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Transformational Leadership in Enhancing Teacher Motivation and Skills in Border Areas within the Digital Era

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Abstract

Transformational leadership is a key factor in addressing educational challenges in the digital era, which requires innovation, collaboration, and enhanced teacher competence. This study aims to analyze the role of transformational leadership in improving teacher motivation and skills in border areas. The research involves teachers and principals of senior high schools in the Indonesia–Malaysia border region. A mixed-method approach was used, combining quantitative and qualitative techniques. Data were collected through questionnaires to capture teachers' perceptions of principal leadership and interviews to gain deeper insights into leadership practices. Data analysis employed descriptive statistics and thematic analysis. The findings reveal that transformational leadership significantly enhances teacher motivation, strengthens professional commitment, and promotes the development of digital skills aligned with 21st-century learning demands. Principals who adopt this leadership style can create an inspiring and adaptive work environment. This study recommends digital leadership training programs to better equip principals in motivating and empowering teachers.

Keywords: transformational leadership; teacher motivation; teacher skill; digital era; training programs;

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INTRODUCTION

Transformational leadership is one of educational leadership models that frequently being discussed in this modern era. This leadership model offers leadership approaches that implementable to face many educational challenges in this digital era. The rapid development of digital technology has changed teaching and learning process; therefore, educational institutions need to adapt by creating innovation, collaboration, and professional development continuously (Charania et al., 2023; Karaferye, 2022). In this case, the principals in every educational institution play strategic roles to guide the teachers in utilizing digital technology, improving pedagogical competence, and maintaining motivation to deal with the demands of educational development (Yani et al., 2021). Thus, effective leadership becomes the main key so that teachers are not only able to adapt against technological change, but they are also able to utilize it optimally to create meaningful learning process.

Although there were some changes leading to the implementation of technology in education, there were many teachers who experienced numerous difficulties. These teachers faced various challenges, both intrinsically and extrinsically. The most perceived challenges are maintaining motivation (intrinsic challenge) and improving digital skills in education (extrinsic

challenge) (Taimur et al., 2021). In addition, previous research focused excessively on technical matters such as developing digital literacy through various technical trainings. The development that has been done lately took teachers' time excessively, thus affecting their motivation and willingness to develop themselves. However, there is limited research that focuses on how to examine educational leadership strategies that influence motivation and develop teachers' digital competencies in learning activities (López Belmonte et al., 2019; Naz & Rashid, 2021; Shen, 2022). In the context of this study, researchers found a research gap in understanding how transformational leadership behaviors, such as inspirational motivation, individual attention, and intellectual stimulation, affect teacher readiness and engagement in digital-based learning environments.

Transformational leadership is a leadership style that focuses on inspiring and motivating employees to achieve their highest potential. Transformational leaders not only pursue short-term results but are also committed to the long-term development of individuals and organizations (Chiș-Manolache, 2022; Gonfa, 2019). The concept of transformational leadership introduced by Burns (1978) and further developed by Bass (1985) emphasizes the leader's ability to inspire their followers to achieve higher levels of performance and personal growth. According to Bass in (Atkinson & Pilgreen, 2011), there are several characteristics of transformational leadership, including: Idealized influence, which is a character that makes others feel good, makes others proud to be associated with the leader, and earns the trust of subordinates; Inspirational motivation, namely the leader's ability to communicate his goals, and help others find meaning in work; Intellectual stimulation is the ability of a leader to make others think about new ways of doing work, new ways of looking at work, and being creative in solving their own problems, and finally Individualized consideration, namely the ability of a leader to encourage individuals to develop themselves, provide feedback to subordinates, and take the time to bring workers into a team or group.

Various previous studies have shown that transformational leadership has a positive effect on teacher satisfaction, commitment, and teachers' professional development (Novitasari & Asbari, 2020; Wulandari et al., 2023). However, empirical studies examining the influence of transformational leadership in the context of digital education, especially in schools located in border areas between countries, are still very limited. This indicates the need for integration between transformational leadership theory with digital competency mastery and teacher motivation in border areas. The implementation of transformational leadership in developing teacher motivation and skills has an impact on improving the quality of education in the digital era (Zhao et al., 2020). Leadership can create a school culture that supports innovation and adaptive attitudes among teachers (Harsono et al., 2023). Thus, this study is expected to contribute theoretically to the study of transformational leadership and leadership development that is relevant to technological developments in the field of education.

