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ARTICLE

Integrating information and communication technology (ICT) and language in vocational education: A bibliometric and qualitative perspective toward workforce readiness and Sustainable Development Goals (SDGs)

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ABSTRACT

Vocational education plays a strategic role in preparing workforce-ready graduates in the context of rapid digital transformation. In the digital era, vocational students must develop technical skills alongside language competence and information and communication technology (ICT) skills. This study examines the integrative role of language and ICT in vocational education using a scoping review approach supported by bibliometric evidence and national descriptive data. Bibliometric data from the Scopus database were used to map global research trends, while secondary data provided contextual insights into the Indonesian vocational education system. The findings highlight curriculum alignment, teacher competence, and infrastructure as key mediating factors shaping workforce readiness. This study proposes an integrative conceptual framework linking language and ICT competencies with workforce readiness and contributes to discussions on vocational education reform aligned with Sustainable Development Goals (SDGs).

INTRODUCTION

Vocational education plays a strategic role in preparing skilled human resources who are ready to enter the workforce, particularly in the context of the rapid digital transformation that is reshaping industrial systems worldwide (Kovalchuk et al., 2022). In the era of digitalization and globalization, the effectiveness of vocational education is no longer determined solely by the mastery of technical competencies. Instead, it increasingly depends on the integration of transversal skills, particularly language proficiency and digital literacy, which are essential for adaptability, collaboration, and competitiveness in the modern labor market (Pambudi & Harjanto, 2020).

Language skills constitute a fundamental component of vocational students' professional competence, particularly in preparing them for effective communication in workplace settings. Numerous studies have examined various aspects of foreign language learning and teaching, highlighting its importance in vocational and professional education (Shaturaev and Khamitovna, 2023; Karmaker, 2025; Kurniawati, 2022; Jamiu, 2022; Sanni, 2023). In this context, language ability refers to an individual's capacity to communicate effectively, both orally and in written form, encompassing listening, speaking, reading, and writing skills that are essential for academic, social, and professional interactions (Husain, 2015).

In vocational education, mastery of both national and foreign languages (such as English, Japanese, or French) plays a crucial role in professional communication, technical documentation, and collaboration across cultural and industrial boundaries (Ahmadi, 2018; Sari, 2023). As global industries increasingly operate in multilingual and multicultural environments, language competence becomes a key indicator of workforce readiness (Constantinescu, 2015).

Alongside language proficiency, information and communication technology (ICT) has become an indispensable element of vocational education in the digital era (Ibrahim et al., 2025). ICT relates to data processing and management, as well as communication technology that enables efficient information

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KEYWORDS

information and communication technology (ICT); language competence; scoping review; sustainable development goals; vocational education; workforce readiness

exchange among individuals and systems (Nath & Liu, 2017; Ratheeswari, 2018). Mastery of ICT allows vocational students to engage with digital tools, simulations, and technology-based workflows that closely resemble real workplace environments. Effective ICT integration enhances learning efficiency, promotes student engagement, and supports the development of industry-relevant skills (Hayani et al., 2024; Karhade & Qi Dong, 2021).

Despite its importance, the implementation of language and ICT competencies in vocational education remains uneven, particularly in developing countries such as Indonesia. In practice, many vocational schools continue to treat language instruction and ICT training as separate curricular components, rather than integrating them in a contextualized, industry-oriented manner. This fragmented approach limits students' opportunities to develop authentic communication skills supported by technology, which are increasingly required in digitally mediated workplaces. Several studies have examined ICT use in language learning, the integration of technology in vocational education, and barriers to ICT implementation in English language teaching (Alkamel & Chouthaiwale, 2018; Çakıcı, 2017; Dwiono et al., 2018; Hashemi & Kew, 2021). A summary of selected previous studies is presented in Table 1.

