

Structural effect of principals change leadership on e-learning effectiveness

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Article Info

Article history:

Received Dec 12, 2022

Revised Aug 22, 2023

Accepted Sep 29, 2023

Keywords:

Attitudes toward change

Change leadership

E-learning effectiveness

Online learning

Teacher work commitment

ABSTRACT

The aim of this research was to investigating the structural effect of the principal change leadership on the effectiveness of online-based learning with teacher work commitment and teacher attitudes towards change as mediator variables, which were approached quantitatively. Multilevel stratified proportional random sampling technique is used in sampling, while inclusion criteria are principals and teachers of primary schools who are still active in Kutai Kartanegara, Samarinda and Balikpapan, East Kalimantan, Indonesia. The structural equation modeling (SEM) analysis technique is used in this research. The results of the study show that the principals' change leadership has a direct effect on the effectiveness of online-based learning, as well as an indirect effect through teacher work commitment and teacher attitudes towards change. This research contributes both theoretically and practically, where the change leadership demonstrated by the principal can ideally encourage teacher work commitment and teacher attitudes towards change, which in turn can promote the effectiveness of the implementation of online learning, as an effort to meet student learning needs.

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1. INTRODUCTION

Studies related to principals change leadership and online learning have been widely studied by scholars, both from developed and developing countries [1]–[3]. For example, study by Altunisik [4] found that principal's leadership can influence the success of e-learning. Meanwhile, research by Kin *et al.* [5] concluded that teacher attitudes towards change are influenced by principal change leadership competencies. Muhamad *et al.* [6] showed that the successful implementation of e-learning is influenced by teacher work commitment, teacher satisfaction and stress levels during pandemic. Many scholars in Indonesia are also interested in researching this topic, especially because the presence of the pandemic in Indonesia has brought various consequences for the educational services in schools [7], [8]. One of them is the change in the implementation of learning, which was previously carried out face-to-face, has now changed its implementation to online-based learning [9], [10].

In a rapidly changing era, accompanied by the pandemic, changes in the field of education have become one of the important tasks to improve student performance in schools [11], [12]. In an effort to keep up with such rapid changes, and optimize the successful implementation of e-learning, innovative leadership

in schools is needed [13], [14]. Therefore, how to realize the effectiveness of the implementation e-learning to meet the learning needs of students is a new challenge for principals. The school principal is responsible for ensuring the implementation of quality learning, with the ability to adapt and innovate during a pandemic that is full of uncertainty.

Recent research related to online learning has mostly focused on evaluation mechanisms, selection of learning media, development of learning platforms, and increasing teacher competence through online courses [15], [16]. In addition to these focuses, it seems that several factors such as change leadership demonstrated by school principals, teacher work commitment, and teacher attitudes towards change must be considered given the importance of e-learning to be implemented effectively. Efforts in achieving effective online learning, change leadership competencies for school principals are very important [4], [17]. A successful change leader helps create a new environment that is conducive to learning and sharing experiences and knowledge. Principals are expected to play a vital role in encouraging teachers to respond positively to change. Principals who have change leadership competence can influence teacher attitudes towards change [5]. Teachers' attitudes towards changes in the current digital era are related to their willingness to deal with the integration of information and communication technology (ICT) in learning activities in schools [18], [19].

The online learning model requires commitment from all parties [6], [20], [21]. Ironically, the ineffective implementation of online-based learning is always associated with teachers, who should be responsible for achieving the effectiveness of e-learning is a shared responsibility, including the principal as a leader in schools [22], [23]. Therefore, principals and teachers need to adapt and prepare for any changes and strive to increase their knowledge and skills, especially in the teaching aspect. Teacher commitment is the key to the successful of e-learning implementation in the pandemic era [22], [24], with the encouragement given by the principal enabling teachers to have a high work commitment [25], [26], which can further improve the effectiveness of online-based learning implemented in schools [22], [25], [27].

Although there have been many studies examining the leadership role of school principal changes, there are still few that examine the impact of principal change leadership (PCL) on the effectiveness of online learning (EOL). For example, study by Kin *et al.* [5] only examined the competence of school principals and teachers' attitudes towards change with the mediating role of Teacher Change Beliefs, does not examine other variables. Meanwhile, research by Nurabadi *et al.* [8] showed that PCL, with other leadership styles, namely instructional leadership and spiritual leadership can affect teacher performance and student achievement. Furthermore, research by Chopra *et al.* [28] examined the effectiveness of e-learning portals according to student perceptions, without examining the factors that influence it. This research tries to complete the previous research gap, namely to investigating the structural effect of PCL on the effectiveness of e-learning. This research contributes to at least three things, from a theoretical aspect to complement the research that has been done [1], [5], [8], [29], by including the variables of teacher work commitment (TWC) and teacher's attitude towards change (TATC) as a mediating variable, which have not been studied by many previous researchers. The second aspect is to provide practical insights to related parties, how to promote the effectiveness of e-learning through predictor variables. The third aspect is as a first step for other researchers related to similar topics, who conduct research in different background or contexts.

