

## Teacher's ICT Competency: Principal Instructional E-Supervision and Learning Organization as Predictor for Technology Integration in the Classroom

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**Abstract:** This study was conducted to examine how the contributions of instructional e-supervision by the school principal and learning organisation affect the teachers' technology, information, and communication (ICT) competencies based on the teacher professional digital competence (TPDC) framework in the process of integrating technology into teaching. The method used was quantitative analysis with multiple linear regression analysis using SPSS 25. The population in this study consisted of 428 teachers from public and private high schools in the city of Makassar. A sample of 257 was obtained using random sampling techniques. The research results in the first hypothesis showed an influence of instructional e-supervision by the school principal on the ICT competence of teachers. In line with this, the second hypothesis, learning organisation, also contributes to the teachers' ICT competencies. Finally, the third hypothesis indicates a simultaneous influence of instructional e-supervision by the school principal and learning organisation on teachers' technology, information, and communication (ICT) competencies with a coefficient of determination of 56.2%.

**Keywords:** E-supervision; teacher technology integration; instructional supervision; learning organization; teacher collaboration

### INTRODUCTION

Improving the quality of education in Indonesia is one of the priorities in preparing for Indonesia's golden generation by the year 2045. Various programs, policies, and even the curriculum have been revitalized by the government and the Ministry of Education, in particular, to enhance the education system continuously in line with the needs. This is a crucial step to produce graduates from educational institutions who are capable of meeting the demands of the job market or even creating employment opportunities. However, data indicates that the quality of education in Indonesia still falls within the low category. This statement can be supported by data from the 2018 PISA assessment, which showed that Indonesia is ranked 75th out of 80 participating countries. It is positioned below neighboring countries such as Malaysia,

Singapore, Thailand, and Vietnam in the fields of reading literacy, mathematics, and science (OECD, 2019).

On the other hand, in the 21st century, the world, including Indonesia, is facing rapid developments in technology, information, and communication, which have both positive and negative impacts on various fields, especially in the field of education. Changes in educational practices cannot be denied, as they must adapt and undergo transformation to keep up with the developments and dissemination of information technology that occurred in the era of the Fourth Industrial Revolution (Burhanuddin, 2017; Danim, 2019; Karakose et al., 2021; Rasmuin & Widiani, 2021; Wiyono et al., 2022). In relation to the issue of digitization in Indonesian education, it revolves around the competency of teachers in adopting and integrating technology itself. Data from the Inclusive Internet Index for the year 2022 indicates that Indonesia is placed at ranked 47th out of 100 participating countries in terms of teacher competence or capacity to adopt the culture and skills of integrating technology into their profession as educators (The Economist, 2022). This highlights that the government still needs to work diligently in efforts to enhance the quality of education in Indonesia, especially in improving the digital professional competence of teachers as individuals who have a direct impact on students.

Moreover, several studies have indicated that the general issue in teacher instruction is still the use of conventional teaching methods that do not align with the needs of the 21st century (Junedi et al., 2020). This is because teachers do not possess optimal skills in applying technology, as teachers in Indonesia generally rarely use technological tools in their teaching, especially in rural areas (Adisel & Prananosa, 2020; Delia Sari Batubara, 2018; Kuncoro et al., 2022; Latip, 2020; Subandiyo, 2016). This problem stems from teachers' lack of awareness of technological advancements and their insufficient motivation to enhance their ability to integrate ICT into the teaching process.

Therefore, one of the steps to enhance the quality of teachers' teaching is through educational supervision as one of the key elements of effective educational management, particularly digital-based instructional supervision carried out by the school principal by incorporating technological convenience into the process. This is because the educational landscape in the 21st century has transformed the perspective of implementing instructional and educational supervision, emphasizing the development of technology (Basilio, 2021). Empirical research on instruction e-supervision has been conducted, and it has been found that in the era of the Fourth Industrial Revolution, instructional e-supervision significantly contributes to the improvement of teacher professionalism, particularly their ability to use Information and Communication Technology (ICT) in the teaching process (e.g., Danial et al., 2022; Effendy, 2019; Guntoro et al., 2016; Karwanto, 2022; Naranata, 2021; Prilianti, 2020; Rupiah, 2021;

Samiya Ma'ayis Mohammad Syahidul Haq, 2022; Satria & Mustiningsih, 2019; Wiyono et al., 2022). In line with Wiyono et al. (2021), it is stated that technology-based educational supervision significantly enhances teachers' academic competence in improving the quality of education by integrating technology into the process.

