

Empowering Vocational Graduates: How Educational Resource Innovation Drives Competitiveness Through Digital Skills

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Abstract

This study aims to analyze the effect of educational resource innovation on the competitiveness of vocational high school (SMK) graduates in Serang City through digital competence as a mediating variable. The research is motivated by the high unemployment rate among SMK graduates, despite the region's dominance of vocational education institutions. This study employed a quantitative, explanatory research design. The population consisted of unemployed SMK graduates in Serang City, with a sample of 300 respondents selected using proportional random sampling. Data were collected through a Likert-scale questionnaire that had been tested for validity and reliability. Data analysis was conducted using Structural Equation Modeling (SEM) with LISREL to examine direct and indirect relationships among variables. The results indicate that educational resource innovation has a significant positive effect on digital competence ($\beta = 0.62$; $p < 0.001$) and graduate competitiveness ($\beta = 0.41$; $p < 0.001$). Digital competence significantly influences graduate competitiveness ($\beta = 0.53$; $p < 0.001$) and partially mediates the relationship between educational resource innovation and competitiveness. These findings suggest that innovative, collaborative, and digitally integrated educational resource management is a strategic factor in enhancing the competitiveness of vocational graduates in the digital era.

Keywords: Educational Resource Innovation, Digital Competence, Graduate Competitiveness, Vocational Education

INTRODUCTION

Ensuring vocational graduates remain competitive has become a pressing strategic priority for human resource development. This is especially true today, as we navigate digital transformation, globalized economies, and the Fourth Industrial Revolution an era defined by rapid technological shifts, automation, and widespread digital integration across job sectors (Schwab, 2016). Within this landscape, Vocational High Schools (SMK) serve as the backbone for preparing young people for the workforce. These institutions are specifically designed to mold competent, adaptable, and work-ready individuals tailored to the immediate demands of the business and industrial sectors (DUDI). Ideally, a robust vocational system strikes a delicate balance. It must equip students with concrete technical abilities (*hard skills*) while simultaneously fostering adaptability (*soft skills*), giving them a fighting chance in an aggressively dynamic job market. Yet, the reality on the ground often tells a different story. Across various regions in Indonesia including Serang City, the

capital of Banten Province SMK graduates ironically still account for a substantial portion of the open unemployment rate.

Serving as the governmental hub and a major vocational education center in Banten, Serang City boasts a disproportionately high number of SMKs compared to general high schools. This dense concentration of vocational institutions ought to be a strategic goldmine for cultivating the skilled labor needed to drive regional economic growth. Instead, the persistent failure to optimally absorb these graduates into the workforce points to a glaring structural mismatch between what schools teach and what the labor market actually dictates. We are left with a frustrating paradox: institutions built specifically to supply "ready-to-work" personnel are turning out alumni who struggle to meet the realities of modern, digitally driven industries.

From a theoretical standpoint, mastering a trade is no longer enough to guarantee competitiveness. It is heavily contingent on how well educational resources are managed demanding innovation, adaptability, and a strong technological foundation (Rusmana, 2020). Looking through the lens of the Resource-Based View (RBV), an institution secures a competitive edge only when it can strategically and sustainably optimize its core assets. For vocational schools, these resources go far beyond brick-and-mortar workshops. They encompass dynamic curricula, top-tier teaching staff, robust industry partnerships, immersive digital learning environments, and progressive pedagogical approaches. Ultimately, innovating these resources is the linchpin for creating a learning atmosphere that truly mirrors the modern workplace.

Meanwhile, the digital wave has entirely rewritten the rules of employment. It has disrupted traditional business models and shifted the baseline of what it means to be employable. Industries today look past mere technical know how. They demand comprehensive digital fluency ranging from information literacy and digital communication to tech-driven collaboration, content creation, and digital problem-solving (Iskandar, 2022). Essentially, digital proficiency acts as the vital bridge connecting a graduate's vocational skills with the high-tech realities of today's firms (Kholida & Leliy, 2021). Those who excel digitally naturally adapt faster to tech shifts, pivot easier between roles, and unlock a much wider array of career paths, particularly within the digital economy, creative sectors, and platform-based work.

Returning to Serang City's dilemma, the sluggish competitiveness of its graduates is deeply tied to a lack of meaningful innovation in educational resources. Many schools simply haven't synced their operations with the digital ecosystem or the mandates of Industry 4.0 (Wening, 2017). A significant number of these institutions are still grappling with outdated learning technologies, weak ties to industry players, and rigid curricula that ignore real-world market signals. This inevitably stunts the students' digital growth, leaving them ill-equipped to survive in a heavily digitized work environment. Overcoming this hurdle requires a radical overhaul of how educational resources are managed. It is no longer just about upgrading physical tools; it is about pushing digital innovation, fostering multi-stakeholder collaborations, and deeply weaving technology into the fabric of vocational teaching.