Although existing research has contributed valuable insights into language education and ICT integration, many studies still treat these domains separately. Research focusing on technological innovation in language learning, global trends in ICT use, teacher competence, or specific digital tools (such as chatbots and multimedia platforms) has grown significantly in recent years (Haristiani et al., 2019; Al Husaeni & Haristiani, 2024). Bibliometric evidence further indicates a steady increase in global publications related to vocational education and language, reflecting rising scholarly attention to this field. However, empirical studies that explicitly examine the integrative role of language skills and ICT in shaping vocational students' work readiness remain limited, particularly within the context of vocational education systems in developing countries.

Table 1: Previous Studies on ICT and Language Education.

No	Author(s) and Year	Research Focus	Key Findings
1	Alkamel & Chouthaiwale (2018)	The Use of ICT in English Learning	ICT helps improve student interest and learning outcomes
2	Çakıcı (2017)	ICT in Foreign Language Teaching	ICT expands access to learning resources and increases efficiency
3	Jayanthi & Kumar (2016)	ICT in Language Teaching	The use of multimedia encourages student engagement
4	Bilyalova (2017)	ICT in Language Learning in Secondary Schools	ICT is effective in strengthening speaking skills
5	Hashemi & Kew (2021)	Barriers to ICT Use in ELT	Limited infrastructure and teacher training are major obstacles
6	Hidayati (2016)	ICT Integration in ELT in Indonesia	Policy support and training are needed for effectiveness
7	Dwiono et al. (2018)	Levels of ICT Integration in English Language Teaching	Comprehensive ICT integration in the classroom is still low
8	Maitlo et al. (2024)	ICT in ESL Teaching	ICT contributes to increased learning interactions
9	Habibi et al. (2020)	The Role of TPACK in ICT Integration by Language Teachers	Teachers' TPACK competencies determine the success of ICT integration
10	Vovchasta et al. (2021)	ICT in Professional Foreign Language Training	ICT supports industry-based language training
11	Banagiri et al. (2021)	ICT in Vocational Subject Teaching	ICT increases the relevance of learning to the world of work
12	Constantinescu (2015)	Language as a Global Communication Tool	Language becomes a predictive tool in global communication
13	Wiranda et al. (2020)	ICT Use by Vocational English Teachers	Teachers utilize ICT despite limited facilities
14	Al Husaeni & Haristiani (2024)	Global Trends in Technology Integration in Japanese Language Education (Bibliometrics)	Research on technology in Japanese language learning continues to increase.
15	Haristiani et al. (2019)	Chatbot Application (Gengobot) for Grammar Learning	Instant messaging-based chatbots effectively improve grammar skills
16	Al Husaeni & Haristiani (2025)	Digital Innovation in Language Learning and Its Linkage to the SDGs	Digital innovation supports the goals of sustainable education
17	Haristiani & Al Husaeni (2025)	ICT Integration in Pragmatic Studies (Bibliometrics)	Global research shows increasing interest in ICT in pragmatics

This gap highlights the urgency of adopting a more holistic and integrative approach to vocational education. As the demands of Industry 4.0 and the digital economy intensify, vocational graduates are expected to possess not only technical expertise but also digital literacy and effective communication skills that enable them to function in technology-driven and globally connected work environments (Pambudi & Harjanto, 2020; Vieira et al., 2022). Failure to integrate language and ICT competencies risks producing graduates who are technically proficient but insufficiently prepared for the communicative and technological challenges of modern workplaces.

This study examines how integrating language skills and ICT in vocational education shapes workforce readiness in the digital era. It is positioned as a scoping review supported by bibliometric evidence and national descriptive data, rather than a primary empirical investigation. Bibliometric analysis is an effective method for indentifying research trends, as reported elsewhere (Ruzmetov and Ibragimov, 2023; Samsuri et al., 2025). The review seeks to map existing research, identify dominant themes, and synthesize scholarly and policy-related evidence on how language and ICT integration contribute to vocational students' work readiness. By adopting this approach, the study also aims to highlight structural challenges and opportunities within the

Indonesian vocational education context, while aligning its analysis with broader global concerns related to Industry 4.0 and the achievement of the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth).

