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Evaluation of the Online Academic Competency Test: A CIPP Model Study in Public Senior High Schools in Semarang City

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Abstract:
This study aims to evaluate the implementation of the Online Academic Ability Test (TKA) based on the perspective of educational technology using the CIPP model (Context, Input, Process, Product) in five public high schools in Semarang City. The present study is a qualitative evaluative study. Data were collected by an in-depth interview with 16 informants and an open questionnaire with 34 students. The data were analyzed in an interactive manner through the use of the Miles, Huberman, and Saldana model and triangulation of source and technique. In the dimension of context, the research findings showed that the school responded to the policy by demanding TKA from all twelfth-grade students. The analysis showed variability in the input dimension concerning availability of computers, examination rooms, and supporting facilities. The main operational challenges on the process side are interruptions to server login, freezes on applications, lack of online literacy among students, and lack of preparation time. Students are performing lower than other subjects in terms of academic achievement in mathematics and English. Operational barriers and differences in physical support capacity were identified as limitations in optimizing online TKA results. The recommendations are equitable distribution of infrastructure, strengthening the network, technical simulations, socializing earlier, and increasing the readiness and motivation of the students.

Keywords: Online TKA; Educational Technology; CIPP Evaluation; Digital Assessment; School Readiness

INTRODUCTION

The current educational landscape must move rapidly in response to the ongoing wave of digitalization to ensure efficiency and transparency across all aspects of learning management. From an educational technology perspective, digital devices are not merely visual aid but part of a well-planned system that spans processes from curriculum design to student learning assessment. In line with this perspective, (Alam & Mohanty, 2023) emphasize that educational technology is an applied discipline aimed at improving the quality of learning and performance through the effective, efficient, wide-reaching, rapid, and beneficial utilization of technology for its users. One concrete manifestation of this transformation is the transition from conventional paper-based assessment systems to standardized national digital evaluation instruments.

In Indonesia, this policy has been reinforced through the issuance of Regulation of the Minister of Primary and Secondary Education Number 9 of 2025, which requires secondary schools to be prepared to administer the Academic Competency Test (Tes Kemampuan Akademik/TKA) through an online-based system. From a cognitive psychology perspective, senior high school (SMA) students are in an adolescent developmental stage characterized by increasingly complex and abstract thinking abilities, as well as the emerging capacity for reasoning and in-depth problem-solving. These

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developmental characteristics require assessment instruments specifically designed to measure higher-order thinking skills while simultaneously mapping students' academic readiness as they transition to higher education.

However, transitioning the national assessment system to a digital environment for students in this transitional age group must contend with considerable operational realities in the field. According to data from the Center for Educational Assessment (Pusat Asesmen Pendidikan, 2025), the national average scores for core subjects such as mathematics and English remain relatively low. This challenge is further complicated by differences in levels of digital readiness and variations in technological knowledge among students.

Initial observations conducted at several public senior high schools in Semarang City revealed several obstacles, including internet connectivity problems, unexpected server freezing, and power outages at several locations during the examination. These conditions represent operational challenges that can disrupt students' concentration and focus. The situation is further complicated by limited time for material preparation and overlapping schedules between school enrichment programs and the Computer-Based National Assessment (Asesmen Nasional Berbasis Komputer/ANBK), which may make it harder for students to adapt to the assessment process psychologically.

The implementation of digital assessment has attracted considerable attention from previous researchers. Several earlier literature studies have examined this phenomenon from various theoretical perspectives. A study by Arsil & Sesmiarni (2025) analyzed the alignment of competency content in standardized examination questions with current curriculum targets at the elementary school level. In a more specific area, research by Udak et al. (2026) examined the cognitive levels and structural characteristics of assessment items in simulations involving physical science subjects. Although previous studies have examined TKA from the perspectives of policy concepts, competency content, and assessment instruments, a significant gap remains in research evaluating the program's implementation as an integrated operational system at the regional level while directly involving students who participate in its implementation.

This study contributes to evaluating the online Academic Competency Test (TKA) from the perspective of educational technology using the CIPP (Context, Input, Process, Product) model with a descriptive qualitative approach. Instead of looking at only the test scores, the study looks at the application of digital assessment at the regional school level after the regulation of 2025 has come into effect. It examines policy documents and students' responses to open-ended questionnaires and interviews with vice principals responsible for curriculum and academic affairs, examination proctors and supervisors. The study is able to describe the operational challenges experienced by schools, and the institutional conditions behind these, by combining these perspectives. This research specifically examines the influence of regulatory alignment, school readiness and support, and the daily conduct of the examination in the implementation of online TKA in five public senior high schools in Semarang City.

