



# Improving Elementary School Science Innovation through Visionary Leadership and Information Computer Technology Awareness

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**Abstract:** Information Computer Technology (ICT) and innovation are well-known important factors in well-known profits, positioning, and performance for an institution to deal with the dynamics of the times. Teacher innovation is an ability that is oriented towards increasing innovation, a certain number of facilities, and infrastructure to achieve a goal. This research aims to analyze the relationship between ICT awareness to improve school science innovation and visionary leadership. This research was conducted in 30 elementary schools in Medan, the respondents in this study were 390 science teachers who were determined by the simple random sampling method. Data analysis in this study used Structural Equation Modeling (SEM) with the Smart PLS data processing tool. There is a positive influence between visionary leadership and ICT awareness on Elementary School science innovation. This hypothesis is proven by a statistical value below 1.99 and a p-value of 0.001. There is a positive influence between visionary leadership and elementary school science innovation. This hypothesis is proven by a statistical value below 1.99 and a p-value of 0.001. ICT Awareness has a positive and significant effect on improving elementary school science innovation and visionary leadership.

**Keywords:** Awareness ICT; Elementary school science; ICT; Visionary leadership

## Introduction

Technology and innovation are well-known important factors in well-known profits, positioning, and performance for an institution to deal with the dynamics of the times. By being innovative, organizations react to dynamic market changes and create or maintain their competitiveness (Alfehaid et al., 2019). Therefore, new ways or strategies are needed to create and produce new products or make improvements (tangible or intangible) by increasing the creative abilities of company employees or members of the organization.

Teachers have a very large influence in determining the quality of education and whether or not the goals of teaching education are achieved. According to Zainal et al. (2019) the key to success in implementing innovativeness lies in professional teachers as

implementers. Innovativeness is defined as the ability to apply creativity in order to solve problems and opportunities to enhance and improve the quality of life. In this case, the teacher's innovativeness can be in the form of creating new or original learning strategies (their own work), or it can also be in the form of modifications of existing strategies so as to create new forms that can increase the amount of knowledge and understanding of students (Darling-Hammond et al., 2020).

According to Fernández-Gutiérrez et al. (2020), explains teacher innovation is an act of generating new ideas, ways, or objects that are perceived by teachers as something new to start or improve products, processes, and services in learning. According to Binsaleh et al. (2021), teacher innovation is an ability that is oriented towards increasing innovation, a certain number of facilities and infrastructure to achieve a goal, with the following indicators 1) Product innovation, 2)

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Innovation process, 3) Innovation Services (Runhaar et al., 2016). Teacher innovation is the activity of a teacher creating new ideas and turning them into useful applications, with new processes and systems, which can provide benefits (Dzhurylo et al., 2019). With indicators: 1) acceptance of new ideas, 2) creation of new ideas, 3) application of new methods in learning, 4) application of changes in learning, 5) evaluation of changes in learning, 6) benefits/results achieved. Based on the theory above, it can be synthesized that teacher innovation is individual behavior to realize creative ideas in the form of ideas, products, or services in order to solve various learning problems so that quality learning occurs (Eberl & Drews, 2021).

The low performance of teachers is predicted due to many originating from within the individual teachers themselves and from outside. In addition, the low performance of teachers is influenced by: (1) competency, (2) work discipline, (3) job satisfaction, (4) the organization where the teacher teaches, (5) the leadership of the school principal, (6) as well as the existence of government policies regarding education. Efforts to improve human resources are efforts that are integrated with improving the quality of education (Subali et al., 2017). The principal as a leader has the authority and policies to improve the quality of education. The principal's leadership greatly supports the achievement of effective and efficient school management. Leadership style has a very important role in organizations dealing with increasingly uncertain situations and conditions, globalization, and organizational complexity. If management requires routine planning and budgeting, leading will include setting direction such as creating a vision for the organization.