In addition, this study offers a novel contribution by proposing an integrative conceptual perspective that explicitly links language competence and ICT within vocational education to workforce readiness in the digital era. While previous studies have extensively examined language skills or ICT integration as separate domains, limited attention has been given to their combined and interdependent roles, particularly within vocational education systems in developing contexts.

By synthesizing existing literature, bibliometric trends, and national contextual data, this study advances a framework-based understanding that positions curriculum alignment, teacher competence, and infrastructural support as mediating factors between language-ICT integration and graduate work readiness. In doing so, the study moves beyond descriptive discussion and contributes a structured analytical lens that can inform both theoretical discourse and practical decision-making in vocational education, in line with Industry 4.0 demands and the SDGs.

METHODS

This study employed a scoping review approach that combined qualitative literature synthesis with bibliometric mapping and national secondary data. The methodological design aimed to map existing research, identify dominant themes, and synthesize evidence on the integration of language skills and ICT in vocational education, rather than to test empirical or causal relationships.

A bibliometric component was incorporated to provide an overview of global research trends related to vocational education and language. Bibliometric data were retrieved from Scopus using the following Boolean query: TITLE-ABS-KEY ("vocational education" OR "vocational training" OR TVET) AND (language OR "language skills" OR English) AND (ICT OR "digital technology" OR "information and communication technology"). The bibliometric data were initially collected in January 2025 and subsequently updated in February 2026. The data were used descriptively to examine publication growth patterns over time, serving as contextual support rather than as a comprehensive bibliometric mapping or citation network analysis.

In addition, national secondary data on the distribution of vocational schools, teachers, and students in Indonesia were included to provide a structural context. These data were used to illustrate regional disparities and institutional conditions within the vocational education system and were not treated as primary empirical evidence.

Next, the literature review was conducted using academic journal articles, policy documents, and research reports related to vocational education, language learning, ICT integration, and workforce readiness. Relevant publications were retrieved primarily from the Scopus database and supplemented by authoritative national policy documents. The review focused on literature published between 2015 and 2024 to capture recent developments associated with digital transformation, Industry 4.0, and vocational education reform.

Document selection was carried out through a relevance-based screening process. Titles and abstracts were initially reviewed, followed by full-text examination of selected documents. Publications were included if they addressed language competence, ICT integration, vocational curriculum alignment, or workforce readiness. Documents not directly related to these themes were excluded from the analysis.

The selected documents were analyzed using qualitative thematic synthesis. Themes were developed inductively by identifying recurring patterns related to language-ICT integration, curriculum practices, teacher competence, infrastructure, and workforce readiness. The analysis focused on synthesizing existing evidence rather than conducting statistical analysis or empirical measurement. Because coding was conducted by the authors, formal inter-coder reliability statistics were not calculated.

In addition, this study did not involve primary fieldwork or the collection of quantitative or qualitative data. Detailed examples in quantitative and qualitative methods in education is reported elsewhere (Susilawati et al., 2025). Instead, the present study added analysis that was based on bibliometric evidence and secondary data derived from existing literature and official sources.

RESULTS AND DISCUSSION

The Global Trends in ICT and Language in Vocational Education

Figure 1 presents the global trend in research publications related to vocational education and language from 1919 to 2025. The figure shows a relatively slow growth of publications throughout most of the twentieth century, followed by a significant increase starting in the early 2000s and accelerating sharply over the last decade. This upward trend indicates a growing global awareness of the importance of language competence within vocational education, particularly in response to digital transformation, globalization, and changing labor market demands. The increasing number of publications suggests that vocational education is no longer viewed solely as a means of developing technical skills, but rather as a multidimensional field that integrates communication skills, technology, and employability (Constantinescu, 2015).

