# Empowering leadership and achievement motivation in enhancing digital learning behavior: Mediating effects of learning climate

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**Abstract:** Digital learning behavior in elementary school teachers is not fully relevant to the current portrait of digital competence. Research that comprehensively discusses the role of empowering leadership and achievement motivation, with learning climate mediation in shaping digital learning behavior, has not been widely conducted. The purpose of this study is to analyze the effect of empowering leadership on educational institution leaders and teacher achievement motivation, mediated by the learning climate, in fostering digital learning behavior in elementary schools in Surabaya City that implement emancipated learning programs. The research method uses a quantitative approach with multi-level analysis conducted in stages: (a) interclass correlation test to see the value of ICC (1), ICC (2), and RWg; (b) construct validity test and construct reliability test; (c) hypothesis testing is done with multi-level analysis and single-level analysis; and (d) coefficient of determination test. The results of this study show that empowering leadership and achievement motivation do not directly affect the learning climate or digital learning behavior. The variable that affects digital learning behavior is the learning climate. However, the learning climate does not play a role as a mediator in the tests conducted in this study. This study implies that it provides an overview of the focus of school leaders in fostering a learning climate, along with other factors that are more relevant to the development of school conditions, in addition to the variables that have been tested in this study.

**Keywords:** Achievement motivation, Digital learning behavior, Empowering leadership, Learning climate.

## 1. Introduction

The challenge of primary school education today lies in digital learning behaviors that are not yet fully relevant to the portrait of digital competence [1]. Improving digital learning behavior is one of the main keys to ensuring the success of technology implementation in education. Without the right behavior, digital technology will only be a less effective tool in supporting the teaching and learning process. Achieving this requires the support of the principal's empowering leadership and strong motivation for teacher achievement. Empowering leadership has a strategic role in creating an environment that encourages innovation and adaptation to digital technology in schools. Empowering leadership not only provides support to teachers in the use of technology but also facilitates the training and resources needed to develop teachers' digital skills. By empowering teachers, principals can ensure that teachers feel confident and competent in integrating technology into the learning process.

On the other hand, teacher achievement motivation is very important in the context of digital learning. Achievement motivation is an internal drive that moves individuals to achieve and exceed

certain performance standards. Teachers with high achievement motivation are more likely to continue learning and innovating in the use of technology by finding new ways to optimize learning through digital devices. Achievement motivation also encourages teachers to overcome obstacles that arise in the use of technology to provide rich and meaningful learning experiences for students. Achievement motivation is not only an individual achievement but how teachers can direct their motivation to achieve greater goals in education, in this study directed at improving the quality of learning through digital learning. One of the determining factors of learning quality is the role of learning climate. A positive learning climate can increase teacher engagement and create a conducive atmosphere in the learning process.

There has not been much research on empowering leadership, achievement motivation, and learning climate comprehensively. Digital learning behavior can be influenced by digital leadership and the ability to innovate [2]. Effective digital leadership involves school leaders who not only understand technology but are also able to inspire and empower teaching staff to adopt and integrate technology into teaching [3]. *Empowering leadership* plays a key role in shaping a positive learning climate in schools [4]. Through the *empowering leadership* approach, leaders can increase teachers' involvement and active role in contributing to the achievement of a conducive learning climate. It can provide the emotional and instrumental support that teachers need so that teachers feel more motivated and inspired in their work [5]. Achievement motivation reinforced by a positive learning climate also encourages teachers to develop their digital skills.

The empirical problem of this research is based on the condition of educators in Indonesia as expressed in the Ministry of Communication and Information's 2022 report on the status of digital literacy in Indonesia in 2022. Based on the data, teachers' pedagogic skills in using digital devices are described in the aspects of: (a) the use of learning multimedia is still 17.1% (b) the use of digital books is still quite low, at 14.5%; and (c) the use of virtual laboratories is only 3.5%. From these data, it can be seen that the use of digital devices by teachers is still considered very minimal amid the current era of massive technological disruption. Researchers see that the formation of teachers' digital learning behavior is the tip of the knot in shaping the competence of graduates who are adaptive to technology.

