

Increasing Innovative Behavior Through Strengthening Principal's Technology Leadership, Information And Communication Technology Literacy (ICT), And Self-Efficacy

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Article Info	Abstract
Article History Received: April 09, 2021 Accepted: November 11, 2021 Keywords : Innovative behavior, Principals' Technology Leadership, ICT literacy, Teacher self-efficacy. DOI: 10.5281/zenodo.5678903	<i>This study discusses the improvement of teacher innovative behavior through the development of principal technology, ICT literacy, and teacher self-efficacy. This study will focus on finding direct and indirect effects between these variables. Thus it will be found indicator variables that will be improved so that it has an impact on increasing the innovative behavior of teachers. This study uses a survey method with a path analysis approach. The sample in this study were private high school teachers with a school accreditation status of "A" in Depok City, West Java Province, Indonesia with a total of 136 teachers. The sample is spread across 13 schools in 8 sub-districts. Determination of sample size is done by using multistage random sampling. Based on the results of the study, it can be said as follows: a) there is a direct influence of technological leadership on the innovative behavior of teachers; b) there is a direct influence of ICT literacy on the innovative behavior of teachers; c) there is a direct effect of efficacy on the innovative behavior of teachers; d) there is a direct influence of technology leadership on teacher self-efficacy; e) the direct influence of ICT literacy on teacher self-efficacy; and f) the direct influence of technology leadership on ICT teacher literacy.</i>

Introduction

Innovative teacher behavior needs to be central to teacher professional development. Innovative behavior is very much needed in facing the ongoing challenges in this digital era, where teachers are faced with the problem of developing information and communication technology which is growing more rapidly than other sciences. Innovative teacher behavior is a teacher who takes innovative actions by observing, listening, and adapting ideas, building action strategies, assessing through reflection and evaluation, adjusting innovation, and finding the group (Messmann& Mulder, 2011; Izzati, 2017). Teacher innovative behavior is the act of a teacher in exploring opportunities, generating ideas, promoting ideas, realizing ideas, and reflecting in their professional work as a result of the accumulation of physical and cognitive work in order to increase the effectiveness of achieving quality learning and education.

The results of a preliminary study on the principal's assessment through a questionnaire regarding the innovative behavior of teachers towards 30 private high school teachers in the city of Depok obtained information that the teacher's actions in exploring opportunities showed that the results were not optimal. This result can be seen from the answers never and never by 35.56%. The teacher's actions in generating new ideas are still not optimal. This result can be seen from the answers never and never by 40.00%. The teacher's actions in promoting innovative ideas are still not optimal. This result can be seen from the answers never and never by 43.33%. The teacher's actions in realizing the latest ideas are still not optimal. This result can be seen from the answers to never and never by 45.56%. The teacher's actions in reflecting on the development of innovation are still not optimal. This result can be seen from the answers never and never by 36.67%.

Innovative behavior of teachers is very much needed in the midst of the Coronavirus disease 19 (Covid-19) pandemic which has an impact on the education sector. Innovation will have an important role to play in recovery after the coronavirus (Chesbrough, 2020). Innovative behavior must be owned by anyone, especially teachers. Teacher innovation is an important element related to achieving educational goals, namely to produce quality human resources, both in terms of science, knowledge, skills, and personality (Setyaningsih et al., 2018).

Educational organizations that want innovative behavior need human resource management that is able to direct teachers to quality themselves which leads to innovative behavior. Principals of public schools in the 21st century must be leaders in technology implementation. This challenge exists because many principals are not sufficiently prepared to lead the implementation and integration of educational technology in schools (Chang et al., 2019). It is hoped that future studies will explore more of the effects of technology leaders on more specific teacher pedagogical approaches (Omar & Ismail, 2020). Technological leadership is a leadership

style that focuses on the character of the leader in lifting the spirit of the workforce to apply technology in the organization (Thannimalai & Raman, 2018; Raman et al., 2019; Aurangzeb, 2019; Omar & Ismail, 2020). Technological leadership is a principal's leadership style that integrates technology in making policies, planning, implementing, and evaluating the development of education in schools which are characterized by 1) vision, planning, and management; 2) interpersonal and communication skills; 3) teacher development and training; 4) technology and infrastructure support; 5) excellence in professional practice; 6) digital learning and teaching culture; 7) digital citizenship, and 8) evaluation and assessment.