To complicate matters, the booming digital economy both nationally and regionally has dramatically shifted how companies hire. Modern recruitment leans heavily on digital competency assessments and practical skill portfolios rather than just formal diplomas (Fanani et al., 2023). Employers are actively hunting for candidates who can pair their vocational certifications with applicable, context-aware digital skills. Because of this shift, digital proficiency emerges as a critical mediating factor. It is the very mechanism that translates innovative schooling into actual work readiness in the digital age.

While previous literature has extensively explored work competence, readiness, and the classic "link and match" between schools and industries, there remains a notable gap. Very few studies have successfully integrated educational resource innovation and digital proficiency into a single, cohesive conceptual model (Nurjanah et al., 2024).

Innovating educational resources is now a fundamental driver for transforming modern learning environments, pushing them toward greater efficiency and industrial alignment. Building better digital infrastructure and constantly updating curricula are not just technical fixes; they are vital catalysts for nurturing well-rounded digital skills. As noted by (Haleem et al., 2022), infusing educational resources with digital tech democratizes access to knowledge and paves the way for deeply personalized learning experiences. This sentiment is echoed by (Vial, 2019), who argues that true digital transformation in schools demands structural shifts in resource allocation to create genuine value for everyone involved, especially amid rapid technological disruption.

Ultimately, the digital savvy cultivated through these progressive resources becomes the cornerstone of a graduate's ability to compete globally. Job seekers armed with data literacy and remote collaboration skills generally enjoy a broader spectrum of career choices and spend less time waiting for job offers. In fact, (Oberländer et al., 2020) highlight a strong positive correlation between advanced digital mastery and the overall productivity of young workers today. Reinforcing this point, (Donald et al., 2021) contend that a graduate's modern edge is deeply tied to their capacity for lifelong learning, largely facilitated by digital tools.

Despite these realities, research explicitly positioning digital proficiency as a mediating variable to boost SMK graduate competitiveness-especially focusing on unemployed alumni in Serang City-remains scarce. Uncovering how digital proficiency mediates this relationship is crucial for drafting vocational education policies that are truly adaptive and aligned with digital transformation goals.

Prompted by these empirical and theoretical blind spots, this research seeks to comprehensively investigate how innovating educational resources can drive up the competitiveness of SMK graduates by actively strengthening their digital capabilities. The objective is not just to map the direct link between resource innovation and competitiveness. Instead, this study delves into the indirect mechanisms at play, specifically testing digital proficiency as the mediating bridge. Ultimately, the findings are expected to enrich the theoretical landscape of vocational education management. Practically, it aims to offer actionable insights for policymakers, school administrators, and other key stakeholders navigating the vocational sector in Serang City.

Consequently, the central hypothesis posits that educational resource innovation exerts a positive and significant impact on SMK graduate competitiveness, working both directly and indirectly via enhanced digital proficiency. Guided by this premise, the study aims to empirically analyze this dynamic in Serang City, firmly establishing digital proficiency as a mediating variable within a structural model tailored for vocational education in the digital age.

METHODS

Research Design and Participants

This study employed a quantitative approach with an explanatory cross-sectional survey design to examine the causal relationships among educational resource innovation (exogenous variable), digital proficiency (mediating variable), and graduate competitiveness (endogenous variable). The research was conducted in Serang City, Banten Province, representing a region with a high concentration of Vocational High Schools (SMK) that continues to face challenges in graduate employment absorption. The target population comprised SMK alumni in Serang City who graduated within the last 1-3 years and were in the transitional phase to the workforce (currently unemployed). A proportional random sampling technique was applied across public and private SMKs to ensure data representativeness. A total of 300 alumni voluntarily participated by providing informed consent. This sample size was deemed highly adequate, satisfying the

assumptions of Structural Equation Modeling (SEM) analysis, which requires a minimum of 5-10 times the number of latent variable indicators to yield a stable and reliable model (Rehman et al., 2024).