The challenge of forming teachers' digital learning behavior needs to be a concern for all education stakeholders to align with learning challenges Nabila and Trihantoyo [6] which leads to the formation of digitization-oriented graduate competencies. The empowering leadership factor can help form teachers' digital learning behavior in learning and using technology effectively [7, 8]. In addition, empowering leadership can encourage educators to seek opportunities to improve digital skills and knowledge Höyng and Lau [9]. Jöntgen, et al. [10] stated that achievement motivation increases individual participation in shaping digital learning behavior [11]. The findings of Shao, et al. [12] revealed that psychological and motivational factors, directly and indirectly influence success outcomes [13]. In addition, research by Trihantoyo, et al. [14] and Jung, et al. [15] found that learning climate has a significant moderating influence on the relationship between empowering leadership and digital learning behavior. Organizational climate supports individuals to develop themselves and the ability to learn to deal with changes that lead to optimizing organizational capacity [6, 16]. It can be concluded that in shaping digital learning behavior, it is necessary to pay attention to empowering leadership factors and achievement motivation as well as the role of learning climate in schools. For this reason, the importance of this research is carried out to provide a formulation in establishing policies on the formation of digital learning behavior by paying attention to the elements of empowering leadership of school principals, teacher achievement motivation, and the learning climate that develops in schools as a form of triadic reciprocal [17].

## 2. Method

This research uses a quantitative approach and is analyzed with numerical data from statistical processing. The survey method is used to collect data and information that describes, compares, and explains the research variables obtained through the distribution of research instruments and data analysis based on statistical procedures [18, 19]. This research uses top-down multi-level analysis, where multi-level analysis is a broad methodology in analyzing research questions and data structures involving more than one type of unit Snijders and Bosker [20] with a top-down model [21].

Respondents in the study were school leaders and teachers at primary school-level educational institutions in Surabaya City. The purposive sampling technique was used with a non-probability sampling method and the elements for the sample were selected based on the researcher's judgment [22]. The criteria set in determining the sample was the school's involvement in the emancipated school program. This program focuses on accelerating schools to move 1-2 steps forward through innovation and a strong desire from the entire educational institution community in terms of school digitalization, data-based planning, learning with a new paradigm, and strengthening human resources in schools. 34 primary schools in Surabaya City qualify for the second stage of the emancipated school program, all of which are used as research samples. The total research sample was 340 respondents consisting of leaders and teachers.

Analysis of research data is carried out in several stages, starting from the interclass correlation test to see the value of ICC (1), ICC (2), and RWg so that the suitability of individual scores to the organizational level will be seen [23]. The next stage is the model fit test to determine the suitability of the research model. Researchers use the *Chi-Square* value Cudeck, et al. [24] *RMSEA* value Browne, et al. [25] CFI value Bentler [26] TLI value Tucker and Lewis [27] and SRMR value [28]. Researchers then conducted validity and reliability tests. A construct validity test was conducted to assess the validity of the questionnaire with a significant AVE value > 0.5 [29]. Meanwhile, the construct reliability value is> 0.7 [29]. Hypothesis testing is done with multilevel analysis and single-level analysis. Hypothesis testing to determine the value and relationship between the variables studied by the formulation of research problems. The *multi-level analysis* was conducted at the *workgroup level*, namely the variables of *empowering leadership*, learning climate, and digital learning behavior. Meanwhile, at *single-level analysis* on achievement motivation variables and digital learning behavior. The sample analyzed was 10 respondents in each team, in this study there were 34 teams. In testing this hypothesis, the MPlus 8.3 *software* was used. The final stage of data analysis is the R-square test or the coefficient of determination, by looking at the R-square value ranging between 0 and 1 [30].

## 3. Results and Discussion

### 3.1. Demographic Profile

The respondents of this study consisted of 340 school leaders and primary school teachers in Surabaya City. The respondent profile represents 34 schools as teams. The researcher assigned 3 school leaders and 7 teachers to each team. School leaders are teachers with additional duties, in this study divided into 13 types of additional duties. The demographic profile also presents data on gender, age, functional position, and length of service as either a school leader or teacher. The gender of school leaders is 61% female and 39% male, while the gender of teachers is 73% female and 27% male. The age profile of respondents of school leaders and teachers is dominated by the age range of 30-40 years with a percentage of school leaders by 33% and teachers by 43%.

The demographic profile on the aspect of functional positions, school leaders are dominated by the functional positions of young teachers and middle teachers with a total of 33% each. Meanwhile, at the teacher level, it is dominated by young teachers with a total of 43%. A functional position is a teacher career development that contains functions and duties related to functional services based on certain

expertise and skills. The following aspect relates to the mas of duties, the majority of school leaders get additional duties for less than 4 years at 36%, while teachers are dominated by teaching time of more than 12 years at 66%.