The leadership style adopted by the principal will be related to the results and effectiveness of the principal in leading and implementing the educational process in schools (Edelmann et al., 2023). Principals must be able to practice innovations and be able to direct all their members and the school as an educational organization to change mindsets and improve the vision and mission by utilizing the talents, skills, and abilities of its members. The competency of the principal in this study is described in the ability of the principal to empower and communicate work programs and goals, both short and long-term for the school, managing change and making innovations (Atika et al., 2021). So that the principal's leadership is focused on visionary leadership.

While psychological factors, namely teacher discipline in the form of encouragement to the teacher's personality in working to achieve school goals, are studied through intrinsic and extrinsic influences. The school principal should have a vision that will position

himself properly and be able to make the school environment healthy (Murtedjo & Suharningsih, 2018). Principals who have a future vision are able to make innovations and changes to teachers so that they can further improve their performance (Ilomäki & Lakkala, 2018). The formulation of strategies and policies that not only take into account aspects of current needs but also future orientations were important in the development of school organizations. As well as what can mediate between previous leadership styles so that they can turn into e-leadership. This research aims to analyze the relationship between ICT awareness to improve school science innovation and e-leadership. This research aims to analyze the relationship between ICT awareness to improve school science innovation and visionary leadership.

## Method

This research uses a non-experimental quantitative method by collecting information through online questionnaires. This research was conducted in 30 elementary schools in Medan, the respondents in this study were 390 science teachers who were determined by the simple random sampling method. Data analysis in this study used Structural Equation Modeling (SEM) with the Smart PLS data processing tool. The questionnaire was designed using a Likert scale measurement of 1-5. The indicators in this study use theory from several sources, including visionary leadership using ICT awareness theory using theory and E-leadership using theory. Data processing in this study uses smart PLS SEM (Partial Least Square- Structural Equation Modeling) Software. PLS has the ability to explain the relationship between variables and has the ability to carry out analyses in one test. The stages of data testing are Reliability and Validity testing which are carried out first before carrying out the hypothesis test. Researchers use outer loading to see the reliability of each indicator, with a lower limit greater than  $> 0.708$ . The reliability construct was measured using Cronbach Alpha with a range of 0.70 - 0.96.

Testing the validity of this study using AVE with a value greater than 0.5. All variables are declared valid. The Lecker fornel is used to see the discriminant validity of each variable. The value of each variable has a greater correlation with other variables so the variable is considered valid. This research uses PLS-SEM to test its hypothesis. R2 is used in this study to measure the inner model with a value of 0-1. If R2 shows 0.75 then the model is considered strong, 0.50 means the model is rated moderate and 0.25 means the model is weak.

## Result and Discussion

### Reliability and Validity Testing

Reliability and validity testing is carried out before carrying out the hypothesis test. Researchers use outer loading to see the reliability of each indicator, with a lower limit greater than  $> 0.708$ . The reliability construct was measured using Cronbach Alpha with a range of 0.70-0.96. The results of the reliability and validity measurements can be seen in Table 1.

**Table 1.** The Results of the Reliability and Validity

Indicator	Cronbach's	Rho_A	Composite reliability	The average variance extracted (AVE)
ICT awareness	0.964	0.967	0.972	0.874
School Innovation	0.960	0.961	0.969	0.861
Visionary leadership	0.951	0.954	0.962	0.837

### VIF Testing

Tests using VIF are used to see whether there is multicollinearity between each variable. Values  $< 3$  are called ideal, 3 - 5 suggested, 5 - 10 Probable, and  $> 10$  critical. Using a limit of 10, it can be stated that there is no multicollinearity between each variable.

**Table 2.** Multicollinearity Testing

Indicator	ICT awareness	School Innovation	E-leadership
ICT awareness		1.741	
School Innovation			
Visionary leadership	1.000	1.000	2.291

### R-Square

This research uses PLS-SEM to test its hypothesis. R2 is used in this study to measure the inner model with a value of 0-1. If R2 shows 0.75 then the model is considered strong, 0.50 means the model is rated moderate and 0.25 means the model is weak.