Furthermore, the integration of technology in education is influenced by various factors, including organizational culture, teacher skills and knowledge, and the formation of professional identity (Adamy & Heinecke, 1997). In this study, we employ school culture or learning organization as one of the concepts related to enhancing teachers' abilities to integrate technology into the learning process (Cakir, 2012; Maddin, 2014). Organizational learning and Professional learning community are two indicators that influence the strong school culture in the school context (Lee & Louis, 2019). This involves teacher adeptness in seeking information from various sources and collaborating as well as communicating with colleagues or other parties to enhance their capability in technology integration. Research consistently indicates that collaboration among teachers significantly influences their efforts in integrating technology (Glazer et al., 2009; Todorova & Osburg, 2010).

Several studies have measured instructional e-supervision and learning organization's impact on the tested response variables. However, limited research examines teachers' ICT skills in technology integration specifically. Therefore, it is important to conduct further research to investigate the impact of school principals' instructional e-supervision and schools as learning organizations in predicting teachers' technology integration skills within the classroom in 21st-century education. In this study, we will expound upon the findings later to illustrate the process of principal instructional e-supervision, which encompasses overseeing the management of instructional e-supervision from planning to evaluation and feedback. This is achieved through the utilization of digital tools such as video conferencing (Zoom, Google Meet, etc.), SMS, WhatsApp, and similar platforms to augment teacher skills in integrating technology within the classroom. Additionally, the concept of a learning organization, as defined by organizational learning and the professional learning community, will be discussed to elucidate its impact on enhancing teacher skills in the integration of technology. Hence, this study is conducted in the context of seven excellent schools in Makassar City.

The reason for selecting Seven Excellence Schools in Makassar City lies in their commitment to implementing instructional e-supervision by effectively utilising digital tools in the supervision process. These schools stand out for their innovative approach to enhancing the teaching and learning experience by incorporating technology into the monitoring and evaluation of educational practices. The utilization of digital tools in the supervision process reflects a forward-thinking educational philosophy and underscores a dedication to staying abreast of advancements

in the Fourth Industrial Revolution. By choosing these schools, we aim to explore and understand the transformative impact of e-supervision on teaching methodologies, further contributing to the discourse on effective educational practices in the digital age.

## **LITERATURE REVIEW**

### **Teacher ICT Competency in Technology Integration**

Several studies have been conducted on teacher technology integration and its significance. For example, Redman dan Kotrlik (2011) proposed that teacher technology integration is a condition in which teachers are capable of utilizing internet access, computers, interactive media, and teleconferencing, with the purpose of supporting and creating an inspiring and meaningful learning process for students. On the other hand, teacher technology integration has also been articulated as a condition in which teachers can integrate and combine hardware and software technology into the curriculum subjects they teach to enhance the quality of education (Shelly et al., 2007; Zorfass & Remz, 1992). Thus, it can be described that teachers' technology integration is a condition in which teachers can effectively implement learning by utilizing and integrating technology, including hardware and software, as well as internet access.

In measuring ICT competency in technology integration by teachers in the classroom, the digital professional competence of teachers by Skantz-Åberg et al. (2022) can be taken into consideration. The measurement indicators are based on a comprehensive perspective, as articulated by Selwyn (2010), that the digital competence or ICT competence of teachers should be measured holistically, involving micro-meso-macro level stakeholders in the school. This holistic measurement is then articulated into several comprehensive dimensions of teacher skills for technology integration, which include (1) technological competence, (2) content knowledge, (3) attitudes toward technology use, (4) pedagogical competence, and (5) critical approach (Skantz-Åberg et al., 2022).

