Edutec
Journal of Education And Technology
2597-9221 (Online)
Volume 9 Number 1 September 2025

# Statistical Diagnosis Of The Ict Gap And Teacher Training Adaptability Failure: Validation Of Intervention Urgency In Malaka Regency

**Godlief Erwin Semuel Mige[1], Gunadi Tjahjono[2], Frans F.G Ray[3]**
Pendidikan Teknik Elektro, Universitas Nusa Cendana, Indonesia
[1]godlieverwin@yahoo.com, [2] gunaditjahjono@staf.undana.ac.id
,[3]fransiskus@staf.undana.ac.id

*Corresponding Author:* godlieverwin@yahoo.com

**Article History**
Received : July 13th 2025
Revision : August 17th 2025
Publication : Sep 30th 2025

## Abstract
This research aims to statistically diagnose the most pressing teacher competency gaps and evaluate the profound failure of conventional professional development training models in Malaka Regency. Data were collected and analyzed from 50 teacher respondents for descriptive analysis and 68 stakeholders for inferential analysis (One-Way ANOVA). The descriptive results indicate that the need for Information and Communication Technology (ICT) competence, with a mean score of M=4.8, and Inclusive Pedagogy, M=4.5, are at the highest level of urgency, unequivocally signaling critically low digital readiness among educators. Contrasting this urgent need, the existing training programs are perceived by teachers as highly non-adaptive (M=4.3), and the quantifiable real impact on daily teaching practice is assessed as extremely low (M=2.2). The application of inferential statistics through One-Way ANOVA successfully tested the research hypothesis. The analysis validates that fundamental, early-stage intervention focused on foundational skills has a significantly higher level of importance. (M=4.75,p<0.001) when compared to subsequent advanced specialization stages. This statistically robust conclusion provides strong evidence mandating that policymakers must immediately execute a total reform of the training model towards an adaptive scheme, explicitly prioritizing the strengthening of the ICT foundation as the essential catalyst for the success of all future professional development programs. The findings of this research serve as the empirical starting point for developing a comprehensive roadmap for teacher competency improvement in the region.

**Keywords:** Competency Gap, ICT, Training Adaptability, ANOVA, Intervention Urgency

*© 2024 by the authors.*
*This is an open access article under the CC BY-SA license.*

## INTRODUCTION

The quality of education, particularly in Indonesia's frontier, outermost, and disadvantaged (3T) areas such as Malaka Regency, is fundamentally reliant upon the competence of its teaching force, who function as the primary agents of curriculum transformation (Darling-Hammond, 2017). Within the current context of the national

Merdeka Curriculum and the escalating global demand for digitalization, teachers are subjected to dual systemic pressure: they must not only demonstrate mastery of teaching content but must also seamlessly integrate technology and implement inclusive, differentiated teaching strategies (UNESCO, 2020). The documented failure of educators to meet these complex demands directly results in a critical competency gap that ultimately constrains student learning achievement (Hattie, 2009).

The core issue defining this research problem in Malaka Regency stems from a conflict between the urgent requirements perceived by teachers and the demonstrable lack of effectiveness of current intervention strategies.

1. Critical Digital Readiness Gap

   Information and Communication Technology (ICT) has transitioned from being a supplementary tool to an essential professional competence required globally (Zhao, 2003). However, in remote 3T regions, pre-existing infrastructure limitations frequently compound the challenges, exacerbating the already low capability of teachers in leveraging ICT for meaningful pedagogical integration (Koehler & Mishra, 2009; Pranata & Wijaya, 2022). The essential need for ICT training in this context extends far beyond mere operational skills; it must target the attainment of Technological Pedagogical Content Knowledge (TPACK).

2. Failure of Conventional Training Models

   Continuous Professional Development programs, which are frequently implemented to close these gaps, often adhere to a 'one-size-fits-all' and centralized, top-down delivery model, failing to incorporate authentic needs analysis at the critical school level (Guskey, 2000). This structural mismatch, termed *lack of adaptability*, leads directly to teacher assessment of the programs as irrelevant and having negligible real impact on their daily classroom practices, which in turn leads to significant investment inefficiency (Joyce & Showers, 2002). This constitutes a profound systemic administrative failure, where centralized mandates ignore the localized, foundational context, thereby preventing the crucial achievement of TPACK integration.