In developing countries, the use of technology in education does not always produce improvements that are directly proportional to student learning outcomes, but there is always hope behind the problems [10], [19]. Therefore, it is important to investigate the structural effect of the effectiveness of implementing e-learning in schools, especially during the current pandemic. Based on this description, the authors set the following hypothesis: i) PCL has a direct effect on TWC (H1); ii) PCL has a direct effect on TATC (H2); iii) PCL has a direct effect on EOL (H3); iv) TWC has a direct effect on TATC (H4); v) TATC have a direct effect on EOL (H5); vi) TWC mediates the nexus between PCL and EOL (H6); and vii) TATC mediates the nexus between PCL and EOL (H7).

2. RESEARCH METHOD

2.1. Research design

This study was approached quantitatively, using a correlational design. This study uses numerical data on the perceptions of principals and teachers related to the variables studied, through survey techniques. In accordance with the research objectives that have been formulated, this study developed a structured online questionnaire. The variables in this study include principal change leadership (PCL), teacher work commitment (TWC), teacher attitudes toward change (TATC), and the effectiveness of online learning (EOL). The research framework is shown in Figure 1.

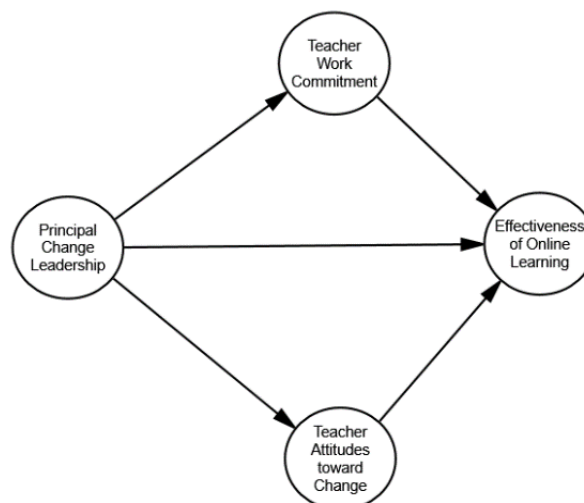


Figure 1. The theoretical framework

2.2. Population and sample

The population in this study was 12,098 principals and teachers, from 328 public and private primary schools in Kutai Kartanegara (152 schools), Samarinda (97 schools), and Balikpapan (79 schools), East Kalimantan, Indonesia. The number of samples was determined using Isaac and Michael formula [30] with a 95% confidence limit. Based on this formula, the number of samples in this research was 378 principals and teachers. Multilevel stratified proportional random sampling technique is used in sampling. Proportional stratified random sampling entails randomly selecting samples from stratified groups that are proportional to the population, as described in Table 1. An online questionnaire was used to collect information from respondents from March to June 2022. The demographics of the respondents can be explained as: i) Gender, divided by 137 male (36.24%) and 241 female (63.76%); ii) Age, <25: 112 (29.63%), 26-35: 146 (38.62%), 36-45: (17.73%), and >45: 53 (14.02%); and iii) Educational qualifications, 51 diploma (13.49%), 238 bachelor (62.96%), 73 master degree (19.31%), and 16 postgraduate/PhD (4.24%).

Table 1. Population and sample

No.	Regency/City	Population	Sample
1	Kutai Kartanegara152	5,346	167
2	Samarinda97	3,803	118
3	Balikpapan79	2,949	93
Total		12,098	378