Based on this background, this study aimed to analyze the role of transformational leadership in improving teacher motivation and skills in the digital era. Specifically, this study examined the influence of transformational leadership on teacher motivation and digital competence and analyzes the barriers and solutions to implementing transformational leadership in high schools located in the border region between Indonesia and Malaysia.

METHODS

This study employed a mixed methods approach. Mixed methods were employed to gain a more comprehensive understanding of the phenomena under study. Quantitative data were analyzed using descriptive statistical techniques, while qualitative data were analyzed using data reduction, data presentation, and conclusion drawing techniques. Respondents in this study were 228 teachers from 30 senior high schools in Sanggau Regency, a region on the Indonesia-Malaysia border. The participants included four principals and four teachers as the sample representation.

The data collection in this study was conducted using a questionnaire to gain quantitative data, and open interviews to collect the qualitative data. The questionnaire contained a list of written statements used to obtain information about the impression of the role of transformational leadership on teacher motivation and teacher digital skills. We designed the questionnaire by writing some statements and is closed with a Likert scale of 1 to 4 using Google Form. The questionnaire was distributed to 30 senior high schools with 228 respondents. The aspects measured were transformational leadership (X Variable) which includes components of ideal influence (4 indicators), inspirational motivation (3 indicators), intellectual simulation (4 indicators), individual consideration (2 indicators). Then the Y_1 variable is teacher motivation (4 indicators), and the Y_2 variable is teacher skills in the digital era (5 indicators). The interview technique was used to obtain data on the principal's perception of his role in motivating and developing teacher skills in the digital era in border areas and to obtain teacher responses to the principal's leadership in motivating and improving their skills. The first aspect explored was the principal's strategy in increasing motivation (2 indicators) and improving skills (3 indicators). The second aspect was teacher perception of the principal's leadership (2 indicators).

Data analysis was conducted in two stages. The quantitative stage used descriptive statistical techniques to objectively assess the influence between variables. The qualitative stage involved data reduction, data presentation, and drawing conclusions.

FINDING AND DISCUSSIONS

This study began with the distribution of questionnaires to the senior high school teachers in the Indonesia-Malaysia border region, specifically in Sanggau Regency. The number of respondents in this study was 228. All respondents were teachers. The respondent characteristics analyzed included gender, age, work experience, and subjects taught. The distribution of each characteristic can be described as follows.

Table 1. Distribution of Gender

No	Gender	Number of respondents	Percentage (%)
1	Woman	169	74.10%
2	Man	58	25.40%
3	Unidentified	1	0.40%
	Total	228	100%

In table 1, most of the respondents were female, 169 people (74.10%), while there were 58 men (25.40%), and there was 1 respondent (0.40%) who did not fill in the gender section.

Table 2. Distribution of age

No	Age	Number of respondents	Percentage (%)
1	20-30	67	29.40%
2	31-40	117	51.30%
3	41-50	30	13.20%
4	>50	14	6.10%
	Total	228	100%

In table 2, the largest age group is in between 31-40 years old with 117 respondents (51.30%), followed by the 20-30 years old group with 67 respondents (29.40%). Meanwhile, the 41-50 years old group has 30 respondents (13.20%), and respondents aged 50 and over are 14 people (6.10%).

Table 3. Distribution of work experience

No	Work experience	Number of respondents	Percentage (%)
1	<5	142	62.30%
2	6-10	52	22.80%
3	11-15	25	11.00%
4	>15	9	3.90%
	Total	228	100%

In table 3, most respondents have worked for less than 5 years are 142 people or 62.30% of the respondents, followed by 52 respondents (22.80%) with 6-10 years of work experience. Furthermore, there are 25 respondents (11.00%) with 11-15 years of work experience, and only 9 respondents (3.90%) have worked for more than 15 years.