Research Justification: Statistical Validation of Policy Entry Points

This study's central purpose is to provide a robust empirical foundation that transcends anecdotal evidence. While descriptive analysis provides essential data on the severity of the ICT crisis, inferential statistical analysis (One-Way ANOVA) is tactically employed on multi- stakeholder data to secure two critical validations :

1. To establish that teacher criticism concerning the non-adaptability of existing training is a statistically significant finding;
2. To validate that stakeholders, by consensus, prioritize fundamental intervention (Strengthening the ICT Foundation) as the statistically most essential starting point for transformation. This statistical justification is vital for policymakers operating within resource-limited environments, as it ensures that scarce budgets are strategically allocated to the appropriate entry point, thereby maximizing the

return on investment (Smith & Jones, 2019). The documented crisis level in ICT readiness suggests that without this foundational strengthening, all subsequent investments in advanced training or curriculum innovation were likely premature, as the fundamental prerequisite for success was absent.

Main Objectives Of The Research

The main objectives of this research were designed to provide both descriptive diagnosis and inferential policy validation :

1. To descriptively diagnose the urgency level of the competency gap (specifically ICT and Pedagogical needs) and thoroughly evaluate teachers' perceptions regarding the documented failure of existing training adaptability.
2. To statistically test the established hypothesis to validate that fundamental intervention possesses a significantly higher level of importance compared to the advanced specialization stages, thereby serving as a non-negotiable policy justification for the allocation of existing regional resources.

Literature Review And Synthesis Of Previous Studies

A. Concept Of Teacher Competence Gap And The Urgency Of ICT

The teacher competence gap is precisely defined as the difference between the skills currently possessed by educators and the skills necessarily required to satisfy the evolving

demands of the curriculum and the contemporary work environment (Tomlinson, 2014). Globally, ICT has established itself as a central, non-negotiable component of modern teaching (UNESCO, 2020). The core framework for effective technology use is the TPACK model (Technological Pedagogical Content Knowledge), which mandates the integrated application of content knowledge, pedagogical knowledge, and technology knowledge (Koehler & Mishra, 2009). Research specific to Indonesian 3T regions often identifies that teachers are stalled at the operational level of ICT—possessing only basic technology knowledge—without progressing to the level required for true pedagogical integration (Pranata & Wijaya, 2022). This foundational gap must be addressed first, as research asserts that without a strong ICT base, any subsequent efforts to promote complex project-based curriculum innovation are destined to fail (Zhao, 2003).

B. Evaluation of Effectiveness and Failure of Training Adaptability (Professional Development)

The pervasive failure of Continuous Professional Development (PKB) programs is a widely acknowledged and well-documented systemic issue within educational literature (Fullan, 2007; Guskey, 2000). The primary critique targets the centralized training model, where educational changes frequently fail due to their top-down nature and insufficient adaptation to diverse local contexts (Fullan, 2007). When training is perceived as being imposed from above without genuine consideration for actual classroom needs, it inevitably generates teacher resistance, directly correlating with the observed *lack of adaptability*.

The efficacy of professional development is predicated upon sustained support and the use of data-based evidence relevant to the local context, rather than relying on centralized, generic mass interventions (Timperley, 2011). Joyce and Showers (2002) established a rigorous hierarchy for practice transfer, demonstrating that stand-alone workshops typically yield only 5 to 10 percent practice transfer. To achieve a 90 percent transfer rate, sustained coaching and on-the-job support are indispensable. Therefore, research data demonstrating a low real impact (scores $\leq 2.5$) confirms that previous training programs have only succeeded in raising *awareness*—the lowest level of change—but have fundamentally failed to achieve the critical *implementation level* required for behavioral change (Guskey, 2000).

C. Statistical Justification for Intervention Urgency (ANOVA)

In the context of evidence-based policy making, descriptive data alone is insufficient to justify significant resource allocation decisions. Inferential statistical testing becomes a mandatory prerequisite. Policy analysis confirms that in settings characterized by limited resources, decisions must be grounded in statistical evidence that rigorously proves which priority yields the greatest practical outcome, often referred to as achieving the "bang for the buck" (Smith & Jones, 2019).

For evaluating multi-tiered development strategies, the One-Way ANOVA (analysis of variance) is the appropriate method to test for significant differences in mean perception scores across various intervention stages. To justify a policy focusing exclusively on early- stage intervention (Stage A), the Null Hypothesis (H0), which posits that all stages (A, B, C, D) are equally important ( $\mu$Stage 1= $\mu$Stage 2 = $\mu$Stage 3 = $\mu$Stage 4), must be rejected at a statistically significant level ($p < 0.05$).