The basic competencies that a teacher must possess to integrate technology start with technological knowledge, defined as a fundamental understanding of operating digital devices and internet access (de la Rama et al., 2020; Johannesen et al., 2014). After acquiring this competence, teachers should be able to apply their operational skills with digital devices to the teaching process, aligning it with the content of the subjects they teach (content knowledge) (Johannesen et al., 2014; Moltudal et al., 2019). Attitudes toward technology use are related to teacher self-efficacy in using technology in the teaching process (Hatlevik, 2017; Purnomo et al., 2023; Wastiau et al., 2013). Pedagogical competence is inseparable from this measurement because it touches on all aspects of how teachers understand the needs of students when using digital devices and media in the learning process in a specific context (Benali et al., 2018; Caena & Redecker, 2019). The critical approach is also crucial for effective technology integration as it

emphasizes the teacher's ability to think critically before using technology in classroom instruction (Vodopivec, 2011; Wastiau et al., 2013). Lastly, professional engagement is a form of feedback from teachers to improve the quality of learning through their ability to build a solid network within and outside the school, maximizing technology to enhance the quality of education (Caena & Redecker, 2019; Ouma et al., 2013).

### **Instructional e-supervision**

In general, supervision is a tool typically used by school principals to enhance teachers' capabilities and professionalism in teaching to improve the quality of education. There are various types of supervision, one of which is instructional supervision or teaching supervision. Instructional supervision is a discipline aimed at providing teachers with stimulus and guidance to improve classroom teaching and enhance the professional capabilities of teachers (Hoy & Miskel, 2013; Imron, 2011; Kyle Ingle, 2009).

As stated by Karwanto (2022), in conducting supervision, supervisors need to manage it, starting from planning and implementation to evaluation and feedback. During the planning phase, supervisors are responsible for designing a supervisory program for teachers to perform their tasks as effectively as possible (Dalanggo, 2019; Imron, 2011) from setting objectives to assessing the learning process (Agama, 2014). Then, during the implementation phase, supervisors implement what was planned in the planning phase using specific approaches and techniques effectively based on three stages: pre-observation, observation, and post-observation (Agama, 2014). After the implementation, supervisors conduct an evaluation (feedback) for the purpose of improving the learning process, involving several stages such as evaluating the results of supervision, following up on the results of supervision, and enhancing supervisory instruments (Agama, 2014; Wiyono et al., 2020).

More specifically, instructional e-supervision is a coaching tool for teachers to improve their professionalism and address teaching issues with the help of technological platforms, such as Google Meet, Google Forms, and Google Docs (Asmarani et al., 2022; Karwanto, 2022; Mustabsyiroh et al., 2021). In line with this, based on the school supervisor performance guidelines provided by the Ministry of Education and Culture (Kemendikbud) in 2022 during the previous pandemic, supervisors were expected to use technology for individual coaching and support for school principals and teachers, employing tools such as SMS, telephone, WhatsApp, Google Forms, Microsoft Teams, Zoom, Google Meet, Webex, etc. For group coaching, video conferences were used (comprising 8 participants). Therefore, it can be said that instructional e-supervision involves the use of both hardware and software (in various application forms) in the instructional supervision process to enhance teachers' professional capabilities. Hence, it is

important to note that the principal role of the supervisor in instructional e-supervision is to manage its process by utilizing technology platforms.

### **School as a Learning Organization**

The general concept of a learning organization emphasizes a culture of learning that includes trust, norms, and values embedded within the members of the organization, leading to organizational development and change (Harris & Jones, 2018; Senge, 1991). Recent research by Lee (2019) divides the measurement of a learning organization into two interrelated dimensions: organizational learning and professional learning communities (PLCs). The measurement of a learning organization based on these two indicators relies on previous relevant research on teachers' professional digital competence (TPDC) (Bamrara, 2020; Cakir, 2012; Cifuentes et al., 2011; Paulus et al., 2020; Rikkerink et al., 2016; Thoma et al., 2017; Vinet & Zhedanov, 2011; Zorfass & Remz, 1992).

Organizational learning serves as a means to develop the organization's capabilities contributing to its long-term performance (Xie, 2019). In the context of organizational learning in schools, the focus is on habits such as seeking new information, processing information with others, integrating and evaluating new ideas, and generating ideas within the school and acquiring them from outside the school, ultimately impacting the effectiveness of learning and other sectors within the schools (Lee & Louis, 2019).

Furthermore, professional learning communities (PLCs) emphasize collaboration among teachers to develop their professional abilities towards achieving learning goals as their guiding principle (Lee & Louis, 2019; Owen, 2015). Lee (2019) articulates PLCs in the forms of shared responsibility, deprivatization of practice, and reflective dialogue. Shared responsibility refers to teachers' behaviour or attitude to take responsibility for the learning that occurs in their own classrooms, signifying that a teacher should have a sense of collective contribution to the learning process and the outcomes achieved by students in carrying out their tasks (Kools et al., 2020; Lee & Louis, 2019; Newmann, 1996).