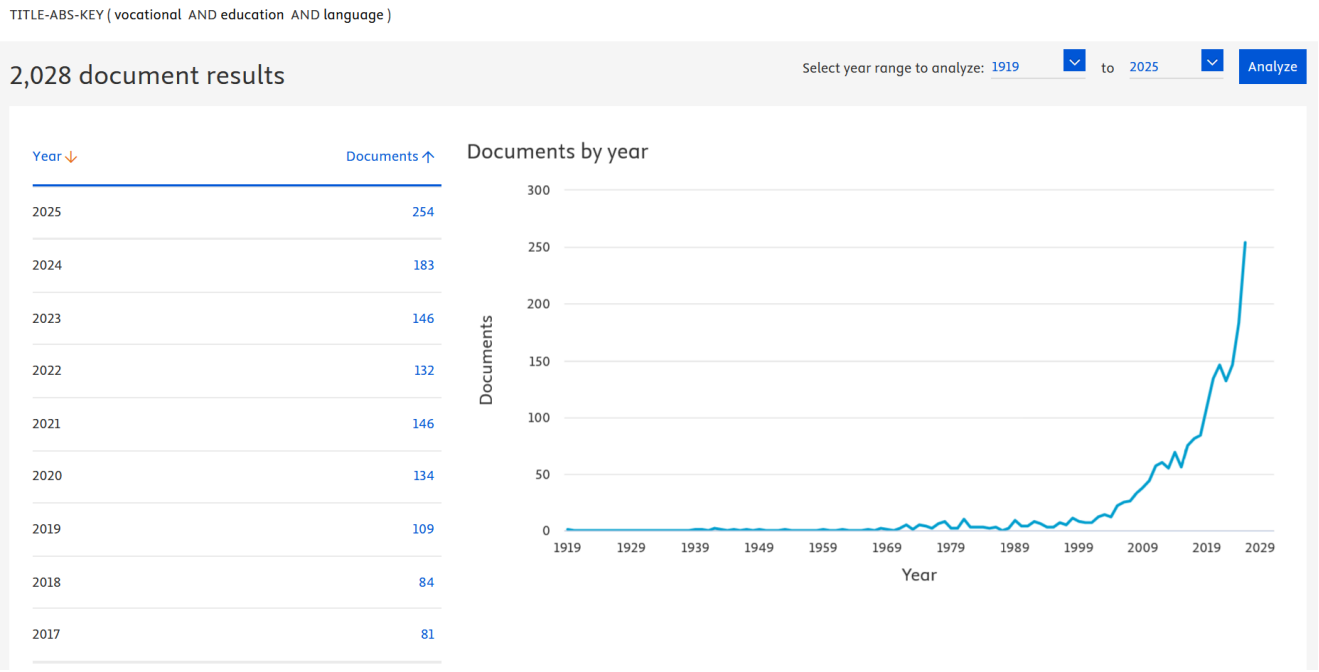

Figure 1: Global research trends in vocational education and language (1919–2025). Data were obtained from the Scopus database, search query TITLE-ABS-KEY (vocational AND education AND language), accessed in February 2026.

Despite this growing scholarly attention, many studies continue to focus on language learning or ICT integration as separate domains. Research on ICT-based language learning, teacher competence, and technological innovation has expanded significantly (Çakıcı, 2017; Bilyalova, 2017; Habibi et al., 2020). Bibliometric evidence, as illustrated in **Figure 1**, reinforces the argument that integration between language and vocational education is gaining importance globally. However, studies that explicitly examine the combined and integrative role of language and ICT in shaping vocational students' workforce readiness remain limited, particularly in developing countries. This gap highlights the relevance of the present study and provides a contextual foundation for examining vocational education practices in Indonesia.

ICT and Language in Vocational Education in Indonesia

In the Indonesian context, vocational education plays a central role in preparing skilled human resources to meet national and global workforce demands. Indonesia has approximately 14,325 vocational high schools, consisting of both public and private institutions, with the majority being privately managed (Pambudi & Harjanto, 2020). The distribution of vocational schools is uneven across provinces, with the highest concentration found in industrial and densely populated regions such as West Java, East Java, and Central Java. These provinces host the largest number of vocational schools due to strong industrial demand and population density, which directly influences access to learning facilities, ICT infrastructure, and foreign language instruction.