2.3. Data collection tools

This study involves four variables, namely PCL, TWC, TATC, and EOL. Respondents were asked to rate aspects of the principal's leadership behavior related to change leadership competencies, as well as teacher aspects related to TWC, TATC, and EOL. The questionnaire for measuring PCL was adapted from the indicators developed by Kin *et al.* [5], [31], namely: i) Capacity building (3 items); ii) Goal framing (3 items); iii) Institutionalizing (3 items); and iv) Defusing resistance and conflict (3 items). Instruments for measuring TWC were adapted from indicators that have been developed [6], [32], [33], include: i) solving complex environmental problems (2 items); ii) practice effective communication (1 item); iii) have flexibility (2 items); iv) apply the latest technology (1 item); v) combine old and new concepts (2 items); and vi) become a change facilitator (2 items). The instrument for measuring TATC uses an instrument that adapts the Attitudes to Change Scale [34] and has been modified by Kin *et al.* [5]. The indicators used to measure TATC, include: i) cognitive reaction to change (3 items); ii) affective reactions to change (2 item); and iii) behavioral reactions to changes (3 items). Furthermore, to measure EOL using a 5-item questionnaire adapted from the instrument developed by Butnaru *et al.* [10]; and Dixson [35].

The instrument used in this study uses a five-point scale, which is tested for reliability and validity based on Cronbach's alpha and the corrected-item total correlation (CITC). As recommended by De Vaus [36], Cronbach's alpha coefficient >0.70 can be used, while factors with CITC <0.30 will be excluded. Table 2 shows that the data collection instrument can be declared valid and reliable.

Table 2. Validity and reliability test

Scales of measurement	Encode	CITC	α
PCL	PCL	0.87–0.53	0.92
TWC	TWC	0.83–0.57	0.88
TATC	TATC	0.93–0.64	0.90
EOL	EOL	0.82–0.51	0.85

2.4. Data analysis

The structural equation model (SEM) with the help of Amos 24.0 program, is used in this research. This research has one exogenous variable (EOL) and three endogenous variables (PCL, TWC, and TATC). To examine the empirical framework suitability, this study uses the recommended criteria [37]–[39], namely the p-value, which should be insignificant ($p > 0.05$), while the Minimum Sample Discrepancy Function (CMIN/df) value should be below 3.00. Furthermore, the goodness-of-fit index (GFI), Tucker Lewis index (TLI), and comparative fit index (CFI) values must be above 0.90 while the Root mean square residuals (RMSEA) index value must be less than 0.08. Normality and outlier test for data assumption test were also carried out in this study.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Data analysis evaluation of normality and outlier assumptions

Assumption test is done by using normality and outlier test. Before beginning a comprehensive SEM model analysis, an assumption test must be completed. Normality test analysis show that the c.r (critical ratio) value for skewness and kurtosis of each indicator is not $> \pm 2.58$. Meanwhile, the value of c.r in the multivariate kurtosis line is 2.186. This means that there is no problem with the normality of the data at the univariate and multivariate levels, as recommended by Byrne [37]. Then the outlier test was carried out, based on the recommendation by Blunch [40], if the Mahalanobis distance (MD) value ($< \text{Chi-square}$) means there is no multivariate outlier issue. Based on the analysis, the Chi-square value in this research was obtained at 177.340, while the largest MD value was 81.131.

3.1.2. Evaluation of measurement model

After the assumption test is done, then the analysis of convergent validity and discriminant validity is carried out. Average variance extracted (AVE), composite reliability (CR), and loading factor were used to determine the convergence validity [8], [41]. Referring to Table 3, all constructs have an AVE > 0.50 , where this value is in accordance with the recommendations by Bagozzi and Yi [42]. Based on the recommendation by Awang [43] that the CR value is significant if (> 0.60), the CR value of each construct is greater than 0.60. Table 3 shows the loading factor values ranging from 0.70 to 0.93, according to the recommendation [37], [41], the load factor should exceed 0.50.

Table 3. Convergent validity and reliability of construct

Construct	Encode	Loading	AVE	CR
PCL	PCL1	0.821	0.681	0.895
	PCL2	0.739		
	PCL3	0.893		
	PCL4	0.840		
TWC	TWC1	0.714	0.685	0.928
	TWC2	0.758		
	TWC3	0.933		
	TWC4	0.830		
	TWC5	0.881		
	TWC6	0.831		
TATC	TATC1	0.908	0.728	0.889
	TATC2	0.850		
	TATC3	0.799		
EOL	EOL1	0.872	0.633	0.895
	EOL2	0.700		
	EOL3	0.822		
	EOL4	0.704		
	EOL5	0.861		

After carrying out a convergent validity analysis as previously described, a discriminant validity analysis was carried out. Ronkko and Cho [44] explained discriminant validity showing the independent construct measurement model of overlapping items, discriminant validity is reviewed by comparing the correlation between the construct and square root value of AVE for each construct [44], [45]. Referring to Table 4, it is known that discriminant validity was achieved because the square root value of AVE was greater than the correlation value between constructs [45].