This study applies Stufflebeam's CIPP evaluation model to examine these interrelated aspects. Unlike the Kirkpatrick model, which is commonly used to assess training through participants' reactions and learning outcomes, or Goal-Free Evaluation, which examines program effects without using stated objectives as its main point of reference, CIPP considers the context, resources, implementation process, and outcomes together. This is especially helpful for the present study in that the implementation of an online assessment depends not only on the students' scores but also on the policy expectations, school facilities, technical support, and the conditions students face during the examination. CIPP examines institutional readiness and operational challenges as parts of one system to understand how these dimensions are reflected in the implementation and outcomes of TKA.

Against this background, the study investigates the role of network disruptions, limited school facilities, and students' learning motivation, especially among those who do not intend to continue to higher education, in the implementation of online TKA and how these conditions manifest themselves in its results at the regional level.

Vol.7 No.2 2026 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.101607

METHODS

This study used a qualitative evaluative approach based on the CIPP (Context, Input, Process, Product) model developed by Stufflebeam. This framework was selected because it enables a comprehensive, contextualized exploration of program implementation as an interconnected educational system rather than relying on outcome metrics.

The research was conducted across five public senior high schools in Semarang City: SMAN 3, SMAN 8, SMAN 10, SMAN 11, and SMAN 12. These schools were chosen purposively based on specific qualitative criteria: participation in the 2025 Academic Competency Test (TKA), variations in technological infrastructure, and institutional willingness to grant access to data.

Data collection continued iteratively until thematic saturation was achieved, involving key informants across distinct roles, including the head of the TKA committee from the Regional Education Office Branch I of Central Java, vice principals for curriculum affairs, IT proctors or technicians, and examination-room supervisors. In addition, qualitative data were gathered through open-ended questionnaires completed by students across the participating schools. The research instruments comprised an open-ended questionnaire guide, a semi-structured interview guide, and observation sheets.

The data collection process proceeded through multiple stages, encompassing observations of school facilities, face-to-face interviews with administrative and technical staff, digital questionnaire distribution to students, and policy-verification visits to the Regional Education Office Branch. Data were analyzed interactively following the model of Miles, Huberman, and Saldana, consisting of data reduction, data display, and drawing qualitative conclusions. Trustworthiness and validity were ensured through source triangulation, technique triangulation, and member checking. Data collection involved 16 key informants selected purposively: 1 Head of the TKA Committee from the Regional Education Office Branch I of Central Java Province, 5 Vice Principals for Curriculum Affairs (1 per school), 5 IT Proctors/Technicians (1 per school), and 5 Examination-Room Supervisors (1 per school).

In addition, qualitative data were also obtained by administering open-ended questionnaires to 34 twelfth-grade students from five participating schools: SMAN 3 (8 students out of 408 twelfth-grade students), SMAN 8 (7 out of 384), SMAN 10 (6 out of 360), SMAN 11 (6 out of 396), and SMAN 12 (7 out of 417). These answers' results provide an idea about the students' experiences and views about the implementation of online TKA. The credibility of the findings is supported by the triangulation of sources and techniques. Data analysis is conducted through the interactive model of Miles, Huberman, and Saldaña, which includes data condensation, data display, and conclusion drawing and verification.

RESULTS

Field investigations carried out at five public senior high schools in Semarang City documented the practical execution of the online Academic Competency Test (Tes Kemampuan Akademik/TKA). The findings are organized based on the four CIPP dimensions: the policy framework, the availability of supporting resources, the conditions and actions taken during the evaluation, and the outcomes. This framework facilitates the expression of the connection between operational challenges at the school level and the implementation and outcomes of online TKA.

Regarding policy direction, the findings indicate that the 2025 TKA regulations at the regional level were essentially implemented through a purely top-down approach. Officials from Regional Education Office Branch I of Central Java explained that they lacked the authority to establish their own regulations and instead disseminated technical guidelines issued by the central and provincial governments. The education authorities initially disseminated the guidelines primarily to school operators, focusing on synchronizing Basic Education Data (Dapodik). However, at the school level, the technical guidelines, which initially stated that the test was optional, were transformed into a mandatory program for Grade 12 students at SMAN 3 Semarang, SMAN 8 Semarang, and SMAN 12 Semarang. "At our school, we decide to make participation mandatory for all Grade 12 students," emphasized the vice principal for curriculum affairs at SMAN 3 Semarang (personal communication, July 23, 2026), explaining that the school adopted the measure independently to secure student's opportunities in public

Vol.7 No.2 2026 | e-ISSN: 2723-8199
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university admissions. “Although the central government described it as optional, if we did not take this step, it would be detrimental to the students. Current trends in the achievement-based pathway or SNBP, have begun to consider TKA score certificates as a crucial additional component. Therefore, this is a purely an investment strategy for the future of our students.”