Measurements and Instruments

Data were collected using a closed-ended questionnaire with a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), distributed both online and offline. The research instrument was developed based on a synthesis of the *Resource-Based View*, the *Digital Competence Framework* (DigComp), and *Employability Theory*. Educational Resource Innovation (20 items) was measured through indicators such as collaboration with the business and industrial world (DUDI), the sharing of practical facilities, the utilization of digital platforms, and industry-based instructional method and curriculum innovations (Sudjimat et al., 2021). Digital Proficiency (20 items) was evaluated across dimensions of information literacy, digital communication, content creation, digital ethics, and technology-based problem-solving (Fanani et al., 2023). Meanwhile, Graduate Competitiveness (15 items) was assessed based on job readiness, technological adaptability, recruitment confidence, and flexibility toward labor market changes (Pristi et al., 2023). Prior to mass data collection, the instrument underwent content validity testing by vocational education experts and a pilot test involving 30 non-sampled respondents. Prerequisite instrument testing via Confirmatory Factor Analysis (CFA) demonstrated that all items possessed factor loadings and Average Variance Extracted (AVE) values ≥ 0.50 , alongside *Cronbach's Alpha* and Composite Reliability (CR) values ≥ 0.70 , confirming their validity and reliability for further analysis (Winarni, 2021).

Data Analysis Techniques

Data analysis was conducted in two stages: descriptive statistical analysis to map demographic characteristics and response distributions, followed by inferential statistical analysis using LISREL-based Structural Equation Modeling (SEM) to test the structural model and research hypotheses. Before hypothesis testing, the data were rigorously checked to ensure they met multivariate assumptions, including tests for normality, outlier identification (*Mahalanobis Distance*), and multicollinearity. The feasibility of the structural model was evaluated using standard Goodness of Fit (GoF) criteria, notably $Chi-Square/df \leq 3.00$, RMSEA ≤ 0.08 , CFI ≥ 0.90 , TLI ≥ 0.90 , and GFI ≥ 0.90 (Novalia et al., 2025). The mediating effect of digital proficiency was specifically analyzed through an *indirect effect* significance test (Sobel test) to firmly establish the intermediary variable's role within the structural model of vocational education transformation. The entire research process was executed while upholding scientific integrity, ensuring respondent confidentiality, and adhering to applicable educational research ethics.

RESULT AND DISCUSSION

Result

Data Description and Prerequisite Testing

Based on the data collected from the respondents, the perception of the Educational Resource Innovation variable falls into the "High" category with an average score of 4.12. A similarly positive trend is evident in the Digital Proficiency (3.98) and Graduate Competitiveness (4.05) variables. These figures indicate that, in general, the majority of alumni perceive the facilities and digital competence development at their vocational institutions to be functioning effectively. Prior to conducting the structural analysis, data assumption tests confirmed that the data were normally distributed ($Chi-Square$ $p-value > 0.05$). All inter-variable relationships were also proven to be linear, thereby fulfilling the absolute prerequisite conditions for further analysis using Structural Equation Modeling (SEM).

Measurement Model and Goodness of Fit Evaluation

The validity and reliability of the instruments were rigorously evaluated through Confirmatory Factor Analysis (CFA). The test results confirmed that all indicators forming the latent variables were valid, as evidenced by factor loading values above 0.50. The reliability of the instruments was robustly confirmed by Construct Reliability (CR) > 0.70 and Variance Extracted (VE) > 0.50 values, proving that all items consistently and accurately measured the intended constructs.

Subsequently, the feasibility of the structural model was evaluated using Goodness of Fit (GoF) indices. The LISREL analysis demonstrated that the proposed model possessed an excellent fit (*Good Fit*) with the empirical field data, as presented in Table 1.

Table 1. Goodness of Fit Test Results

Indikator GoF	Nilai Hasil	Standar	Keterangan
Chi-Square	142.35	Kecil	Good Fit
RMSEA	0.045	< 0.08	Good Fit
GFI	0.92	> 0.90	Good Fit
CFI	0.96	> 0.90	Good Fit

Hypothesis Testing and Mediation Analysis

Based on the *Standardized Solution* and *t-values* output, all causal hypotheses within this structural model were significantly accepted. Directly, Educational Resource Innovation was proven to have a positive effect on Digital Proficiency ($t = 5.42 > 1.96$) and Graduate Competitiveness ($t = 2.15 > 1.96$). Digital Proficiency also exerted a strong direct effect on Graduate Competitiveness ($t = 4.89 > 1.96$). Regarding the mediation effect, the *indirect effect* analysis using the Sobel Test yielded a *Z* value of 3.78 (> 1.96). This finding confirmed a significant indirect effect of Educational Resource Innovation on Graduate Competitiveness through Digital Proficiency. Based on this interpretation, Digital Proficiency acts as a partial mediation variable. This asserts that although facility and resource innovations can directly boost job readiness, the impact is multiplied and far more optimal if the institution primarily focuses on enhancing students' digital proficiency.