Table 4. Discriminant validity

Construct	(1)	(2)	(3)	(4)
1. PCL	0.825			
2. TWC	0.291	0.828		
3. TATC	0.148	0.161	0.853	
4. EOL	0.088	0.276	0.197	0.796

Furthermore, the measurement model evaluation is carried out. The criteria in evaluating the goodness of fit index for measurement model use the criteria recommended by previous researches [37]–[39]. Referring to Table 5, the goodness of fit index for the measurement model, note that all index fall within the suggested criteria, including i) p-value=0.061; ii) CMIN/df=1.822; ii) RMSEA=0.047; iv) GFI= 0.925; v) CFI= 0.968; and vi) TLI= 0.956.

Table 5. Summary of measurement model match statistics

Fit statistics	Result	Minimum index
p-value	0.061	> 0.050
CMIN/df	1.822	< 3.000
RMSEA	0.049	< 0.080
GFI	0.925	> 0.900
CFI	0.968	> 0.900
TLI	0.956	> 0.900

3.1.3. Interpretation of structural model and hypothesis testing

The interpretation of the model is carried out after the measurement model evaluation has been completed. Figure 2 illustrates the results of SEM test. The mediation hypothesis was tested using the Sobel test [46], where if the p value (<0.05), it indicates the significance of the mediating effect. Sobel test was used to investigating the effect of the mediator variable, namely teacher work commitment and teacher attitudes toward change, in mediating the effect of principal change leadership on the effectiveness of e-learning.

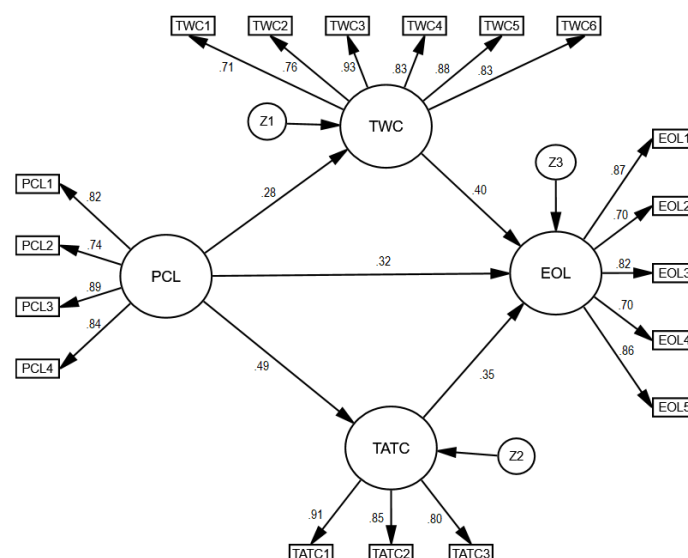


Figure 2. SEM test results

The results of hypothesis testing and a summary of the structural effects of principal change leadership on the effectiveness of e-learning and indirect effects through teacher work commitment and teacher attitudes toward change shown in Table 6. The effect of principal change leadership on the effectiveness of e-learning statistically significant. When teacher work commitment and teacher attitudes toward change are added to the model as a mediating variable, the effect is also significant. The total indirect effect of principal change leadership on the effectiveness of e-learning is 0.284; when paired with direct effect, the total effect is 0.603. The indirect effect of principal change leadership on the effectiveness of e-learning through teacher work commitment is 0.113, which accounts for 18.7% of the total effect. Meanwhile, the size of the principal change leadership mediating effect on the effectiveness of e-learning through teacher attitudes toward change is 0.170, which is 28.2% of the total effect. In short, the mediation effect reached 46.9% of the total effect, which means that principal change leadership can significantly promote the effectiveness of online learning, with various scenarios including through teaching through teacher work commitment and teacher attitudes toward change.

Table 6. Summary of size effect and hypothesis testing

Model pathways	β	p	Cut of value	Decision
PCL \rightarrow TWC	0.281	0.003	0.050	H1 Received
PCL \rightarrow TATC	0.487	0.000	0.050	H2 Received
PCL \rightarrow EOL	0.319	0.001	0.050	H3 Received
TWC \rightarrow EOL	0.403	0.000	0.050	H4 Received
TATC \rightarrow EOL	0.350	0.000	0.050	H5 Received
PCL \rightarrow TWC \rightarrow EOL	0.113	0.000	0.050	H6 Received
PCL \rightarrow TATC \rightarrow EOL	0.170	0.000	0.050	H7 Received

*Total indirect effect PCL \rightarrow EOL, β = 0.284

*Total effect of PCL \rightarrow EOL, β = 0.603

3.2. Discussion

Innovation and change are the keys to success in facing all challenges during the pandemic. In order to meet student learning needs during the pandemic, the application of online-based learning (e-learning) is one solution that must be implemented. Principals who are open to change are important in implementing and maintaining online-based learning which is a complex process. This study shows that principal change leadership has a direct effect on the effectiveness of e-learning. Research by Kin *et al.* [5] explained that principals are leaders of change in schools, where these changes involve shared responsibility, and teamwork to anticipate the needs of students facing a technology-driven future.