Deprivatization of practice emphasizes teacher engagement and openness among colleagues regarding classroom learning, sharing through observation, discussion, and collaboration (Lee & Louis, 2019; Newmann, 1996). Finally, reflective dialogue is a culture of in-depth discussions among teachers about what works and what needs to be changed in the classroom to enhance teacher professionalism in improving student learning outcomes (Lee & Louis, 2019; Mohan & Chand, 2019).

## **Research Hypotheses**

The aim of this research is to determine the effect of the implementation of technology instructional supervision by school principals on teacher ICT integration to enhance the quality of the teaching process. The hypotheses are as follows:

H<sub>1</sub>: Instructional e-supervision significantly affects teacher ICT Competency

H<sub>2</sub>: School Learning Organization significantly affects teacher ICT Competency

H<sub>3</sub>: Instructional e-supervision and School Learning Organization simultaneously affect teacher ICT Competency

## **METHOD**

### **Research Design**

In this study, a quantitative approach was used with a regression design that utilized a survey in the form of a questionnaire developed based on the theory created by the researcher. This was done to obtain information for testing the hypotheses related to the contribution of technology instructional e-supervision and learning organization to teacher ICT competency in classroom teaching.

### **Population and Sample of Research**

The population in this study consists of both public and private prominent high schools in the city of Makassar, with a total of 428 teachers. The sample selection was carried out using Isaac's table with a 1% margin of error (see Suryana, 2013), resulting in a total of 257 individual teachers who completed the survey questionnaire. The reason for selecting prominent schools as the sample in this study is that it aims to test a variable, namely technology instructional supervision and teacher ICT competency in technology integration, taking into consideration that it has been implemented in prominent urban schools, including those in the city of Makassar, which is one of the capitals with more advanced human resources in terms of technology.

### **Instrument of Research**

To collect data for this research, a survey in the form of a questionnaire was used as the data collection technique. The development of the research instrument was based on the constructed variable constructs to be measured. For each statement item, the researcher developed them based on the theory of instructional supervision applied in e-supervision, learning organization, and teachers' ICT competency developed through the Teacher Professional Digital Competence (TPDC) framework. In the variable of technology instructional supervision, there are three measurement indicators, namely initial meeting (planning), implementation, and evaluation (feedback), with a total of 14 items. Next, the learning organization variable consists of four indicators: organizational learning, shared responsibility, deprivatization of practice, and

reflective dialogue, comprising a total of 9 items. Finally, the teacher ICT competency variable consists of 6 indicators: teacher technological competence, content knowledge, attitudes to technology use, pedagogical competence, critical approach, and professional engagement, with 17 items.

Statistical tests were used to analyse the variables under investigation to measure the validity and reliability of the instruments. Based on the P value in the correlation table, it was found that the instructional e-supervision variable was  $0.000 < 0.05$ , the learning organization variable was  $0.000 < 0.05$ , and the teachers' ICT competency variable was  $0.000 < 0.05$ . This means that all the instruments developed for the variables in this study are valid. Furthermore, for the reliability test results, the P value in the Cronbach Alpha table for each variable was as follows: instructional e-supervision was  $0.678 > 0.60$ , learning organization was  $0.671 > 0.60$ , and teachers' ICT competency was  $0.832 > 0.60$ . Therefore, it can be concluded that all the instruments for the variables are reliable for use in further analysis.

#### **Procedure of Research Data Collection**

Several systematic steps were carried out in this research. The first step is to build or identify the theory of the variables to be studied. This is followed by formulating the research hypotheses and then developing the research instrument into a questionnaire to be filled out by respondents. Once the instrument has been finalized, the next step is to collect data, which was carried out from July to September 2023. After the respondents have completed the questionnaires, the final step is to analyse the data obtained to test the research hypotheses or objectives.

#### **Process of Research Data Analysis**

To address the research hypotheses with the available data, the data analysis technique used in this study is descriptive analysis and multiple linear regression using SPSS 25 software. Before conducting inferential tests, classic assumption tests are performed, including normality, multicollinearity, heteroskedasticity, and autocorrelation. After that, inferential statistical analysis is conducted to answer the research hypotheses using regression analysis techniques through significance tests at a 5% level of significance, t-tests, and F-tests, as well as the determination coefficient. If the significance value is  $< 0.05$  and the calculated t and F values are  $>$  the tabulated t and F values, then the hypothesis can be accepted (Sugiyono, 2019).