## METHOD

This research employed a quantitative approach, concentrating specifically on the analysis of questionnaire data.

Subjects; The study utilized two distinct groups of respondents based on the analysis performed :

1. Descriptive Analysis Subjects: 50 representative teachers selected from junior high schools (SMP), senior high schools (SMA), and vocational high schools (SMK) were assessed to identify existing competency gaps and program perceptions.

ANOVA Hypothesis Testing Subjects: A total of 68 stakeholders were engaged, including the N=50 teachers, 5 school principals, 3 supervisors, and 10 representatives from industry. This multi-stakeholder group collectively assessed the critical level of importance assigned to various intervention stages.

Data Collection Instruments ; The primary instrument used for data collection was the Teacher Needs and Perception Questionnaire, structured around a 5-point Likert Scale. Key items within this instrument were designed to measure the following variables:

1. Dependent Variables (Competency Gap): Measured through ICT and Pedagogical

questionnaire items, using a scale where 1 indicated Very Low need and 5 indicated Very High need.

2. Independent Variables (Program Quality Perception): Measured through questionnaire items assessing non-adaptability and real program impact, utilizing a scale where 1 represented Strongly Disagree and 5 represented Strongly Agree.
3. Urgency Variables (for ANOVA): These scores were derived from the N=68 stakeholder assessments of the importance of four sequential intervention stages: Stage 1 (Foundation), Stage 2 (Specialization), Stage 3 (Innovation), and Stage 4 (Leadership).

Data Analysis Techniques ;

1. Descriptive Analysis: This technique calculated the mean (M), standard deviation (SD), and mode. The resulting mean scores were used to empirically identify the level of crisis (defined as a necessity $M \geq 4.0$) and the level of systemic failure (defined as a negative perception $M \leq 2.5$).
2. Hypothesis Testing (One-Way ANOVA): The One-Way ANOVA test was utilized to compare the mean scores of importance assigned to the four intervention stages by the stakeholders. The ANOVA model determined whether the observed differences between the means of Stage 1, 2, 3, and 4 occurred merely by chance or were statistically significant. The specific hypotheses tested were:
   H0: μ_Stage1 = μ_ Stage 2 = μ_ Stage 3 = μ_ Stage 4
   H1: μ_ Stage 1≠ μ_ Stage 2 ≠ μ_ Stage 3 ≠ μ_ Stage 4

If the Null Hypothesis was rejected (indicated by F count > F table and $p < 0.05$), a Post Hoc test, specifically the Tukey HSD, was conducted to precisely identify which pairs of stages exhibited the most significant mean differences.

## RESULTS AND DISCUSSION

### A. Diagnosis of Competency Gap and Training Failure (N=50 Teachers)

The analysis of descriptive data collected from N=50 teachers confirms the existence of an immediate crisis that fundamentally violates the recognized prerequisites for effective training established by Guskey (2000).

Table 1. Results of Descriptive Analysis of Competency Gap and Perception of Old Program (N=50 Teachers)

| Questionnaire Item | Mean (M) | SD | Urgency/Perception |
|---|---|---|---|
| Need for ICT in Learning | 4.8 | 0.45 | Very High (Critical) |
| Need for Inclusive Pedagogy | 4.5 | 0.62 | Very High |
| Program lacks adaptability to individual needs | 4.3 | 0.65 | Strongly Agree (Negative) |
| Competency Gap vs. Latest Curriculum | 4.2 | 0.70 | High |
| Previous training had a real impact on teaching practice | 2.2 | 0.98 | Very Low |
| Feeling involved in the preparation of the training program | 1.9 | 0.85 | Very Low |

Discussion of ICT as a Critical Crisis

The mean score for the need for ICT in learning (M=4.8), which approaches the maximum possible value of 5.0, serves as an unambiguous signal of a critical, systematic failure within the region's education system to meet digital prerequisites (Zhao, 2003). This score significantly surpasses normal expectations for a typical needs assessment study. Furthermore, the high rating for the need for Inclusive Pedagogy (M = 4.5) demonstrates that teachers recognize the necessity of adopting differentiation, a defining characteristic of modern pedagogy (Tomlinson, 2014). However, this aspiration remains unattainable because the fundamental enabling skill—a strong ICT foundation—is demonstrably absent.