**Table 1.**
Demographic Profile of Respondents.

| Characteristic | Frequency | % |
|---|---|---|
| Leader Position | | |
| Principal | 33 | 0.32 |
| Vice Principal | 5 | 0.05 |
| Head of Library | 8 | 0.08 |
| Head of Student Health Unit | 2 | 0.02 |
| PR Coordinator | 1 | 0.01 |
| Student Affairs Coordinator | 4 | 0.04 |
| Finance Coordinator | 6 | 0.06 |
| Curriculum Coordinator | 17 | 0.17 |
| Teacher Competency Development Coordinator | 1 | 0.01 |
| Infrastructure Coordinator | 1 | 0.01 |
| General Coordinator | 7 | 0.07 |
| School Development Team | 15 | 0.15 |
| Learning Committee | 2 | 0.02 |
| Leadership Gender | | |
| Lak-Laki | 40 | 0.39 |
| Female | 62 | 0.61 |
| Teacher Gender | | |
| Male | 65 | 0.27 |
| Female | 173 | 0.73 |
| Leader Age | | |
| <30 Years | 8 | 0.08 |
| 30-40 years old | 34 | 0.33 |
| 40-50 Years | 27 | 0.26 |
| >50 Years | 33 | 0.32 |
| Teacher Age | | |
| <30 Years | 25 | 0.11 |
| 30-40 years old | 103 | 0.43 |
| 40-50 Years | 59 | 0.25 |
| >50 Years | 51 | 0.21 |
| Functional Position of Leader | | |
| First Teacher | 13 | 0.13 |
| Junior Teacher | 34 | 0.33 |
| Middle Teacher | 34 | 0.33 |
| Master Teacher | 21 | 0.21 |
| Teacher Functional Position | | |
| First Teacher | 61 | 0.26 |
| Junior Teacher | 103 | 0.43 |
| Middle Teacher | 56 | 0.24 |
| Master Teacher | 18 | 0.08 |
| Duration of Leaders' Additional Duties | | |
| <=4 years | 37 | 0.36 |

| | | |
|---|---|---|
| 5-8 years | 17 | 0.17 |
| 9-12 years | 15 | 0.15 |
| >12 Years | 33 | 0.32 |
| Length of Teaching Assignment | | |
| <=4 years | 30 | 0.13 |
| 5-8 years | 23 | 0.10 |
| 9-12 years | 28 | 0.12 |
| >12 Years | 157 | 0.66 |

### 3.2. Measurement Model Test

#### 3.2.1. Interclass Correlation Coefficient

The emancipated learning program has an important role in encouraging empowering leadership and achievement motivation in developing teachers' digital learning behavior. This program aims to create a learning environment that supports and empowers all school members. In line with this, this study tested seven research hypotheses at *multiple levels*, namely the organizational level and the individual level. Data analysis began with the *intraclass correlation coefficient* ICC (1), ICC (2), and RWg tests conducted at the organizational level as follows.

**Table 2.**
Evaluation of ICC (1), ICC (2), and RWg.

| Variables | RWg | ICC1 | ICC2 | P |
|---|---|---|---|---|
| Empowering leadership | 0.98 | 0.3 | 0.63 | 0.000 |
| Learning climate | 0.95 | 0.42 | 0.83 | 0.000 |

The results of the calculation of the ICC (1) value for each variable at the organizational level ranged from 0.3 to 0.42. Referring to Wittmer and LeBreton [31] then the ICC (1) value for all variables is greater than 0.05 so that the data supports *multi-level* analysis. Furthermore, for the ICC (2) value, it is known that the value ranges from 0.63 to 0.83. These results indicate that for the value of ICC (2) for each variable the value has shown the level of reliability between sample groups is close to good [32]. The value of RWg is known to be greater than 0.7, which ranges from 0.98 to 0.95, thus supporting aggregation in the calculation of multi-level models [33]. Based on the results of these calculations, the overall value <0.05, the research data, especially at the organizational level, supports multi-level model analysis.