Regarding school support capacity, information technology proctors at all five schools said they were not surprised by the new system because its implementation pattern was similar to that of the Computer-Based National Assessment (Asesmen Nasional Berbasis Komputer/ANBK) in previous years. In contrast, the preparation of teachers assigned as examination-room supervisors did not proceed smoothly. At SMAN 3 Semarang, an examination-room supervisor became confused during an online briefing because of internet connectivity problems. In contrast, supervisors at SMAN 11 Semarang missed important information because no face-to-face coordination meeting was held before the examination.

The physical infrastructure conditions also revealed clear disparities. SMAN 12 Semarang was forced to compress its examination schedule into two waves and three sessions per day to accommodate the limited number of computers available for its 417 students. More serious operational constraints emerged at SMAN 11 Semarang, where spatial limitations forced the school to convert its chemistry laboratory into an emergency examination room. "The situation was indeed quite urgent as our main computer laboratory could not accommodate all grade 12 students in a single session," explained the proctor at SMAN 11 Semarang (Interview, July 24, 2026). He noted that strict regulations prohibiting supplementary fees from parents, coupled with tight public school budget constraints, prevented the immediate procurement of new air-conditioning units. "Ultimately, the only viable solution was to adapt the chemistry laboratory, despite it being equipped with only wall-mounted fans," he added.

The thermal discomfort from this improvised setup directly affected student focus and endurance during the assessment. "There were no system-level technical problems, only non-technical ones," a student at SMAN 11 Semarang reflected in an open-ended questionnaire (July 23, 2026), adding that "sitting in front of a computer for approximately two hours in a room with only fans was enough to cause dizziness from the heat and lead to a loss of focus.”

Compounding these facility-level challenges, internet-based technical disruptions surfaced across multiple testing centers as the exam began. An examination-room supervisor from SMAN 12 Semarang, observed firsthand the systemic failure caused by concurrent login attempts. "The primary issue in the field occurred with the central server during the first few minutes after the examination began," he recalled (Interview, July 15, 2026), describing how the influx of simultaneous student requests overwhelmed the platform, leaving several participants staring at loading screens for up to fifteen minutes before gaining access to the test items.

As a result of accumulated internet traffic on the central server, the examination application temporarily froze and prevented access to economics questions at SMAN 8 Semarang. In addition, the researchers identified gaps in students' digital literacy at SMAN 3 Semarang, where some students were confused about basic keyboard shortcut commands when the Exam Browser unexpectedly terminated their sessions through a forced logout. Conversely, the risk of power outages was successfully mitigated at SMAN 8 Semarang and SMAN 12 Semarang through the preparedness of the curriculum teams, which connected backup generators to the schools before the examinations began.

To compensate for preparation delays caused by the central authorities' relatively late dissemination of the examination schedule, which occurred only two to three months before the assessment, schools implemented emergency time-management measures by temporarily suspending regular lessons. SMAN 3 Semarang began morning academic guidance sessions alongside independent tryouts in August 2025; SMAN 8 Semarang ran a one-week intensive review program; and SMAN 11 Semarang set aside two full weeks for intensive academic enrichment. "The dissemination from the central authorities came very suddenly, so in practice we only had about two effective months for preparation," acknowledged the Vice Principal for Curriculum Affairs at SMAN 11 Semarang (Interview, July 23, 2026). Deciding to dedicate two full weeks exclusively to TKA material enrichment,

Vol.7 No.2 2026 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.101607

he admitted that "honestly, two weeks was still far too short to catch up on the students' learning gaps." This compressed timeframe also contributed to administrative oversights, such as a data-entry error at SMAN 11 Semarang where a student who had formally opted out remained registered in the system and was ultimately required to sit for the examination without prior preparation.