Table 4. Distribution of subject taught by the teachers

No	Subject	Number of Respondents	Percentage (%)
1	Bahasa Indonesia	23	10.10%
2	Mathematics	16	7.00%
3	English	13	5.70%
4	Geography	10	4.40%
5	Biology	9	3.90%
6	Sociology	9	3.90%
7	History	8	3.50%
8	Chemistry	7	3.10%
9	Economic	7	3.10%
10	Guidance and Counseling	7	3.10%
11	Pancasila education	7	3.10%
12	Informatics/ Computer science	6	2.60%
13	Islamic religion	6	2.60%
14	PJOK	6	2.60%
15	Christianity religion	5	2.20%
16	Physics	5	2.20%
17	Vocational subject (TKJ, ATPH, Accounting, etc.)	23	10.10%
18	Others (Arts, crafts, religion, etc.)	61	26.80%
	Total	228	100%

In table 4, the data shows that the largest proportion comes from others (Arts, Crafts, Religion, and other fields) category with 61 respondents (26.80%), followed by Bahasa Indonesia and Vocational subject (TKJ, ATPH, Accounting, etc.) each with 23 respondents (10.10%), then Mathematics are in the next position with 16 respondents (7.00%), followed by various other subjects such as English, Geography, Biology, and Sociology with smaller percentages.

Based on tables 1, 2, 3, and 4, the dominant demographic characteristics of respondents are female (74.1%), 31-40 years of age (51.3%), and work experience <5 years (62.3%). As for the distribution of subjects, general subjects dominate (Bahasa Indonesia, Mathematics, English),

vocational groups have a significant portion (10.1%) and there is a wide variety of subjects with low frequency. The conclusion is that respondents are dominated by young teachers with limited work experience, female representation is very dominant in this sample, and the variety of subjects shows the diversity of the fields of study taught.

The results of the descriptive analysis of the influence of transformational leadership (X) on teacher motivation (Y_1), and teacher skills in the digital era (Y_2) on 228 respondents showed that Transformational Leadership (X) had an average (Mean) of 3.47, a standard deviation of 0.41, with a score range between 2.17 – 4.00. The data shows that teachers rate the principal's leadership in the high category. The principal's leadership is considered capable of implementing transformational leadership that is able to be a role model, has a clear vision, encourages new approaches, is able to provide inspiration, and provides individual attention to teachers.

The result analysis of the influence of transformational leadership (X) on teacher motivation (Y_1) among 228 respondents obtained an average (mean) of 3.56, with a standard deviation of 0.43, and a score range of 2.50-4.00. With these results, teacher work motivation can be categorized in the high category. These results indicate that most teachers felt enthusiastic, passionate, and had an awareness to continuously improve themselves. The support and encouragement of the principal are important factors in maintaining teacher motivation in the digital era.

Finally, the results of the influence of transformational leadership (X) on teacher skills in the digital era with an average (mean) of 3.29, a standard deviation of 0.44, and a score range between 2.20-4.00. Teacher skills in using digital technology were classified as quite high, although the value was slightly lower than the other two variables. This means that most teachers were already quite skilled in using digital media for learning, but there was still room for improvement, especially in creativity and technical problem solving.

The correlation between variables based on the scores of the three variables, namely transformational leadership (3.47), teacher motivation (3.56), and teacher skills (3.29), showed a positive trend, in which the better the principal's transformational leadership, the higher the teachers' motivation and digital skills. To obtain more accurate results, researchers analyzed the data by conducting validity and reliability tests, as well as normality tests. The following are the results of the validity and reliability tests, as well as the normality test for the questionnaire results.

a. Validity and Reliability Tests

Validity test has been conducted to determine the extent to which a research instrument is able to accurately measure the concept (variable) it is intended to measure. In this study, the author used the *Paerson Correlation* validity test.

Correlations

		Transformational Leadership	Teacher Motivation	Teachers' teaching skills in digital era
Transformational leadership	Pearson Correlation	1	.642**	.645**
	Sig. (2-tailed)		.000	.000
	N	228	228	228
Teacher motivation	Pearson Correlation	.642**	1	.999**
	Sig. (2-tailed)	.000		.000
	N	228	228	228
Teachers' teaching skills in digital era	Pearson Correlation	.645**	.999**	1
	Sig. (2-tailed)	.000	.000	
	N	228	228	228