### 3.2.2. Model Fit Test

The next stage of analysis is to test the fit model by looking at the goodness-of-fit measures which include: (1) The Chi-Square test is based on the generalization of the LR statistic for joint hypothesis testing with many parameters Cudeck, et al. [24] (2) Root Mean Square Error of Approximation (RMSEA) is used to assess the fit of the model with improvements for degrees of freedom [25, 34] (3) Comparative Fit Index (CFI) is a measure of model fit to the data with values between 0 and 1 [26, 28] (4) Tucker-Lewis Index (TLI) to account for the complexity of the model Tucker and Lewis [27] (4) SRMR (Standardized Root Mean Square Residual) as a measure of fit based on the difference between the observed covariance and the covariance predicted by the model [28]. The following are the results of the fit model test in this study.

**Table 3.**
Goodness of Fit Indices.

| Index | Value | Threshold | Summary |
|---|---|---|---|
| Chi-Square | 10.396* (df 1319) | 0.5 | Model does not fit |
| RMSEA | 0.159 | 0.05 - 0.08 | Model does not fit |
| CFI | 0.663 | 0 - 1 | Model fit |
| TLI | 0.648 | 0.8 - 0.9 | Model lack of fit |
| SRMR | 0.063 | < 0.08 | Model fit |

Based on the fit model test using Mplus 8.3 software, it can be concluded that there are two fit models, namely CFI with a value of 0.663 and SRMR with a value of 0.063. Meanwhile, one index shows a less-fit model with a TLI value of 0.648. As for the index of the model not fit, it is shown from the Chi-Square value, which is 10,396 * (df 1319) and RMSEA of 0.159. The CFI fit model index in this study can be used as a goal for the model to be said to be fit. The CFI value of 0.663 provides an assessment of the level of fit of the proposed model with empirical data. The higher the CFI value, the better the proposed model fits the research data [26]. The higher the CFI value, the better the proposed model fits the research data, so that this model is empirically consistent with the theoretical hypotheses built and can provide researchers with confidence in determining the decisions taken. The SRMR value of 0.063 also provides a measure of how well the proposed statistical model fits the observed data, the lower the SRMR value indicates the better the model fits the data [28].

### 3.2.3. Validity and Reliability Test

To ensure the accuracy and consistency of the data under study, validity and reliability tests were carried out. Based on the results of the validity and reliability test which refers to the validity value of the questionnaire with a significant AVE value> 0.5 [29] and construct reliability value > 0.7 [29]. Evaluation of *construct validity* and *construct reliability* for each variable at each level was carried out with MPlus 8.3 *software*, showing that the *average variance extracted* (AVE) values were all greater than 0.50 with a range of values between 0.703 - 0.907. Meanwhile, the evaluation of construct reliability for each variable also has a value greater than 0.70 with a value range of 0.854-0.984. It can be concluded that the evaluation of *construct validity* and *construct reliability of* the *multi-level* assessment model is good.

**Table 4.**
Construct Validity and Construct Reliability.

| Variables | Construct Reliability | Average Variance Extracted |
|---|---|---|
| *Empowering Leadership* | 0.977 | 0.781 |
| Learning Climate | 0.970 | 0.770 |
| Achievement Motivation | 0.968 | 0.680 |
| Digital Learning Behavior | 0.973 | 0.703 |

### 3.2.4. Test of Hypothesis

The next test stage is hypothesis testing with single-level modeling and multi-level level modeling methods using MPlus 8.3 software. At a single level, the number of samples in this test was 34 teams by taking a sample of 7 respondents each. Meanwhile, multi-level with the number of testing samples as many as 34 teams by taking a sample of 10 respondents each.
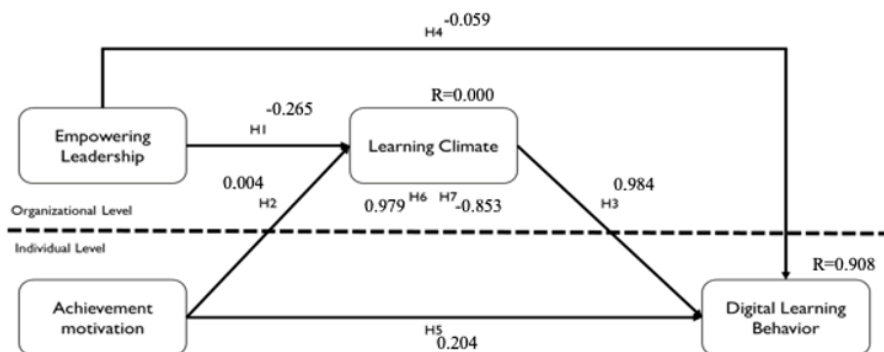
**Figure 1.**
Research Model Analysis Results.