In terms of academic outcomes, official score records at SMAN 3 Semarang and SMAN 8 Semarang identified Mathematics and English among the lowest-performing subjects. In contrast, Indonesian Language and Geography achieved the highest average scores. Analysis of the open-ended questionnaire revealed an evenly split student perception (50:50). Half of the respondents viewed the test as fair, citing the immediate and transparent display of scores via the automated system. Conversely, the remaining half argued that the online TKA failed to reflect their actual abilities, pointing to the prevalence of speculative guessing in multiple-choice formats and the disproportionate difficulty of nationally standardized questions that heavily emphasized Higher-Order Thinking Skills (HOTS).

This performance gap was further driven by underlying motivational factors. "The motivation of Grade 12 students is divided into two distinct groups," explained the Vice Principal for Curriculum Affairs at SMAN 10 Semarang (Interview, July 20, 2026). He observed that while university-bound students prepared rigorously often supplementing their studies with costly private tutoring those intending to enter the workforce or enlist in the military merely clicked through the test items. "They know that the TKA score is primarily used for university admission and has no bearing on their high school graduation," he noted, emphasizing that student motivation directly accounted for score fluctuations and underperformance.

After the results were published, the vice principals who were responsible for the curriculum sent the score evaluation reports to the subject-teacher deliberation forums (MGMP) to help the teachers make changes in their teaching methods. But the Central Java Regional Education Office Branch I said that the changes to infrastructure and the overall curriculum alignment are still the responsibility of the Provincial Education Office and the central government. To summarize, the results suggest that operational challenges and unequal access to support resources impeded schools' ability to achieve the desired results in the online TKA.

DISCUSSION

Context Evaluation: Adaptation of TKA Policy to Student Needs

Findings from the context dimension indicate that schools not only implemented the policy but also made strategic adjustments. SMAN 3, SMAN 8, and SMAN 12 changed the TKA from an optional to a mandatory assessment because TKA scores had begun to be considered as additional points in the SNBP. This phenomenon aligns with Stufflebeam & Zhang (2017), who argue that context evaluation examines how local institutions formulate strategic decisions in response to stakeholder needs. However, this decision has created tension between assessment's formative and summative functions. Black & Wiliam (2018) emphasize that formative assessment theory should be embedded within a broader theory of pedagogy, in which the design of educational activities and assessment mutually influence one another. In the context of TKA, schools have positioned assessment primarily as a summative instrument for measuring final achievement and supporting university admission processes, without adequately integrating it into everyday learning processes.

Fitrianingsih & Pramono (2025) found that transforming digital assessment requires a holistic framework that integrates pedagogical, technical, ethical, and policy dimensions. The success of digital assessment depends heavily on educator readiness and institutional support not merely on technology availability. This perspective align with the findings of Widhanarto et al. (2024) who found that developing teachers' digital capacity through structured training and mentoring is a key factor in successfully transforming digital learning. Teachers need to be competent in designing and developing technology-based learning media to bridge the gap between policy and classroom pedagogical practices.

Rohmadi et al. (2025) found that university students responded positively to computer-based testing (CBT) because of its ease of use; however, about 40% reported problems with interrupted internet connectivity. This finding is relevant to implementing TKA in Semarang, where network and server

Vol.7 No.2 2026 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.101607

disruptions emerged as significant barriers. Meanwhile, Nusaibah (2025) found that efficiency, environmental, and ethical considerations form important foundations for adopting digital assessment. This strengthens the argument that digital assessment transformation is driven not only by technological demands but also by awareness of cost efficiency, paper reduction, and improved examination integrity. Nevertheless, field realities indicate that although schools and students recognize these benefits, various technical barriers can reduce the effectiveness and fairness of examination implementation.

Thus, school-level policy adaptation can be strategic, but it has not yet been adequately supported by integrating assessment's formative function. Successful digital assessment transformation requires a holistic framework encompassing educator readiness, institutional support, and awareness of its environmental and ethical benefits, rather than relying solely on technological availability. These findings strengthen the argument that strategic decision-making at the school level does not automatically guarantee effective implementation without adequate pedagogical integration.

This finding is further supported by Khatimah et al. (2023), who found that implementing application-assisted assessment can help teachers obtain information about students' competency achievement. However, it still faces several challenges. Therefore strategic decisions at the school level do not always guarantee effective implementation unless comprehensive changes in pedagogical practice accompany them. Assessment policies and learning practices must be closely integrated to ensure TKA does not become a summative instrument detached from student's academic development.