Teachers' ICT literacy needs to be investigated for its existence as one of the variables that influence the innovative behavior of teachers. The innovative behavior of teachers will be influenced by their ability to know and understand and apply existing ICT (ICT literacy) (Hughes, 1997; Lemon & Garvis, 2015). Information and communication technology (ICT) literacy is knowledge of the use of various types of ICT which are applied in understanding, accessing, managing, integrating, evaluating, and creating ICT in various forms as well as knowledge in understanding ethics, law, and socio-economics around ICT which is characterized by: 1) knowledge of ICT, 2) knowledge of accessing/using ICT in various forms, 3) knowledge of managing ICT, 4) knowledge of integrating ICT, 5) knowledge of evaluating ICT, 6) knowledge of making information work in a knowledge society, and 7) knowledge various ethical, legal and socio-economic issues surrounding ICT.

More systematic research on teacher innovative behavior to improve the quality of education in the future needs to pay attention to self-efficacy (Thurlings et al., 2014). There are two barriers to the integration of technology in education. The first obstacle is the lack of adequate access, time, training, and institutional support. While the second obstacle is pedagogic trust, technological belief, and willingness to change or known as self-efficacy. On that basis, it can be presumed that ICT literacy will affect teachers' self-efficacy and innovative behavior (Ertmer, 1999; Lemon & Garvis, 2015). Teacher self-efficacy is a teacher's belief or confidence in his potential so that he has the drive to plan, organize, carry out, and complete the tasks needed to achieve educational goals which are characterized by 1) task challenges, 2) task complexity, 3) self-motivation, 4) steady belief, 5) confidence in success, 6) physical and mental readiness, 7) previous experience of success, 8) pride in success, and 9) optimism to succeed.

Thus, this study will discuss the improvement of teacher innovative behavior through the development of principals' information and communication technology leadership, ICT literacy, and teacher self-efficacy. The study will focus on finding direct and indirect effects between these variables. Thus will be found indicators of the variables to be improved so as to have an impact on increasing the innovative behavior of teachers.

METHOD

The method used in this quantitative research is a survey method with a path analysis approach. The independent variable consists of two independent variables, namely Principal Technology Leadership (X1), and Teacher ICT Literacy (X2). While the mediator/intervening variable is Teacher Self-Efficacy (X3) and Teacher Innovative Behavior (Y) is the dependent variable. The sample in this study were private high school teachers with a school accreditation status of "A" in Depok City, West Java Province, Indonesia with a total of 136 teachers. The sample is spread across 13 schools in 8 sub-districts. Determination of sample size is done by using multistage random sampling.

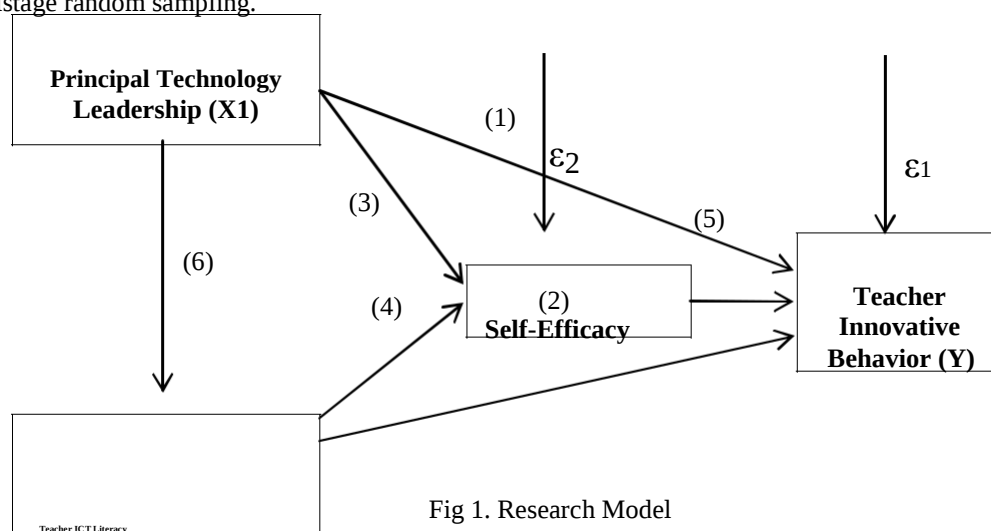


Fig 1. Research Model

Based on the theoretical review and framework that has been described previously, the following research hypothesis is proposed.

1. There is a direct influence of technological leadership on the innovative behavior of teachers.
2. There is a direct influence of ICT literacy on the innovative behavior of teachers.
3. There is a direct effect of self-efficacy on the innovative behavior of teachers.
4. There is a direct influence of technological leadership on teacher self-efficacy.
5. There is a direct influence of ICT literacy on teacher self-efficacy.