### 3.2.5. Empowering Leadership on Learning Climate

The first hypothesis was tested to analyze the effect of empowering leadership on learning climate, the estimated value of -0.265 indicates that there is a negative effect of empowering leadership on learning climate. However, this effect is not significant because the p-value is 0.489, indicating that statistically this relationship is not strong enough to be concluded as a real effect. In the context of multi-level analysis, empowering leadership did not show a significant effect on the learning climate. Indicating that although empowering leadership is often associated with an increased sense of responsibility and autonomy at the individual level Yu, et al. [35] teachers perceived that the learning climate did not contribute significantly. One of the reasons why empowering leadership did not show a significant effect is because the learning climate in schools is determined by many other factors that are more systemic, such as school policies, infrastructure, and learning culture that are not only dependent on leadership style [36].

### 3.2.6. Achievement Motivation on Learning Climate

The second hypothesis in this study examines the effect of achievement motivation on learning climate. The estimated value is 0.004 with a p-value of 0.953, meaning that the relationship between achievement motivation and learning climate is not significant. This shows that teachers' motivation to achieve is not enough to influence teachers' perceptions of the learning climate at school. In this case, other factors such as school policies and teaching methods may be more important in shaping perceptions of the learning climate [37].

### 3.2.7. Learning Climate on Digital Learning Behavior

The next test analyzes the effect of learning climate on digital learning behavior, obtaining an estimated value of 0.984 and a p-value of 0.000. The effect of the learning climate on digital learning behavior is highly significant and positive. This shows that a supportive learning climate will greatly influence teachers' behavior in using technology for digital learning [38]. A positive learning climate, such as support from the principal, a conducive learning atmosphere, and policies that promote the use of digital technology, can encourage teachers to be more active and engaged in digital learning [39].

### 3.2.8. Empowering Leadership on Digital Learning Behavior

In the fourth hypothesis, the test results of the effect of empowering leadership on digital learning behavior obtained an estimated value of -0.059, while the p-value is 0.002. This result shows that empowering leadership has a significant negative effect on digital learning behavior. That is, the higher

the level of empowering leadership applied, the lower the digital learning behavior. This indicates that in the context of digital learning, giving autonomy and freedom by leaders may make teachers less structured in adopting digital technology for learning [40]. This can happen if support is not accompanied by clear guidance on how to utilize digital technology effectively.

### 3.2.9. Achievement Motivation on Digital Learning Behavior

The fifth hypothesis in this study examines the effect of achievement motivation on digital learning behavior with an estimated value of 0.204 and a p-value of 0.223. Although there is a positive effect of achievement motivation on digital learning behavior, this result is not statistically significant. There is not enough evidence to conclude that achievement motivation has a strong influence on how teachers behave in digital learning. This means that although teachers have the motivation to achieve, it is not directly reflected in the use of digital technology in learning. There are other factors at the emancipated school, such as access to technology, digital skills, and support from the learning environment [41].

### 3.2.10. Empowering Leadership on Digital Learning Behavior Mediated by Learning Climate

The sixth hypothesis tests the mediating variable of learning climate on the effect of empowering leadership on digital learning behavior, with an estimated value of 0.979 and a p-value of 0.102. The positive estimation result (0.979) indicates a tendency that when the empowering leadership style is applied, and in the presence of a supportive learning climate, teachers tend to have better digital learning behavior. This means that a good learning climate can be an important factor that allows empowering leadership to influence teachers' behavior in using digital technology [42]. However, since the p-value is 0.102, this mediating effect is not statistically significant. This indicates that although the relationship between these variables exists, its impact is not strong enough to be considered real in the context of this study. There are other factors to consider to increase the positive influence.

### 3.2.11. Achievement Motivation on Digital Learning Behavior Mediated by Learning Climate

In the last hypothesis of this study, testing the mediation of learning climate on the effect of achievement motivation on digital learning behavior, the estimated value is -0.853 and the p-value is 0.000. The estimated value of -0.853 indicates that the learning climate acts as a negative mediator on the effect of achievement motivation on digital learning behavior. That is, the higher the achievement motivation, the lower the digital learning behavior through the mediation of the learning climate. When learning climate is included as a mediator, achievement motivation leads to a decrease in digital learning behavior. This could indicate that teachers with high achievement motivation focus more on conventional learning methods and less on utilizing digital technology [43].