Input Evaluation: Disparities in Infrastructure, Facilities, and Student Readiness

The most critical finding in the input dimension concerns the availability of facilities and infrastructure, which revealed significant disparities among schools. Widhanarto et al. (2024) demonstrated that developing teachers' competencies in producing digital learning media requires adequate infrastructure and systemic support. Their training program achieved a 75% success rate among participants who developed Android-based learning media, indicating that managing teachers' digital capacity is crucial to educational transformation.

Manguni (2022) showed that implementing of computer-based assessment requires adequate facilities and infrastructure, including computers, internet connectivity, technical personnel, and supporting facilities. Mafiroh et al. (2024) likewise found that limited computer availability can become a significant barrier, requiring schools to adopt strategies to ensure all participants can take part in the assessment. (Fadilah & Hayati, 2022) and Tampubolon et al. (2022) identified that students were not yet fully prepared to undertake computer-based assessments. Werfhorst et al. (2022) demonstrated substantial disparities in digital readiness among secondary school students, including differences in digital skills and access to ICT resources.

Infrastructure disparities and differences in human resource readiness represent major barriers to the effectiveness of online TKA. The absence of professional educational technology personnel and gaps in students' digital literacy further undermine the quality of assessment implementation. Therefore, sustained investment in digital infrastructure and teacher capacity development constitutes an essential prerequisite for the successful transformation of national digital assessment.

Process Evaluation: System Disruptions, Digital Literacy, and Implementation Management

Technical obstacles, including difficulties accessing the central server login and application freezing, indicate weaknesses in the online examination system that affected student's experiences and performance. Selwyn (2017) cautions that network stability is not merely a technical issue but also an key determinant of students' academic performance, as system failures in the first minutes of an examination can undermine students' confidence. Black & Wiliam (2018) demonstrate that theories of pedagogy, instruction, learning, and educational context influence the design of educational and assessment activities. However, within the TKA context, this productive relationship remains insufficiently established.

Vol.7 No.2 2026 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.101607

Lee et al. (2022) found that online assessment presents various technical, academic, and ethical challenges from students' perspectives. (Jaap et al., 2021) likewise demonstrated that the transition from conventional examinations to online examinations affects students' experiences, including their perceptions of the equity of examination conditions. (Nasikhah & Sumarsono, 2024) showed that implementing computer-based assessment still faces challenges related to socialization, infrastructure readiness, student motivation, and curriculum alignment. Arifin et al. (2023) in developing an online training model, found that the quality of interaction, learning materials, projects, and evaluation strongly influenced improvements in participant's competencies. Sobirin et al. (2024) further emphasized that implementing the Computer-Based National Assessment (ANBK) requires readiness across multiple school components, not merely the availability of technological devices.

Operational barriers, including server disruptions and rushed time management, reveal weaknesses in system architecture and policy planning. Technical stability and adequate preparation time are critical prerequisites that have not yet been fully met. Consequently, systemic improvements and more comprehensive dissemination planning, supported by a structured implementation management approach, are urgently needed to reduce students' academic stress.

Product Evaluation: Academic Achievement and TKA Effectiveness

The relatively low scores in Mathematics and English suggest that digitalizing examinations does not automatically improve students' academic achievement. (Tomar et al., 2024) showed that digital assessment can influence motivation, peer learning, and group dynamics when designed and integrated appropriately into the learning process. Students questioned the alignment between assessment items and learning materials, while technical barriers compromised the system's practicality. Terblanche et al. (2024) found that students' perceptions of online assessment were associated with fairness, technology, time, relevance, and their overall assessment experience. Alamr et al. (2025) also identified challenges instructor face in providing personalized feedback through automated tools, which may compromise the depth of academic guidance.

Rohmadi et al. (2025) found that 98.2% of university students reported that computer-based testing (CBT) made the assessment process easier, while 91% considered it more objective. However, Nusaibah (2025) identified limitations related to assessment formats that relied exclusively on multiple-choice questions, while essay questions required manual grading. This issue is relevant to TKA, where multiple-choice formats may encourage speculative guessing and may not optimally measure higher-order thinking skills (HOTS). Putri et al. (2026) emphasized that technology effectiveness depends on the system's ability to provide tangible benefits and align with users' needs. Valverde-Berrocoso et al. (2022), through a systematic review, emphasized that the impact of technology on academic performance should be understood in terms of how technology is integrated into the learning process.

