., & Sofroniou, N. (1999). *The multivariate social scientist: An introduction to generalized linear models*. London, UK: Sage. https://doi.org/10.4135/9780857028075

Jöreskog, K., & Sörbom, D. (1993). *LISREL 8: Structural equation modelling with the SIMPLIS command language*. Chicago, IL: Scientific Software International Inc.

Kaiser, H. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31-36. https://doi.org/10.1007/BF02291575

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods* (Vols. 1-0). Thousand Oaks, CA: Sage. https://doi.org/10.4135/9781412963947

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting statistical equation analyses. *Psychological Methods, 7*(1), 64-82. https://doi.org/10.1037/1082-989X.7.1.64

Meador, D. (2019). *The essential qualities of an effective school leader.* Retrieved from https://wwwthonghtco.com/how-school-administrator-can-be-effective-leader-3194539

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). New South Wales, Australia: Allen & Unwin. https://doi.org/10.1080/00396338.2013.784467

Rissanen, I., Kuusisto, E., Tuominen, M., & Tirri, K. (2019). In search of a growth mindset pedagogy: A case study of one teacher's classroom practices in a Finnish elementary school. *Teaching and Teacher Education, 77*, 204-213. https://doi.org/10.1016/j.tate.2018.10.002

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates. https://doi.org/10.4324/9781410610904

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences, 42*(5), 893-898. https://doi.org/10.1016/j.paid.2006.09.017

Tuksino, P. (2009). *A quality assessment of Science instructional Management in Basic Education Schools: An application of a value-added model and differential item functioning.* (Unpublished Ph.D dissertation). Chulalongkorn University, Thailand.

Ullman, J. B. (2001). Structural equation modelling. In B. G. Tabachnick & L. S. Fidell (Eds.), *Using Multivariate Statistics* (4th ed, pp 653- 771). Needham Heights, MA: Allyn & Bacon.

Yamane, T. (1970). *Statistic: An introductory analysis*. Tokyo, Japan: Harper International Edition.

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