### 3.2.12. Coeficient Determination (R-Square)

To find out information about the goodness of a model, in this study, the coefficient of determination (R-square) test was carried out. The R-square value ranges between 0 and 1, with 1 indicating that all variability in the dependent variable can be explained by the independent variable, and 0 indicating that no variability in the dependent variable can be explained by the independent variable [30]. The organizational level R-square value on the learning climate variable is 0.000, which means that the formation of the learning climate in the research context is not determined by the principal's empowering leadership or teacher achievement motivation. The learning climate in the research context of this emancipated school is determined by other factors not examined in this study. Meanwhile, the R-square value of the digital learning behavior variable is 0.908. In this study, the formation of digital learning behavior variables by 90.8% is determined by the variables of empowering leadership, learning climate, and achievement motivation. Based on the overall R-square test, it indicates that empowering leadership and achievement motivation do not shape the learning climate, but can

shape digital learning behavior. The number of training programs on the use of technology in learning conducted by various elements of the organization in the research subject produces saturation in teachers. Nevertheless, teachers' competence in using technology has increased.

## 4. Discussion

The originality of this study shows that empowering leadership and achievement motivation do not contribute to the learning climate. Learning climate is more influenced by collective perceptions of organizational support rather than specific leadership styles [36]. One of the factors causing the formation of a learning climate is the daily interactions and experiences that occur in the organization. Other studies also suggest that leadership styles, including transformational and transactional leadership, influence job satisfaction and organizational commitment. Meanwhile, empowering leadership style is compared with other leadership styles in the context of job satisfaction and commitment [44].

This study also found that achievement motivation does not affect learning climate. The results of previous research, that achievement motivation only contributed 12.3% to teacher performance [45]. This result corroborates that achievement motivation, which is related to achieving personal goals, does not have a strong direct influence on the learning climate [46]. Instead, environmental factors such as social support and organizational structure contribute more to the formation of a learning climate [47].

The learning climate of the emancipated school in the context of this study shows a positive contribution to influencing digital learning behavior. This result is in line with the research findings that a strong organizational learning climate has a significant positive impact on digital learning orientation. Organizations that support continuous learning and innovation tend to have students and staff who are more open to digital learning technologies [38]. The formation of digital learning behavior is also determined by clear and measurable goal setting, which plays an important role in moderating digital learning behavior. Students who set specific goals for learning tend to be more engaged and motivated in the use of digital learning tools [48].

Learning climate also plays a mediating role in the effect of empowering leadership on digital learning behavior. The workplace learning climate, which includes social support, open communication, and collaborative interaction, serves as an important mediator in the relationship between empowering leadership and learning [49]. A positive social climate amplifies the effects of empowering leadership by creating an environment that supports learning and knowledge exchange. Meanwhile, the learning climate does not mediate the effect of achievement motivation on digital learning behavior. This result contradicts the findings of a study that stated that a positive school climate, which supports the creation of a conducive environment for teachers to deliver high-quality learning, is the most important factor in digital learning behavior [50]. Based on the context of this study, this is influenced by the digital competence of teachers in Surabaya City, which is already in the good category [51].

## 5. Conclusion

The results of this study are very challenging given the various tests of influence between variables. The context of this study is a emancipated school program with unique characteristics, where human resources are a key factor in terms of commitment and motivation to develop. This research shows that the only hypothesis that positively and significantly influences occurs in testing learning climate on digital learning behavior. Meanwhile, the mediation of the learning climate in describing the influence of empowering leadership and achievement motivation on digital learning behavior is not seen. This finding illustrates that although learning climate can affect digital learning behavior directly, it does not function as a mediator that explains empowering leadership and achievement motivation affecting teachers' digital learning behavior. Some variables have not been explored in this study.

The implication of this research is to guide schools in implementing emancipated learning programs to investigate other factors that are more relevant in creating a learning climate in schools. The form of stakeholder involvement such as parents and community needs to be a concern as a trigger factor for the formation of a learning climate in the emancipated school. In the formation of digital behavior, the strategy of empowering teachers by creating a school culture that supports the needs of teachers. This can increase teacher motivation with various teacher-oriented programs, such as career development opportunities or designing incentives in the form of awards for outstanding teachers.

## Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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## Copyright:

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