In general, as shown in **Tables 2 and 3**, vocational high schools represent a substantial segment of Indonesia's secondary education system. Based on national administrative data, Indonesia has 14,325 vocational schools, consisting of 3,775 public schools and 10,550 private schools, supported by a total of 337,306 teachers and serving more than 5 million students nationwide.

The distribution is highly uneven across provinces, with the largest concentrations found in West Java (2,922 schools; over 1.05 million students), East Java (2,160 schools; approximately 786,000 students), and Central Java (1,547 schools; over 823,000 students), reflecting population density and industrial activity in these regions.

In contrast, eastern provinces such as Papua, West Papua, and Papua Highlands have significantly fewer schools, teachers, and students. The data also reveal the dominance of private schools across most provinces, highlighting the major role of non-governmental institutions in vocational education provision, while simultaneously underscoring persistent regional disparities in educational access, capacity, and resource distribution.

This structural pattern is analytically important for understanding ICT and language integration in vocational education. As shown in **Tables 2 and 3**, provinces with the largest vocational school enrolment are also dominated by private institutions, which often operate under varying levels of financial and infrastructural capacity. Such disparities may contribute to uneven access to digital technologies, language laboratories, and continuous teacher professional development, thereby influencing the quality and effectiveness of integrated ICT–language instruction. Consequently, the distribution of public and private schools does not merely describe institutional composition, but helps explain why ICT and language integration (and ultimately workforce readiness) remain uneven across regions.

The dominance of private vocational schools in major provinces reflects the significant role of non-governmental actors in expanding vocational education. However, this dominance does not necessarily guarantee equal educational quality. Many private vocational schools face limitations in terms of digital infrastructure, laboratory facilities, and access to advanced ICT tools, which can affect the effectiveness of language and technology integration (Wiranda et al., 2020). Conversely, in less developed regions such as parts of Papua and Kalimantan, public vocational schools tend to dominate due to limited private sector participation. This regional disparity illustrates a persistent challenge in achieving equitable vocational education quality across Indonesia.

From a theoretical perspective, vocational education success is not determined solely by technical skill mastery but also by the

integration of language competence and digital literacy. Language proficiency, particularly in foreign languages such as English, plays a critical role in professional communication, understanding technical documentation, and participating in global and multicultural workplaces (Ahmadi, 2018). Language functions as a strategic tool in global communication and workforce mobility, making it a key indicator of vocational graduates' work readiness (Constantinescu, 2015; Ikuenomore, 2024).

At the same time, ICT competence has become an essential requirement in vocational education, as digital technologies increasingly shape industrial processes and workplace practices. ICT enables access to industry-based learning materials, digital simulations, and collaborative learning environments that mirror real-world work conditions (Ratheeswari, 2018; Banagiri et al., 2021). ICT integration enhances learning motivation, efficiency, and relevance, particularly when combined with contextual and practice-oriented pedagogical approaches (Hayani et al., 2024; Vieira et al., 2022).

Table 2: Distribution of Vocational High Schools by Province in Indonesia.