6. There is a direct influence of technological leadership on teachers' ICT literacy.

RESULT AND DISCUSSION

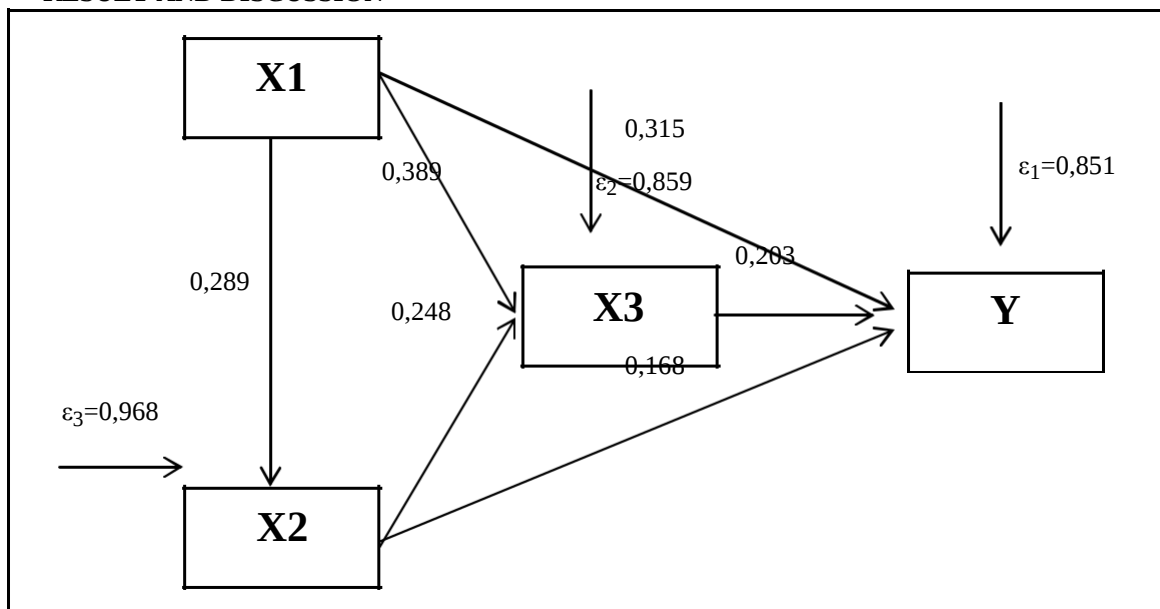


Fig 2. Hypothesis Test Results

A summary of the overall results of hypothesis testing can be seen in the following table

Table 1. Summary of Research Hypothesis Testing Results

No	Correlation	Coefficient	Sig	t Value	t _{table}	α	Conclusion
1	Technology leadership (X1) has a direct positive effect on teacher innovative behavior (Y)	0,315	0,000	3,769	1,98	0,05	Positive direct effect
2	ICT literacy (X2) has a direct positive effect on teacher innovative behavior (Y)	0,168	0,036	2,116	1,98	0,05	Positive direct effect
3	Self-efficacy (X3) has a direct positive effect on teacher innovative behavior (Y)	0,203	0,020	2,361	1,98	0,05	Positive direct effect
4	Technology leadership (X1) has a direct positive effect on self-efficacy (X3)	0,389	0,000	5,047	1,98	0,05	Positive direct effect
5	ICT literacy (X2) has a direct positive effect on self-efficacy (X3)	0,248	0,002	3,214	1,98	0,05	Positive direct effect
6	Technology leadership (X1) has a direct positive effect on ICT literacy (X2)	0,250	0,003	2,992	1,98	0,05	Positive direct effect

The direct influence of technology leadership (X1) on the innovative behavior of teachers (Y)

From the calculation results, the path coefficient value $\beta_{y1} = 0.315$ ($p < 0.05$) with t observed = 3.769; while t table at the real level = 0.05 obtained t table = 1.98 then t observed $>$ t table means H_0 is rejected and H_1 is accepted. Thus there is a direct influence of the technological leadership variable (X1) on the innovative behavior of teachers (Y). That is, the stronger the technological leadership applied by the principal will increase the innovative behavior of private high school teachers in Depok City.