**. Correlation is significant at the 0.01 level (2-tailed).

The score of r product moment for a significance level of 5% with 229 respondents is 0.129. If the score of r count >r table, then the questionnaire can be said to be valid. Based on the results of the validity test output for variables X, Y_1, and Y_2 in Table 1, it can be concluded that all questionnaire items are valid because the score of Pearson Correlation for each item is greater than 0.129

Cronbach's Alpha

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.895	.906	3

It can be said that the data are reliable if the Cronbach's Alpha value is at least 0.7. The table above shows that the Cronbach's Alpha value in this study is 0.895, which is greater than 0.7. The guidelines for interpreting the Cronbach's Alpha value are as follows: the score of reliability coefficient of less than 0.60 is categorized as low. A range of 0.60–0.70 indicates moderate reliability and is still acceptable. If it is in the range of 0.70–0.80, it is included in high reliability, while a range of 0.80–0.90 indicates very good reliability. The score that reach or approach 0.90 is considered the best reliability. By considering these characteristics, the data in this study showed very good reliability

b. Normality Test

The normality test is a statistical test used to determine whether observed data has a normal distribution. In this study, the normality test is used to determine whether the score data for each variable (X, Y_1, and Y_2) is normally distributed. Normal distribution is an essential requirement for parametric statistical analyses such as Pearson correlation, linear regression, or MANOVA.

One-Sample Kolmogorov-Smirnov Test

		Transformational leadership	Teacher motivation	Teachers' teaching skills in digital era
N		228	228	228
Normal Parameters[a,b]	Mean	37.72	35.69	28.46
	Std. Deviation	4.346	4.267	3.416
Most Extreme Differences	Absolute	.142	.225	.232
	Positive	.142	.189	.185
	Negative	-.132	-.225	-.232
Statistical test		.142	.225	.232
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

It can be said that the data is normally distributed if the score of Asymp. Sig (2-tailed) of the variable is > 0.05. Based on the data, it can be seen that the score of Asymp. Sig (2-tailed) of variables X, Y_1 and Y_2 is 0.000 < 0.05. Thus, the data in this study was not normally distributed. Because we got the data that were not normally distributed, the analysis in this study could not be carried out using the MANOVA test. It is because the MANOVA test can only be carried out with

normally distributed data. Furthermore, to determine the correlation between variables, the researcher used the Spearman Rho test.

The Spearman Rho correlation test was used to examine the relationship between research variables using non-parametric statistics. The goal was to determine whether the relationship between the two variables could be identified as significant, to determine the strength of the relationship, and to determine the direction of the relationship. The basis for decision-making was that if the significance value was <0.05, there was a correlation; if the significance value was >0.05, there was no correlation.

Correlations

			Transformational leadership	Teacher motivation	Teachers' teaching skills in digital era
Spearman's rho	Transformational leadership	Correlation Coefficient	1.000	.684**	.684**
		Sig. (2-tailed)	.	.000	.000
		N	228	228	228
	Teacher motivation	Correlation Coefficient	.684**	1.000	1.000**
		Sig. (2-tailed)	.000	.	.
		N	228	228	228
	Teachers' teaching skills in digital era	Correlation Coefficient	.684**	1.000**	1.000
		Sig. (2-tailed)	.000	.	.
		N	228	228	228

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the Spearman Rho test results, the significance value of variables X, Y_1, and Y2 was 0.000, which was less than 0.05. Therefore, we concluded that there was a relationship or correlation between the variables. Looking at the level of correlation strength, the correlation coefficient value of this research data was 0.684, with the criteria for a very strong correlation. From this analysis, it can be concluded that there was a correlation between transformational leadership, teacher motivation and teacher skills in the digital era. Seeing the positive correlation value, it can be concluded that if we increase transformational leadership, teacher motivation and teacher skills will also increase.

We conducted the interview with the school principals with open-ended questions. The results showed that there were efforts to implement transformational leadership through motivation and teacher skill development. In the interviews, researchers explored the principal's perceptions of his or her role in motivating and developing teacher skills in the digital era. The interviews revealed that principals in border areas had a digital vision for improving the quality of education. Principals strived to practice transformational leadership values through exemplary behavior, open communication, dialogue, and collaborative support. Transformational leadership strategies were evident through discipline, encouragement, attention to teachers, and directing them to innovate in classroom learning. Furthermore, principals demonstrated concrete support by ensuring adequate digital learning and training facilities for teachers despite limited resources. Principals demonstrated an appreciative and reflective attitude, where failure was viewed as a learning process, not a mistake.