Perceptions of fairness and student motivation are important determinants of TKA outcomes. The split in student motivation between those intending to pursue higher education and those who do not suggests that TKA is not yet fully inclusive. This finding supports the proposition that lower motivation among students who do not intend to pursue higher education is associated with lower assessment scores. The relatively low achievement in Mathematics and English cannot be attributed solely to technical factors; it is also linked to insufficient alignment between daily curriculum implementation and the standards reflected in national assessment items. Digital assessment should therefore account for the diversity of students' educational orientations to ensure its benefits are experienced more inclusively.

CIPP Evaluation Synthesis

Overall, the findings show that the challenges of implementing the online-based Academic Competency Test (TKA) form an interconnected chain across the *context*, *input*, *process*, and *product* dimensions. In the *context* dimension, schools showed adaptive capacity by making TKA a mandatory

Vol.7 No.2 2026 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.101607

program based on students' interests and needs. However, in the *input* dimension, disparities remained in the availability of computers, examination rooms, internet connectivity, and supporting facilities. These disparities subsequently extended into the *process* dimension through server disruptions, application freezing, gaps in digital literacy, suboptimal coordination among examination supervisors, and limited preparation time. Furthermore, these challenges ultimately affected the *product* dimension, as reflected in variations in assessment scores, divided perceptions of fairness among students, and differences in student motivation.

This pattern is consistent with findings from previous national studies. Manguni (2022), Nasikhah & Sumarsono (2024), and Mafiroh et al. (2024) demonstrated that infrastructure readiness, network connectivity, human resources, socialization, and student preparedness are important components of computer-based assessment. This study's findings indicate that the digitalization of TKA cannot be understood merely as a change in the assessment medium from paper to computer. Rather, it represents a systemic transformation that simultaneously requires policy readiness, adequate infrastructure, human resource capacity, digital competence, implementation management, curriculum alignment, and student motivation.

If any of these components is inadequately prepared, the effectiveness assessment's effectiveness may decline even when the technological platform is available. Therefore, improving the effectiveness of online TKA requires a systemic approach that focuses not only on technology procurement but also on equitable distribution of supporting resources, enhanced digital competencies, more comprehensive policy planning, stronger coordination, technical simulations, and improved student understanding of the assessment's benefits and purposes.

CONCLUSION

Based on the field findings and in-depth analysis, this study successfully addressed its primary evaluation focus in evaluating the implementation of the online-based Academic Competency Test (TKA) in public senior high schools in Semarang City from an educational technology perspective using the CIPP (Context, Input, Process, Product) model.

The findings show that operational network barriers and disparities in physical support facilities at the school level were closely associated with, and hindered, the optimal achievement of the online TKA program's outcome at the regional level. Overall, the findings indicate that schools' tactical response of making student participation mandatory to secure opportunities through the achievement-based admission pathway (SNBP) reflects a strong and forward-looking *context* dimension.

However, systemic inadequacies in the input dimension later constrained the program's effectiveness, including disparities in computer laboratory capacity, the use of a hot chemistry laboratory as an emergency examination room without air conditioning (AC), and inadequate technical preparation for teachers serving as examination supervisors. These conditions disrupted the operational *process* dimension in the field, ranging from mass login traffic congestion at the start of the examination, students' digital-literacy difficulties when the application unexpectedly forced them to log out, to the overly sudden dissemination of the examination schedule by the central authorities. This situation ultimately required schools to sacrifice regular instructional hours of intensive short-term enrichment programs.

The accumulation of technical constraints and time-management challenges, combined with low learning motivation among students who did not intend to pursue higher education, ultimately affected the *product* dimension, as reflected in the relatively low average scores in Mathematics and English among students in Semarang City. Following these findings, an operational recommendation for the Provincial Education Office and relevant ministries is to reassess the examination system architecture by considering a semi-online model using a local Virtual Hard Disk (VHD) infrastructure to reduce simultaneous congestion on the central server. In addition, school curriculum management teams are recommended to optimize the role of internal Subject Teacher Deliberation Forums (Musyawarah Guru Mata Pelajaran/MGMP) from the start of the new academic year to develop learning strategies that

bridge daily classroom instruction with national competency standards emphasizing Higher-Order Thinking Skills (HOTS).

For future research, subsequent researchers are encouraged to conduct large-scale comparative studies examining the effectiveness of online TKA implementation across public and private schools with different student socioeconomic characteristics. Alternatively, quantitative research using a Structural Equation Modeling (SEM) approach could estimate the extent to which educational digital infrastructure readiness influences students' academic anxiety during the assessment process.

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