The success of new technologies in schools depends on how principals choose to engage and support their staff in the adoption of new technologies. Careful thinking and planning for technology integration allow school leaders to feel confident about initiatives and to empower and encourage teachers to use new technologies in their classrooms. Successful principals are those who invest in planning to implement emerging technologies, are open to new innovations, adopt a school culture that encourages collaborative learning partnerships with their teachers and foster a learning community that extends beyond the classroom (Keane et

al., 2020). The second challenge for principals lies in providing teachers with appropriate professional development so that they can integrate technology into their teaching. Before deciding on targeted professional development to improve teacher technology integration, leaders must understand the reactions of teachers and their development to new technologies and innovations (Sharma, 2019). This research is also supported by the results of research by Omar & Ismail (2020) which show that there is a strong positive relationship between principals' technological leadership and the integration of teachers' mobile technology in the learning process. This is evidenced by the correlation coefficient of $r = 0.686$ and the value of $\text{Sig} = 0.000 < 0.01$. The principal's technology leadership contributed 47.40% to the integration of teachers' mobile technology. This study concludes that principals play an important role in ensuring technology is integrated into their organizations.

The direct effect of ICT literacy (X2) on the innovative behavior of teachers (Y)

From the calculation results, the path coefficient value $2 = 0.168$ ($p < 0.05$) with $t_{\text{count}} = 2.116$; while t_{table} at the real level = 0.05 obtained $t_{\text{table}} = 1.98$ then $t_{\text{count}} > t_{\text{table}}$ means H_0 is rejected and H_1 is accepted. Thus there is a direct influence of the ICT literacy variable (X2) on the innovative behavior of teachers (Y). That is, the stronger the ICT literacy of teachers, the more innovative behavior of private high school teachers in Depok City will be.

This study is supported by the results of Chou et al., (2019) that there is an insignificant direct effect of acceptance of technological innovation on innovative teaching behavior using ICT with a value of $r = 0.244$ ($t = 0.190$, $p > 0.05$). This study concludes that teachers are encouraged to adopt and integrate ICT into their teaching activities, but their readiness to integrate ICT determines the effectiveness of the technology. Teachers' attitudes towards technology (ICT literacy) were significantly and positively related to their adoption and integration of computers into their teaching. Therefore, it is worth exploring organizational characteristics that influence teacher adoption and integration of ICT into teaching.

The direct effect of self-efficacy (X3) on the innovative behavior of teachers (Y)

From the calculation results, the path coefficient value $3 = 0.203$ ($p < 0.05$) with $t_{\text{count}} = 2.361$; while t_{table} at the real level = 0.05 obtained $t_{\text{table}} = 1.98$ then $t_{\text{count}} > t_{\text{table}}$ means H_0 is rejected and H_1 is accepted. Thus, there is a direct influence of the self-efficacy variable (X3) on the innovative behavior of the teacher (Y). That is, the stronger the teacher's self-efficacy, the more innovative behavior of private high school teachers in Depok City will be.

This finding is in line with Bandura's ideas, as well as with many studies showing that self-efficacy is an excellent predictor of various types of human behavior. In addition, facilitation and support from others emerge when innovative behavior is related to the use of new technology (Thurlings et al., 2014). There are two barriers to the integration of technology in education. The first obstacle is the lack of adequate access, time, training, and institutional support. While the second obstacle is pedagogic trust, technological belief, and willingness to change or known as self-efficacy. The research recommends a study of teacher self-efficacy for important technologies for future teacher education programs in Australia. Only through a better understanding of how technology is taught and applied can we also increase perceived technological competencies and capabilities in schools (Lemon & Garvis, 2015).

The direct effect of technology leadership (X1) on self-efficacy (X3).

From the calculation results, the path coefficient value $31 = 0.389$ ($p < 0.05$) with $t_{\text{count}} = 5.047$; while t_{table} at the real level = 0.05 obtained $t_{\text{table}} = 1.98$ then $t_{\text{count}} > t_{\text{table}}$ means H_0 is rejected and H_1 is accepted. Thus there is a direct influence of technology leadership variable (X1) on self-efficacy (X3). That is, the stronger the technological leadership applied by the principal, the higher the self-efficacy of private high school teachers in Depok City.

This study is supported by the results of research by Siong (2012) that there is evidence of a significant direct relationship between principals' technological leadership and teacher self-efficacy. Meanwhile, Omar and Ismail (2021) in their research concluded that there was a moderate positive relationship between principals' technological leadership and teacher self-efficacy ($r = 0.47$, $p < 0.01$). However, the principal's technology leadership only contributed a low 22% variance effect on teacher self-efficacy ($r^2 = 0.22$, $F = 21.38$, $p < 0.05$). Overall, teacher self-efficacy towards ICT can develop if principals act as true technology leaders. Principals need to reconsider the characteristics of technology leadership in order to become role models in the use of ICT in schools.