Discussion

The primary findings of this study reveal that educational resource innovation has a positive and significant effect on the digital proficiency of SMK graduates. This proves that schools that are adaptive in managing their resources—such as fostering collaborations with industries, utilizing digital platforms, and sharing practical facilities—directly accelerate their students' digital capabilities (Hartanto et al., 2019). Conceptually, this finding reinforces the core pillars of the *Resource-Based View* (RBV) (Nurjanah et al., 2024), which postulates that an institution's competitive advantage is shaped by its ability to exploit strategic resources that are valuable and difficult to imitate (Rizal et al., 2021; Vuorikari et al., 2022). In the context of SMKs in Serang City, these breakthroughs successfully provide a contextual learning environment responsive to technological disruption, thereby producing graduates who are better equipped to face the rigorous dynamics of the workforce (Aly, 2025; Syafitri, 2023).

The fact that digital proficiency has a stronger effect on competitiveness compared to the direct effect of resource innovation itself is an essential finding. Digital proficiency acts as a bridging mechanism between the vocational education system and the realities of modern industry. Graduates with high digital

literacy and competence are far more adaptive, confident during recruitment, and ready to occupy new job niches such as digital freelancing or platform work (O.E.C.D., 2021). This strongly aligns with *Employability Theory*, which asserts that contemporary career success no longer relies solely on mechanical technical skills but hinges heavily on technology-based adaptive competencies (Nugraha et al., 2020; Vuorikari et al., 2022).

Given Serang City's high concentration of SMKs, the number of unemployed alumni could be significantly reduced if the learning ecosystem is recalibrated. Innovation must no longer be interpreted merely as physical development, but rather as a comprehensive overhaul of the digital ecosystem (Fananiet et al., 2023). Operationally, this innovation can be realized through the integration of Learning Management Systems (LMS), the development of digital-based teaching factories, the utilization of industrial simulations, and the active involvement of technology company practitioners as co-teachers (Iskandar et al., 2025). Naturally, this transformation demands the capacity building of teachers as the spearhead. Digital literacy training for educators is absolutely necessary so that digital instruments do not merely serve as physical tools but transform into meaningful learning experiences (Nagel, 2020).

From a theoretical standpoint, this research enriches the vocational education management literature by formulating a conceptual model that positions digital proficiency as a mediating variable (Santoso et al., 2024). Whereas previous studies generally only drew a straight, direct line between competence and job readiness, this study successfully weaves the concepts of innovation management, digital competence, and employability into a single, cohesive analytical framework.

Limitations and Recommendations

Despite providing critical strategic implications, this research is not without its limitations. First, the population scope relies solely on SMK alumni in the Serang City area, meaning that extrapolating the results to regions with different socio-demographic characteristics must be done with caution. Second, the quantitative survey (cross-sectional) approach limits researchers from delving deeply into the subjective experiences and qualitative narratives of graduates as they encounter complex workforce realities. Third, the modeling variables strictly focused on resource innovation and digital proficiency, thereby leaving analytical room for other predictor variables (Alvionita et al., 2025). Therefore, future research is highly recommended to employ a mixed-methods approach, broaden the geographical scope, and integrate complementary variables such as soft skills, the effectiveness of industry *link and match*, and career determination to construct a more persistent and holistic blueprint for vocational education policy.

CONCLUSION

In conclusion, this research confirms that educational resource innovation significantly enhances the competitiveness of Vocational High School (SMK) graduates in Serang City, with digital proficiency playing a pivotal mediating role. The Structural Equation Modeling (SEM) analysis demonstrates that while innovative, collaborative, and technology-driven resource management directly bolsters graduate employability, its impact is profoundly optimized when channeled through the development of students' digital competencies.

These findings carry critical strategic implications for vocational education stakeholders, local governments, and SMK management. The high concentration of vocational institutions in Serang City does not automatically translate to a highly competitive workforce unless it is systematically coupled with resource innovation and digital upskilling. Therefore, vocational revitalization policies must pivot toward a holistic digital transformation. Enhancing graduate competitiveness requires strengthening educational resources

through the development of digital learning ecosystems, the optimization of digital-based teaching factories, and robust, symbiotic partnerships with the industry.

Ultimately, an effective model for elevating SMK graduate competitiveness in the Industry 4.0 era necessitates the seamless and sustainable integration of educational resource innovation and digital proficiency. This synergistic approach—fostering collaboration among schools, industries, and the government—serves as the quintessential strategy for cultivating an adaptive, highly skilled workforce equipped to meet the rigorous demands of the modern labor market at both regional and national levels.

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