## **RESULT**

### **Classic Assumption Test**

The first classic assumption test, namely the normality test, can be conducted using the One-Sample Kolmogorov-Smirnov table. The significance value is  $0.200 > 0.05$ , meaning the data is normally distributed. Second, the multicollinearity test is assessed through the Tolerance

value, which is  $0.588 > 0.1$ , and the VIF value is  $1.701 < 10$ , indicating no multicollinearity. Therefore, the independent variables in this study can be used together as predictors of teacher ICT competency. Third, the heteroskedasticity test is performed using a Scatterplot, where the results show that the data moves randomly and does not form any patterns. It can be concluded that the research data is heterogeneous. The results of these three tests show that all the tests meet the requirements for conducting inferential analysis to address the research hypotheses.

### Descriptive Statistic

Descriptive of the statistical outcomes for every variable under examination, which can be illustrated through SPSS descriptive statistics presented in Table 1. Instructional e-supervision encompasses various indicators, namely the initial meeting (planning), implementation, and evaluation (feedback). On the other hand, the learning organization comprises indicators such as organizational learning, shared responsibility, deprivatization of practice, and reflective dialogue. Finally, the competence of teachers in ICT relies on the Teacher Professional Digital Competence (TPDC) framework, encompassing technological competence, content knowledge, attitudes toward technology use, pedagogical competence, critical approach, and professional engagement.

**Table 1. Descriptive statistic instructional e-supervision, learning organization, and teachers' ICT competency**

Variables	N	Min.	Max.	Mean	Std. Deviation
Instructional e-supervision	257	52.00	69.00	61.0817	3.76003
Learning organization	257	27.00	45.00	36.6809	2.84072
Teacher ICT Competency	257	64.00	85.00	75.0506	5.23149
Valid N (listwise)	257				

Table 1 shows that the instructional e-supervision, learning organization, and teacher ICT competency variable has a minimum value of 52, 27, and 64. The maximum score value for each is 69, 45, and 85, with a mean of 61.08, 36.68, and 75.05. Lastly, the standard deviation (data spread) is 3.76, 2.84, and 5.23.

### Hypotheses Result

#### *The influence of instructional e-supervision (X1) on teacher ICT competency (Y)*

Based on the results of the SPSS statistical test for partial t-tests and significance, the following results are obtained for the instructional e-supervision variable (X1). In instructional e-supervision, there are three measurement indicators: initial meeting (planning), implementation, and evaluation (feedback). Meanwhile, teachers' ICT competency relies on the Teacher

Professional Digital Competence (TPDC) framework, which consists of teacher technological competence, content knowledge, attitudes to technology use, pedagogical competence, critical approach, and professional engagement.

**Table 2. The results of the regression analysis of instructional e-supervision on teacher ICT competency**

Variable	t	Sig.
Instructional e-supervision	5.247	0.000

The results above indicate that the significance coefficient is  $0.000 < 0.05$ , and the calculated t-value is  $5.247 >$  the tabulated t-value (1.650804). This means that  $H_0$  is rejected, and it can be interpreted that instructional e-supervision partially affects teacher ICT competency.

***The influence of learning organization (X2) on teacher ICT competency (Y)***

Next, in the results of the SPSS statistical test for partial t-tests and significance conducted on the learning organization variable, the following results are obtained. In this variable, the indicators measured are organizational learning, shared responsibility, deprivatization of practice, and reflective dialogue.

**Table 3. The results of the regression analysis of learning organization on teacher ICT competency**

Variable	t	Sig.
Learning organization	9.866	0.000

The results above indicate that the significance coefficient is  $0.000 < 0.05$ , and the calculated t-value is  $9.866 >$  the tabulated t-value (1.650804). This means that  $H_0$  is rejected, and it can be said that there is a partial effect of learning organization on teacher ICT competency. As for the t-test curve obtained, it is as follows.