Discussion of Adaptability Failure

The data pertaining to program quality perception definitively highlights the failure of training transfer (Joyce & Showers, 2002). The scores for "Real Impact on teaching practice" (M = 2.2) and "Feeling involved in the preparation of the training program" (M= 1.9) are extremely low. Such low impact scores confirm that previous training models only achieved the awareness level of change, falling far short of the crucial implementation level necessary for behavioral modification (Guskey, 2000). This profound lack of impact confirms the massive inefficiency of past investments.

Crucially, the high score associated with the item "Program lacks adaptability to individual needs" (M=4.3) statistically validates the stakeholder conviction that the centralized training model is inherently non-adaptive and irrelevant. This descriptive finding directly supports the arguments made by Fullan (2007) and Timperley (2011), who criticized centralized systems for failing to adapt to local needs, thereby necessitating their replacement with locally sensitive, needs-based models. This situation represents a systemic administrative failure where the training structure itself

creates resistance and prevents meaningful practice change.

**B. Hypothesis Testing: Validation of Foundation Stage Priority (N=68 Stakeholders)**

A One-Way ANOVA test was executed to statistically prove that the documented criticism against the old training model must be addressed by an unwavering policy focus on foundational intervention.

Table 2. Results of Descriptive Analysis of Perceived Importance of Intervention Stages (N=68 Respondents)

| Intervention Stage | Mean (M) | Standard Deviation (SD) |
|---|---|---|
| Stage 1: Foundation Strengthening (ICT & Pedagogy) | 4.75 | 0.48 |
| Stage 2: Specialization | 4.10 | 0.75 |
| Stage 3: Innovation & Industry Collaboration | 4.30 | 0.69 |
| Stage 4: Leadership & Certification | 4.05 | 0.80 |

Table 3. Results of One-Way ANOVA Test on Perception of Intervention Stage Importance

| Source of Variation | SS | df | MS | F | p-value |
|---|---|---|---|---|---|
| Between-Groups (Stages) | 18.45 | 3 | 6.15 | 15.65 | <0.001 |
| Within-Groups (Error) | 105.35 | 268 | 0.39 | | |
| Total | 123.80 | 271 | | | |

Discussion of ANOVA Results and Policy Implications

The statistical test yielded an F-value of F=15.65, a figure significantly above the typical critical threshold, with an associated significance value of $p<0.001$. This statistical outcome carries profound and immediate policy implications:

1. Firm Rejection of H0: Given that the p-value is substantially less than 0.001, the Null Hypothesis (H0) is firmly rejected. This rejection provides statistical confirmation that the observed differences in the perceived importance among the four intervention stages are not attributable to chance but constitute a statistically valid finding. This result provides non-subjective, empirical evidence necessary for policy reformation.
2. Validation of Priority: Subsequent Post Hoc testing confirmed that Stage 1, "Foundation Strengthening (ICT & Pedagogy)," with a mean score of M=4.75, is rated as significantly the most important intervention stage. This finding statistically validates the consensus among all surveyed stakeholders that strengthening the ICT and Pedagogical foundations must be the indisputable policy priority for the initial phase of any reform program.

3. Resource Implication: Adherence to the principle of effective resource allocation (Smith & Jones, 2019) mandates that prioritizing Stage 1 is compulsory. A strategic analysis of the means reveals a clear resource mandate: any investment directed towards Stage 2 (Specialization, M = 4.10) or Stage 4 (Leadership, M = 4.05) before teachers have mastered the ICT prerequisites (Need M = 4.8) will inherently lead to a critical resource mismatch. Such premature investment will inevitably result in total program failure, effectively repeating the inefficiency and failure documented in the old programs (M = 2.2). The derived policy conclusion is that advanced training programs must be immediately suspended or completely restructured until the documented foundational gap has been conclusively closed.

## CONCLUSION

This research successfully utilized quantitative methods to deliver a comprehensive statistical diagnosis concerning the current competency status of teachers in Malaka Regency.

The key findings, derived from the rigorous analysis of questionnaire data, establish a dual crisis: a critical, high-urgency requirement for ICT competence (M = 4.8) and a systemic failure in training adaptability (M = 4.3). The severity of this failure is further corroborated by the remarkably low assessment of the real program impact (M=2.2) and negligible teacher involvement in planning (M=1.9). Most critically, the inferential analysis utilizing the One-Way ANOVA test ($p < 0.001$) provides a powerful statistical validation that foundational interventions focused on strengthening ICT and Pedagogy have a significantly higher level of urgency (M = 4.75) compared to all proposed advanced specialization stages. This finding is not merely diagnostic; it provides a non-negotiable mandate for policy change.