As it is known that the pandemic has brought massive changes, the rapid transition of technology in schools creates various problems [47]. Research conducted by Stewart *et al.* [48] in the state of Minnesota, United States, which is one of the most developed countries in the world, even showed that 80% of supervisors agreed that their district had behavior patterns that were resistant to school reform. Various studies state that the effectiveness implementation of e-learning requires good planning, high organizational commitment and strong leadership [10], [49], [50].

The need for achieving effective implementation of online learning requires a high work commitment of teachers [22], [24]. Teacher work commitment can simply be interpreted as a teacher's decision to become an integral part of a school and be actively participated in efforts to improve school quality [24], [51]. Several experts identified the profile of teachers who have high work commitment, including i) a highly dedicated teacher looking for new challenges; ii) display a problem-solving attitude; iii) demonstrate enthusiasm for leadership; iv) shows the fulfillment of work and profession; and v) tend to do their best in every job [52], [53]. Such a teacher profile can promote the effectiveness of the implementation e-learning. Seeing the importance of teacher work commitment, school principals still play an important part in determining how committed teachers are [4], [54], [55].

Change leadership competence is needed for a school principal to influence teacher attitudes in working towards achieving change goals through skills, knowledge and behaviors that show good performance. School leadership is the key to change in schools in responding to the challenges that exist in the midst of the increasingly massive acceleration of digitalization as a result of the pandemic, which is ultimately related to efforts to achieve school achievement [8], [23]. In order to plan and implement school change effectively, principals should be able to encourage teacher attitudes towards change [5], [49], [56]. It is important for principals to encourage positive teacher attitudes towards change so that any changes are effective.

The results showed that principal change leadership can significantly increase the effectiveness of online learning, with various scenarios including through students through teacher work commitment and teacher attitudes toward change. Change leadership behavior exhibited by school principals can be the difference between failure and success in implementing changes in schools such as online learning [29], [57].

In challenging and even unpredictable situations, the most successful school leaders are optimistic, persistent in pursuit of goals, ready to learn from others, open-minded, flexible, and resilient. The pandemic has forced a shift from conventional learning to e-learning in almost all schools in the world, where this shift requires teachers in a short time to adjust their teaching [27], [58]. Students must be ensured to get effective online-based learning, it is therefore necessary for school principals to encourage increased teacher work commitment and positive attitudes of teachers towards change, through change leadership behavior exhibited by school principals [4], [5], [24].

4. CONCLUSION

Meeting the needs of high-quality learning for students must always be pursued. The online-based learning that is carried out is a consequence of the presence of the pandemic, whose effectiveness must always be strived for. The results of the study show that the leadership of school principal changes has a direct effect on the effectiveness of e-learning, as well as an indirect effect through teacher work commitment and teacher attitudes towards change. Various scenarios can be carried out by principals as leaders of change in schools, including by encouraging an increase in teacher work commitment and positive attitudes of teachers towards change, in an effort to promote the effectiveness of e-learning. This research is inseparable from several limitations including: First, this research is approached with a quantitative approach with principals and teachers as respondents, through self-assessment which may not provide the actual situation. Second, the population of this study is focused on principals and teachers of public primary schools in one province, namely East Kalimantan Province, Indonesia.

Despite the constraints, the findings of this research provide insight into the importance of change leadership practices demonstrated by school principals to ideally encourage teacher work commitment and teacher attitudes towards change, which in turn can increase the effectiveness of e-learning implementation, as an effort to meet student learning needs. Based on the conclusions that have been formulated and looking at the limitations of the research, recommendations for future study can be carried out with a longer time span, as well as combines data collection techniques like surveys, interview, and observations. Future research could replicate this study in low-performing or mediocre primary schools, to test the research findings across different samples and to what extent this can be generalized. The findings of this research can be a stepping stone for further research on the same topic, for example by adding several variables not examined in this study. It is hoped that their findings can enrich the results of this research both practically and theoretically.

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