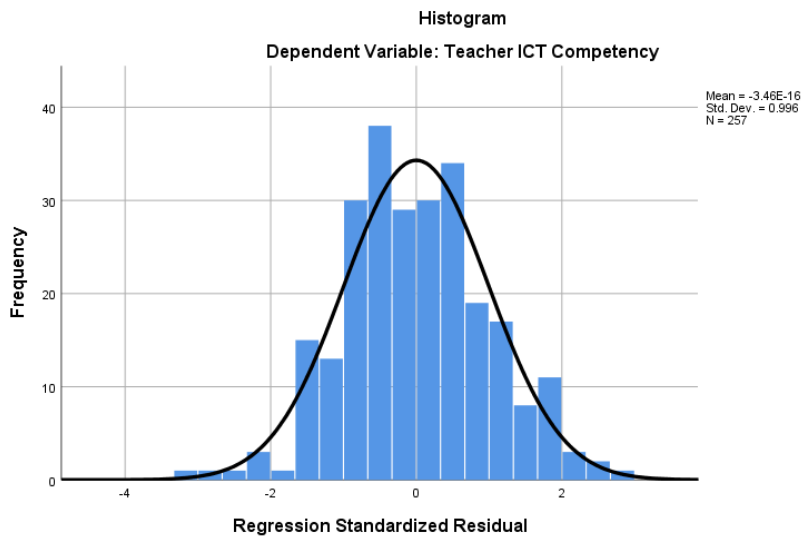


Figure 1. T-Statistic curve

***The influence of instructional e-supervision (X1) and learning organization (X2) on teacher ICT competency (Y)***

To determine the simultaneous influence of independent variables on the dependent variable, calculations can be performed using SPSS in the ANOVA table, with the following results.

**Table 4. The results of multiple regression analysis for instructional e-supervision and learning organization on teacher ICT competency**

Variable	F	Sig.
1	162.767	0.000

Based on the visualization of Table 3, it can be seen that the obtained significance value is  $0.000 < 0.05$ , and the calculated F-value is  $162.767 >$  the tabulated F-value (3.0312033). This means that  $H_0$  is rejected, and it can be interpreted that there is a simultaneous effect of instructional e-supervision and learning organization on teacher ICT competency. To determine the percentage of the influence of instructional e-supervision and learning organization on teacher ICT competency, you can refer to the coefficient of determination (R Square) in Table 4.

**Table 5. The coefficient of determination for instructional e-supervision and learning organization on teacher ICT competency**

Model	R	R Square
1	0.749	0.562

The visualization of Table 4 shows that the coefficient of R Square (R<sup>2</sup>) is 0.562, which means that the teacher ICT competency variable is influenced by instructional e-supervision and learning organization to the extent of 56.2%. The remaining 43.8% is influenced by other variables not examined in this study.

**DISCUSSION**

The first results of the research using questionnaires found that the instructional e-supervision process significantly influences teachers' ICT competency (H1). This means that principal instructional e-supervision influences teacher technology integration skills. Through a comprehensive process that spans from planning to evaluation and feedback, principals oversee and guide instructional e-supervision, leveraging digital tools such as video conferencing, SMS, WhatsApp, and others. This active engagement and supervision by the supervisor create an environment conducive to the effective use of technology in the classroom. Furthermore, principals provide teachers with support, resources, and feedback, fostering a collaborative approach to technology integration. By utilizing platforms like video conferencing, principals can facilitate virtual discussions and training sessions, enabling teachers to enhance their ICT competencies. The feedback loop established through instructional e-supervision allows for targeted guidance. It addresses specific areas where teachers can improve their technology integration competencies, such as technological competence, content knowledge, attitudes to technology use, pedagogical competence, critical approach, and professional engagement.

This aligns with Karwanto's findings (2022) that the importance of managing electronic or digital academic supervision systematically and programmatically by utilizing various technologies will positively impact the quality of professional development for teachers in the digital era. More specifically, a study by Ma'ayis and Syahidul Haq (2022) found that implementing instructional e-supervision has many benefits and influences on teachers, making them more professional and capable of utilizing technology to support them in classroom instruction. Looking into teachers' TPDC framework, as discussed by Skantz-Åberg et al. (2022), touches on the dimension of technological competence because it involves teachers' knowledge

of technology concepts in general. Furthermore, Naranata (2021) also stated in their research that the use of Zoom Meeting and Google Form applications in the instructional e-supervision process is effective and has a positive impact on improving teacher performance in conducting online learning, especially regarding teachers' ability to plan, implement, evaluate, and follow up on online learning.