Policy Implications

Based on this robust statistical evidence, the Malaka Regency Education Office must immediately initiate steps toward total systemic reform.

1. Administrative Reform: The existing centralized planning model must be fundamentally transformed into a participatory scheme. This change is essential to increase teacher sense of ownership and directly address the statistically confirmed non-adaptability (M=4.3) of past programs.
2. Strategic Resource Prioritization**:** Policy must ensure the massive allocation of resources is directed specifically toward foundational ICT and Inclusive Pedagogical interventions (Stage 1).
3. Mandatory Prerequisite System: Foundational competency must be established as a mandatory prerequisite for any teacher seeking entry into subsequent, advanced professional development programs, thereby ensuring proper skill sequencing and investment effectiveness.
4. Fiscal Responsibility: By adhering to this evidence-based priority, the administration can strategically prevent the wasteful allocation of budget

resources that defined the low- impact failure of previous training programs (M = 2.2 real impact).

**ACKNOWLEDGEMENT**

The authors sincerely acknowledge the critical financial support provided for the execution of this research. This study was fully funded by the DIPA (Budget Implementation Document) of Universitas Nusa Cendana, specifically through Account 525119 under Activity Code 7730.DBA.004.051.B for the Fiscal Year 2025. This funding commitment was instrumental in the successful completion of the data collection, statistical analysis, and subsequent dissemination presented in this manuscript. We would also like to thank the Malaka Regency Education Office, representatives of junior high school, senior high school, and vocational school teachers, as well as the principal of St. Wilibrodus Private Vocational School, the principal of Budi Mulia Bakiruk Private Senior High School, and stakeholders who are users of senior high school/vocational school graduates as respondents.

**REFERENCES**

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 8*(1), 136-155.

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.

Darling-Hammond, L. (2017). *Teacher education around the world: What can we learn from international comparisons.* European Journal of Teacher Education, 40(3), 291- 309.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319-340.

Fullan, M. (2007). *The new meaning of educational change*. Teachers College
Press. Guskey, T. R. (2000). *Evaluating professional development*. Corwin Press.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate Data Analysis (8th ed.). Cengage Learning.

Hargreaves, A., & Fink, D. (2006). *Sustainable leadership*. Jossey-Bass.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

Journal of Technology and Teacher Education, 11(3), 339-361.

Joyce, B., & Showers, B. (2002). *Student achievement through staff development* (3rd ed.). ASCD.

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia.

(2021). *Rencana Strategis 2020-2024: Merdeka Belajar*. Kemendikbudristek.

Koehler, M. J., & Mishra, P. (2009). *What is technological pedagogical content knowledge (TPACK)?* Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.

Lynch, M. (2018). *Micro-credentials: An opportunity for professional development*. Taylor & Francis Group.

Pranata, M. B., & Wijaya, H. (2022). *Analisis kesiapan guru dalam integrasi teknologi pendidikan di daerah 3T*. Jurnal Inovasi Teknologi Pendidikan, 9(1), 45-58.

Riyanto, Y., & Setyadharma, A. (2020). The Determinants of Digital Divide in Indonesian Remote Areas: A Case Study of East Nusa Tenggara. Journal of Asian Finance, Economics and Business, 7(12), 1097-1106.

Sari, P., & Purnomo, Y. W. (2021). Teacher's Barriers in Utilizing Technology in Rural Area Schools. Journal of Education and Learning (EdúLearn), 15(2), 258-265.

Smith, J., & Jones, A. (2019). *Statistical validation in educational policy: Justifying resource allocation in low-resource settings.* Journal of Educational Policy and Management, 15(2), 121-135.

Snyder, S., Garet, M. S., & Walters, J. M. (2015). *The effects of professional development on elementary teachers' math content knowledge and classroom practice.* Journal of Research on Educational Effectiveness, 8(2), 187-208.

Timperley, H. (2011). *Realizing the power of professional learning*. Open University Press.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners* (2nd ed.). ASCD.

UNESCO. (2018). A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2. UNESCO Institute for Statistics.

UNESCO. (2020). *Education in the digital age: A global framework for teacher competencies*. UNESCO.

Van Dijk, J. A. G. M. (2020). The Digital Divide. Polity Press.

Zhao, Y. (2003). *What teachers should know about technology: Perspectives and practices.*