No	Province	Public vocational	Private vocational	Total vocational
1	Aceh	154	70	224
2	North Sumatra	279	674	953
3	West Sumatra	116	100	216
4	Riau	139	171	310
5	Jambi	108	75	183
6	South Sumatra	121	194	315
7	Bengkulu	65	38	103
8	Lampung	112	380	492
9	Bangka Belitung Islands	36	23	59
10	Riau Islands	38	68	106
11	DKI Jakarta	73	483	556
12	West Java	288	2,634	2,922
13	Central Java	239	1,308	1,547
14	DI Yogyakarta	50	157	207
15	East Java	299	1,861	2,160
16	Banten	98	639	737
17	Bali	58	111	169
18	West Nusa Tenggara	100	241	341
19	East Nusa Tenggara	178	177	355
20	West Kalimantan	120	115	235
21	Central Kalimantan	94	45	139
22	South Kalimantan	64	62	126
23	East Kalimantan	88	128	216
24	North Kalimantan	22	12	34
25	North Sulawesi	94	98	192
26	Central Sulawesi	107	76	183
27	South Sulawesi	168	238	406
28	Southeast Sulawesi	103	67	170
29	Gorontalo	40	19	59
30	West Sulawesi	60	68	128
31	Maluku	84	37	121
32	North Maluku	63	88	151
33	West Papua	16	5	21
34	Southwest Papua	16	23	39
35	Papua	35	14	49
36	South Papua	21	4	25
37	Central Papua	17	37	54
38	Papua Highlands	12	10	22
	Indonesia (Total)	**3,775**	**10,550**	**14,325**

Note: Data were obtained from the Indonesian Central Bureau of Statistics https://www.bps.go.id/en/statistics-table/3/TVU5MFYwMVlaMFJ4ZW5obWJGZHNVMjFpVUhoMlp6MDkjMw%3D%3D/number-of-schools--teachers--and-pupils-in-vocational-high-schools-under-the-ministry-of-education--culture--research--and-technology-by-province--2020.html)

Table 3: Distribution of Teachers and Students in Vocational High Schools in Indonesia.

No	Province	Public Teachers	Private Teachers	Total Teachers	Public Students	Private Students	Total Students
1	Aceh	6,573	726	7,299	47,064	7,659	54,723
2	North Sumatra	11,212	9,749	20,961	137,491	156,825	294,316
3	West Sumatra	5,893	1,260	7,153	73,840	11,779	85,619
4	Riau	5,601	2,953	8,554	71,023	35,646	106,669
5	Jambi	3,528	896	4,424	37,809	10,550	48,359
6	South Sumatra	5,931	2,910	8,841	80,225	47,328	127,553
7	Bengkulu	2,656	385	3,041	24,368	3,207	27,575
8	Lampung	5,488	5,181	10,669	71,535	82,617	154,152
9	Bangka Belitung Islands	1,352	364	1,716	19,604	5,175	24,779
10	Riau Islands	1,811	769	2,580	30,822	9,067	39,889
11	DKI Jakarta	3,490	8,130	11,620	58,159	138,100	196,259
12	West Java	18,326	38,948	57,274	349,760	708,862	1,058,622
13	Central Java	16,996	28,710	45,706	303,453	519,577	823,030
14	DI Yogyakarta	3,196	2,966	6,162	52,370	38,090	90,460
15	East Java	21,302	27,337	48,639	352,073	433,914	785,987
16	Banten	4,604	9,477	14,081	94,428	161,479	255,907
17	Bali	3,636	2,018	5,654	55,988	38,645	94,633
18	West Nusa Tenggara	5,796	2,439	8,235	56,212	22,192	78,404
19	East Nusa Tenggara	6,361	3,139	9,500	57,309	39,908	97,217
20	West Kalimantan	3,826	1,129	4,955	57,640	17,824	75,464
21	Central Kalimantan	2,607	591	3,198	26,818	6,010	32,828
22	South Kalimantan	3,087	1,062	4,149	44,019	13,063	57,082
23	East Kalimantan	3,604	1,808	5,412	55,536	29,082	84,618
24	North Kalimantan	773	135	908	9,644	917	10,561
25	North Sulawesi	3,058	955	4,013	31,186	11,149	42,335
26	Central Sulawesi	3,264	726	3,990	31,647	9,210	40,857
27	South Sulawesi	7,811	2,378	10,189	86,042	29,983	116,025
28	Southeast Sulawesi	3,901	632	4,533	27,916	4,824	32,740
29	Gorontalo	1,464	269	1,733	13,092	2,097	15,189
30	West Sulawesi	2,002	547	2,549	17,736	5,810	23,546
31	Maluku	2,241	512	2,753	15,089	5,678	20,767
32	North Maluku	1,448	617	2,065	9,251	9,153	18,404
33	West Papua	552	105	657	5,193	1,426	6,619
34	Southwest Papua	556	262	818	5,441	3,490	8,931
35	Papua	993	299	1,292	9,364	3,976	13,340
36	South Papua	633	61	694	6,343	639	6,982
37	Central Papua	512	502	1,014	5,457	5,765	11,222
38	Papua Highlands	151	124	275	2,235	2,526	4,761
	Indonesia (Total)	**176,235**	**161,071**	**337,306**	**2,433,182**	**2,633,242**	**5,066,424**