Next, in the study's second hypothesis through the questionnaire, it was also found that the learning organization, represented by organizational learning and professional learning communities (PLCs), significantly influences teachers' ICT competency (H2). The indicator of organizational learning is defined as the teacher's adeptness conditions by seeking information from various sources able to contribute to enhancing their ICT competencies in integrating technology in the classroom. This involves colleagues and other parties outside the school to find information about technology development and strategies in the instruction. Hence, Schools that foster organizational learning help teachers stay agile in responding to emerging trends and technological advancements, ensuring that they are well-prepared to integrate new technologies into their teaching practices.

A professional learning community (PLC) significantly influences teacher skills in technology integration by fostering a collaborative and supportive environment for continuous learning. In a PLC, teachers share knowledge, experiences, and best practices related to technology integration in the classroom. This condition is defined by three aspects: shared responsibility, deprivatization of practice, and reflective dialogue. Firstly, teachers within a PLC can share valuable resources, teaching materials, and effective strategies for incorporating technology into instruction. This exchange of resources helps teachers access a broader range of tools and methods, contributing to developing their technology integration skills. Secondly, teacher openness is able to make teachers seek advice, guidance, and feedback from their peers. This peer support mechanism creates a safe space for teachers to experiment with technology, learn from each other's experiences, and refine their skills through constructive feedback. Lastly, reflective dialogue encourages teachers to collaborate and engage in joint learning experiences. Through collaborative discussions and activities, educators can share their expertise, troubleshoot challenges, and collectively explore new technologies, enhancing their skills.

This is in line with previous research studies that indicate the contribution of a learning organization to teacher ICT integration (Zorfass & Remz, 1992). For example, in the dimension of professional learning community, it was found that a school operating as a learning organization, supported by effective leadership and focusing on professional development, positively contributes to teacher attitudes toward technology use, ultimately impacting TPACK competence (technological, pedagogical, and content knowledge) as parts of teacher ICT

competencies in integrating technology both in the school in general and in the classroom particularly (Cakir, 2012; Cifuentes et al., 2011; Paulus et al., 2020; Thoma et al., 2017; Vinet & Zhedanov, 2011). Furthermore, Sheppard (2020) found that teacher ICT integration in the classroom learning process depends on organizational learning, which is also supported by school leadership. Rikkerink et al. (2016) articulated the influence of organizational learning about school digitization from a leadership perspective, including coordination and communication across three organizational levels (strategic, tactical, and operational).

Finally, the third hypothesis (H3) of this study indicates that instructional e-supervision and a learning organization together can influence teacher ICT competency using the TPDC framework. Teachers, guided by the leadership and collaborative ethos promoted by instructional e-supervision, become part of a dynamic learning community. This community shares insights, best practices, and experiences related to technology integration, fostering a culture of continuous improvement. Hence the first and second hypotheses in this study able to support the third hypotheses simultaneously.

## **CONCLUSION AND SUGGESTION**

### **Conclusion**

Based on the research conducted with data obtained through questionnaires, the results indicate that all three hypotheses proposed by the researcher were accepted. In the first hypothesis, it was found that the implementation of instructional e-supervision by school principals significantly contributes to the enhancement of teachers' digital professional competence (TPDC), supported by previous research findings. The second hypothesis was also accepted, with the interpretation that the learning organization, as measured by organizational learning and professional learning communities (PLCs), significantly influences teacher ICT competency with TPDC as the standard, which is also supported by previous research. Therefore, in the end, for the third hypothesis, it can be concluded that instructional e-supervision and learning organization, when considered simultaneously in the study, significantly affect teacher ICT competency.

### **Recommendation**

Referring to the research results, practical implications for the implementation of instructional e-supervision, learning organization, and teacher ICT competency are suggested. However, it should be noted that this study has limitations in terms of empirical research references regarding the impact or effects of instructional e-supervision on the indicators of teacher professional digital competence (TPDC). Furthermore, this study employed a thorough analysis of variables both in measurement and discussion. Consequently, it becomes challenging

to specify the particular indicators within principal instructional e-supervision or the learning organization that contribute to an increase in teacher ICT competencies. Therefore, a promising avenue for future research involves conducting factor analysis on each indicator identified in this study to gain a more nuanced understanding of their individual impact on teacher ICT competencies.

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