The direct effect of ICT literacy (X2) on self-efficacy (X3)

From the calculation results, the path coefficient value $32 = 0.248$ ($p < 0.05$) with $t_{\text{count}} = 3.214$; while t_{table} at the real level = 0.05 obtained $t_{\text{table}} = 1.98$ then $t_{\text{count}} > t_{\text{table}}$ means H_0 is rejected and H_1 is accepted. Thus there is a direct influence of the ICT literacy variable (X2) on self-efficacy (X3). That is, the stronger ICT literacy will increase the self-efficacy of private high school teachers in Depok City.

A person will have good self-efficacy if he has sufficient provisions in carrying out his activities. The provision in question is good knowledge, ability, and skills. A teacher who has good knowledge of ICT and the

ability to access/use ICT in various forms certainly has good self-confidence in accepting task challenges and task complexity. Teachers who have good abilities in managing ICT, and integrating ICT certainly have self-motivation, solid belief, confidence in success, have physical and mental readiness, and optimism to succeed. This study is supported by the results of research by Siong (2012) that there is evidence of a significant direct relationship between the use of ICT in teaching and teacher self-efficacy. Meanwhile, Prior et al., (2016) found that digital literacy has a significant positive effect on self-efficacy ($\beta = 0.274$). The similarities between digital literacy and self-efficacy indicate a close and positive relationship between these concepts. Therefore, this study hypothesizes that digital literacy will lead to self-efficacy.

The direct influence of technology leadership (X1) on ICT literacy (X2)

From the calculation results, the path coefficient value $\beta_1 = 0.250$ ($p < 0.05$) with $t_{count} = 2.992$; while t_{table} at the real level = 0.05 obtained $t_{table} = 1.98$ then $t_{count} > t_{table}$ means H_0 is rejected and H_1 is accepted. Thus there is a direct influence of technology leadership variable (X1) on ICT literacy (X2). That is, the stronger the principal's technological leadership, the more ICT literacy of private high school teachers in Depok City will be.

The principal is an individual who can lead and influence teachers to perform tasks based on the goals to be achieved. Technology leadership is critical to increasing the integration of the latest technologies while providing all the ICT infrastructure for the school community. Principals are also responsible for providing training opportunities and professional development programs for teachers to enhance ICT competencies in the latest applications. Therefore, the principal's technological leadership will affect the ICT literacy of his teachers. Principals who apply technology leadership will develop and train teachers and staff and provide technology infrastructure support. This will certainly equip teachers with good ICT knowledge and gain access to ICT in various forms. Principals who apply excellence in professional practice and culture Digital learning and teaching and digital citizenship will produce teachers who are able to manage ICT and integrate ICT well. Principals who conduct evaluations and assessments will produce teachers' ICT literacy in terms of the ability to evaluate ICT and understand the various ethical, legal, and socio-economic issues surrounding ICT. This study is supported by the results of research by Siong (2012) that there is evidence of a significant direct relationship between principals' technological leadership and teachers' use of ICT in learning. While Wei et al., (2016) from their findings show that there is a statistically significant positive correlation that is quite strong ($r = .590$, $p < .01$) between principals' technology leadership practices and teachers' ICT competence. In addition, multiple regression analysis shows that digital citizenship and systemic improvement are two key technology leadership practice dimensions that are statistically significant predictors of teacher ICT competence.

CONCLUSION

Based on the results of the study, it can be concluded as follows. There is a direct influence of technological leadership on the innovative behavior of teachers, which means that the stronger the technological leadership applied by the principal will increase the innovative behavior of teachers. There is a direct influence of ICT literacy on teacher innovative behavior, which means that the stronger the teacher's ICT literacy, the more innovative the teacher's behavior will be. There is a direct effect of self-efficacy on teachers' innovative behavior, which means that the stronger the teacher's self-efficacy, the more innovative the teacher's behavior will be. There is a direct influence of technological leadership on teacher self-efficacy, which means that the stronger the technological leadership applied by the principal, the higher the teacher's self-efficacy. There is a direct influence of ICT literacy on teacher self-efficacy, which means the stronger ICT literacy will increase teacher self-efficacy. There is a direct influence of technological leadership on teachers' ICT literacy, which means that the stronger the principal's technological leadership, the higher the teacher's ICT literacy.

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