Note: Data were obtained from the Indonesian Central Bureau of Statistics https://www.bps.go.id/en/statistics-table/3/TVU5MFYwMVIaMFJ4ZW5obWJGZHNVMjFpVUhoMlp6MDkjMw%3D%3D/number-of-schools--teachers--and-pupils-in-vocational-high-schools-under-the-ministry-of-education--culture--research--and-technology-by-province--2020.html)

The integration of language and ICT in vocational education offers significant pedagogical advantages. ICT-supported language learning allows students to engage with authentic materials, professional communication scenarios, and industry-specific language use. For example, the use of chatbots and digital platforms for grammar and communication practice has been shown to improve language proficiency and learner engagement (Haristiani et al., 2019; Nazartseva et al., 2019). Moreover, bibliometric studies indicate a growing global interest in integrating technology and language education as part of sustainable educational development (Al Husaeni & Haristiani, 2024; Al Husaeni & Haristiani, 2025).

However, despite these opportunities, significant challenges remain in implementing integrated language and ICT learning

across vocational schools in Indonesia. Limited digital infrastructure, unequal access to technology, and insufficient teacher training continue to hinder effective ICT integration (Hashemi & Kew, 2021; Karhade & Qi Dong, 2021). Teacher competence, particularly in terms of technological pedagogical content knowledge (TPACK), plays a decisive role in determining the success of ICT-supported language learning (Habibi et al., 2020). Without adequate professional development and institutional support, technology investments may fail to produce meaningful improvements in learning outcomes.

Furthermore, language instruction in vocational education often lacks contextual relevance to students' specific areas of expertise. Language teaching in vocational settings should be functional and aligned with occupational needs. When language and ICT are taught separately, students may struggle to apply their skills in real workplace contexts. This fragmentation undermines the goal of producing workforce-ready graduates who can effectively communicate and operate in technology-driven environments (Pambudi & Harjanto, 2020).

From a policy and sustainability perspective, the integration of language and ICT in vocational education aligns closely with the SDGs. Strengthening language competence and digital literacy supports SDG 4 (Quality Education) by promoting inclusive, relevant, and future-oriented learning. At the same time, preparing vocational graduates with communication and technological skills contributes to SDG 8 (Decent Work and Economic Growth) by enhancing employability and workforce adaptability. In this context, vocational education should be viewed as part of a broader ecosystem involving government, industry, and educational institutions working collaboratively to address labor market challenges.

Integrating language skills and ICT is not merely an instructional enhancement but a strategic necessity for vocational education in the digital era. While global research trends demonstrate increasing attention to this integration, practical implementation remains uneven, particularly in developing contexts. Addressing disparities in infrastructure, teacher capacity, and curriculum relevance is essential to ensure that vocational education fulfills its role in preparing graduates who are not only technically competent but also communicative, digitally literate, and globally competitive.

An Integrative Framework of ICT and Language for Workforce Readiness

This study proposes an integrative conceptual framework that explains how language competence and ICT competence jointly contribute to workforce readiness in vocational education. As illustrated in **Figure 2**, the framework conceptualizes language and ICT as foundational inputs whose effects on graduate outcomes are mediated by key institutional and pedagogical factors.