Furthermore, we also interviewed the teachers to find out their perspectives about principal's transformational leadership. Based on the results of interviews with open questions, the principal was seen as a transformational leader who had a clear digital vision and inspired teachers to change, provided direct role models in the use of technology, showed empathy and individual

attention, especially to teachers who were still adapting to digital learning, was able to grow teacher motivation and self-confidence through a constructive and supportive approach.

On the other hand, teachers acknowledged that there were still structural and technical limitations in developing digital skills, particularly the lack of continuity in training and mentoring, and limited facilities and internet access in border areas. However, teachers also had high expectations for the leadership of school principals to address the challenges faced by teachers in border areas.

The research findings indicate that principals were considered capable of implementing transformational leadership when they served themselves as role models, had a clear vision, encouraged new approaches to learning, were able to provide inspiration, and provided individual attention to teachers. These results were in line with the findings of (Kareem et al., 2023) and (Morales, 2022) who emphasized that transformational leadership could increase teacher motivation, professional growth, and commitment through visionary and inspirational leadership practices. However, these findings differ from previous studies that mostly focused on the implementation of transformational leadership in urban schools or those with adequate resources (Benton, 2017; Sardon Ari, 2017). This study demonstrated the effectiveness of implementing transformational leadership in schools in border areas where the context of the research was much more challenging. These findings extended the results of previous studies by showing that the implementation of transformational leadership did not always depend on ideal environmental conditions.

Transformational leadership was then found to have an effect on increasing teacher motivation. Most teachers felt enthusiastic, passionate, and conscious of continuous self-improvement. These results were consistent with research by (Fauziyah, 2022; Morales, 2022), which found that transformational leadership could foster teachers' intrinsic motivation through inspiration, clarity of vision, and individual empowerment. These findings also aligned with the opinions of Bissane Harb et al., Stanley Kulei Chebon et al.,(Chebon et al., 2019; Harb & Sidani, 2019) that transformational leaders could motivate subordinates to transcend personal interests for shared goals through idealized influence and inspirational motivation. Transformational leadership was not only effective in ideal school environments but could also be a key driving factor in increasing teacher enthusiasm and professional awareness across various educational contexts.

Transformational leadership influenced teacher skill development in the digital era. Most teachers in this study were already quite skilled in using digital media for learning, but there was still room for improvement, especially in creativity and technical problem-solving. These results aligned with research findings from (Pakalniņa et al., 2023) who confirmed that transformational leadership encouraged teacher capacity development through empowerment and adaptation to educational technology. Similarly, transformational leadership played a role in stimulating teachers' critical and creative thinking to effectively integrate technology into the learning process (Mendis, 2001). Transformational leadership, in addition to building commitment and work enthusiasm, also enhanced teachers' professional skills to face the demands of education in the digital era.

On the other hand, teachers acknowledged that there were still structural and technical limitations in developing their digital skills, particularly the lack of continuity in training and mentoring, and limited facilities and internet access in border areas. These findings aligned with the findings of (Azevedo & Azevedo, 2020), who emphasized that infrastructure barriers and institutional support were the main factors hindering the effectiveness of digital transformation in educational settings. Teachers' digital skills were highly dependent on continuous access to training and technological resources (Fulgence, 2020; Tejada Fernández & Pozos Pérez, 2018). Therefore, the challenges facing teachers in border areas require policy support for improving digital competency.

CONCLUSION

Based on the analysis, the transformational leadership of principals play a crucial role in improving teachers' motivation and digital skills in border areas. The visionary, inspiring, and caring principals are able to create a work environment that adapts to developments in information technology and encourages teacher professionalism. However, this study identified weaknesses in the form of limited facilities, a lack of sustainable digital training, and unequal internet access in schools located in border areas. These problems could hinder the effective implementation of transformational leadership in school management. The implication of this study is that strengthening digital leadership is a crucial strategy in addressing changes and developments in education during this digital era, especially in areas with limited resources. Therefore, policy support is needed to encourage digital-based leadership training, competency development, and continuous educational technology infrastructure in schools in border areas.

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