**Table 3.** R-Square Testing

Indicator	R-square	R-square adjusted
ICT awareness	0.514	0.363
School Innovation	0.370	0.686
E-leadership	0.696	0.509

The results of the measurements show that the ICT Awareness value is 0.514, R square school innovation value is 0.370 or 69.00%, and E-leadership value is 0.696.

### Hypothesis Test

Hypothesis testing can be seen from the value of the t-statistics and the probability value. For hypothesis

testing, namely by using statistical values, for alpha 5% the t-statistic value used is 1.96. So that the criteria for accepting/rejecting the hypothesis are that Ha is accepted and H0 is rejected when the t-statistic is  $> 1.96$ . To reject/accept the hypothesis using probability, Ha is accepted if the p-value  $< 0.05$ .

### Relationship between ICT Awareness and Elementary School Science Innovation

The hypothesis in this study states that there is a positive influence between ICT awareness and Elementary School science innovation. This hypothesis is proven by a statistical value below 1.99 and a p-value of 0.001. This result is in line with (Purwanto et al., 2021); (Qaddumi et al., 2021) that there is a positive influence between ICT Awareness and Elementary School science innovation and is in line with (Ogundile et al., 2019); (Purnamawati et al., 2019) that there is a positive influence between ICT Awareness and Elementary School science innovation. According to (Samoylenko et al., 2021) stated that innovation is one of those words that we all use, agree is a positive thing and for the most part want more.

There are obvious distinctions between the innovators (who), an innovation (what) and the process of innovating (how). This is to illuminate and inquire into the phenomenon of innovation (and leadership) before history judges an accomplishment as innovative or declares a person to be a leader (Slimane, 2015). The focus will be on the innovator and the context or 'way of being' of the innovator. that competency for innovation is a natural by-product of certain ways of relating to the world; the context in which we relate to circumstances and change (Serdyukov, 2017). I will also distinguish between innovation and art, two terms often used interchangeably. Finally, we distinguish simple change that is a variation of what already exists from profound change that alters the scope of what is possible (Schot & Steinmueller, 2018).

Pedagogical adoption of ICT is complex and requires an integration of vision, systemwide experimentation and new roles and relationships for teachers and students. Let us not forget that classrooms have never been ideal learning environments and teachers in public education systems have always been somewhat burdened by working with students who are there under compulsion. ICTs can help to make schools less-stressful workplaces for both teachers and students. The rapid development of ICT in the 21<sup>st</sup> century has influenced various aspects of people's lives, one of which is in the educational field. ICT has a vital role in the development of learning systems (JSingh et al., 2020).

### *Relationship between Visionary Leadership and ICT Awareness*

There is a positive influence between visionary leadership on ICT Awareness. This hypothesis is proven by a statistical value below 1.99 and a p value of 0.001. That there is a positive influence between visionary leadership on ICT Awareness and is supported by (Renouw & Antonio, 2023), that there is a positive influence between visionary leadership on ICT Awareness.

### *Relationship between Visionary Leadership and School Innovation*

There is a positive influence between Visionary Leadership and school Innovation. This hypothesis is proven by a statistical value below 1.99 and a p value of 0.001. This result is in line that there is a positive influence between Visionary Leadership and school Innovation and in line with (Shanti et al., 2020) that there is a positive influence between Visionary Leadership and school Innovation.

Integrating technology into education provides students with an engaging learning experience in science, allowing them to remain more interested in the subject without being distracted (Haleem et al., 2022). The utilization of projectors, computers, and other cutting-edge technical gear in the classroom may make studying fascinating and entertaining for students. Student learning can become more dynamic and engaging by establishing tasks in class that incorporate technology resources, oral presentations, and group participation (Pozo et al., 2021). Participation can extend beyond verbal communication as well.

## Conclusion

ICT Awareness has a positive and significant effect on improving elementary school science innovation and E-leadership. E-Leadership as a process of social influence mediated by advanced information technology. Integrating technology into education provides students with an engaging learning experience in science.

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