At the input level, language competence and ICT competence are identified as essential skills for vocational students in the digital era. Language competence enables effective communication, comprehension of technical information, and participation in workplace interactions, while ICT competence supports digital literacy, technology use, and adaptability to digitally mediated work environments. Previous studies have highlighted the importance of both competencies in preparing vocational graduates for contemporary labor market demands, particularly under Industry 4.0 conditions. However, the framework emphasizes that these competencies do not directly translate into workforce readiness.

Their influence is shaped by several mediating factors, namely curriculum alignment, teacher training, and educational infrastructure. Curriculum alignment refers to the extent to which vocational curricula integrate language and ICT in ways that reflect industry needs and occupational practices. Teacher training plays a critical role in enabling educators to design and deliver integrated language-ICT instruction, while adequate infrastructure (including digital tools, internet access, and learning platforms) provides the material conditions necessary for effective implementation. These mediating elements help explain variations in outcomes across institutions and regions, particularly in contexts characterized by unequal resource distribution.

At the output level, the framework links the mediated integration of language and ICT to workforce readiness and global competence. Workforce readiness is reflected in graduates' employability, job-related skills, and capacity to adapt to changing workplace demands, whereas global competence encompasses the ability to operate effectively in digitally connected and internationally oriented environments. By structuring these relationships explicitly, the framework offers a coherent analytical lens for understanding how vocational education systems can better prepare students for both local and global labor markets.

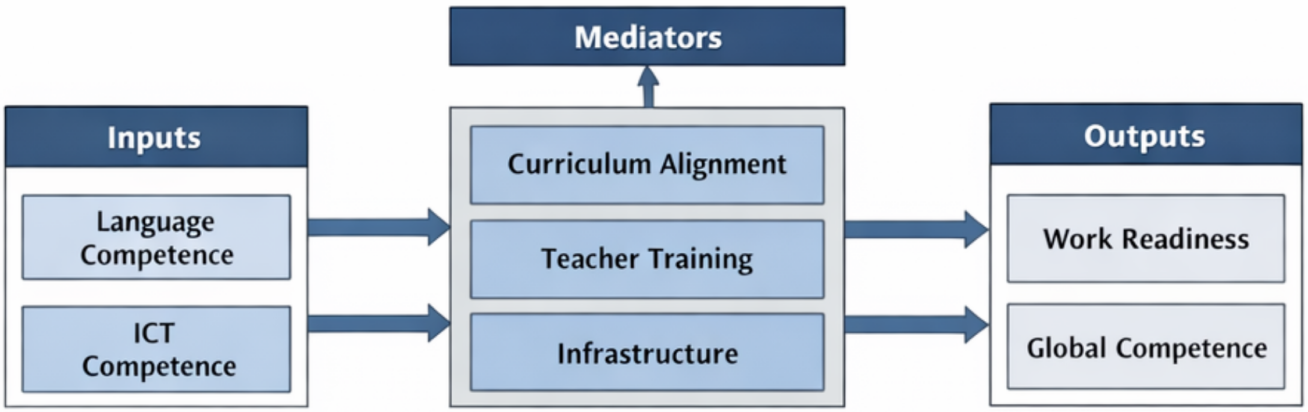

Figure 2: Conceptual framework linking language competence and ICT skills to workforce readiness.

CONCLUSION

This study provides a scoping review of the integration of language competence and ICT in vocational education, supported by bibliometric trends and national contextual data. The findings highlight the growing global attention to language–ICT integration and underscore its importance in preparing workforce-ready graduates in the digital era. By proposing an explicit integrative

framework, this study clarifies how curriculum alignment, teacher training, and infrastructure mediate the relationship between language and ICT competencies and workforce readiness. The model offers theoretical and practical guidance for vocational education stakeholders and supports the achievement of SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth).

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CONFLICT OF INTEREST

Authors confirm that there is no conflict of interest.

CONTRIBUTIONS OF INDIVIDUAL AUTHORS

NH and MK prepared the manuscript and analysis data.

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