

## Comparative Analysis of Digital Competence Education Based on the DigCompEdu Framework in Indonesian and Chinese Higher Education

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### Abstract

*Given the growing importance of digital competence in education, this paper provides a comparative analysis of DigCompEdu-based digital competence education practices in higher education in Indonesia and China. This study uses a systematic literature review combined with policy document analysis to establish how both countries implement digital competence frameworks for educators. Data sources include indexed journal articles and official documents meeting specific criteria related to higher education, lecturers, and DigCompEdu frameworks. The results show that in Indonesia, DigCompEdu is more widely adopted at research and study program levels, particularly in teacher training institutions, while in China, it functions primarily as a normative framework at policy levels. In both countries, relatively strong competency areas include digital resources usage, communication, collaboration, and security, whereas digital assessment, reflective practice, and learner empowerment remain weak. This study recommends developing standardized instruments and explicitly integrating DigCompEdu areas into higher education curricula.*

**Keywords:** Digital Competence Education; Higher education; DigCompEdu in Indonesia; DigCompEdu in China.

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### Abstrak

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*Mengingat semakin pentingnya kompetensi digital dalam pendidikan, artikel ini menyajikan analisis komparatif praktik pendidikan kompetensi digital berbasis DigCompEdu di pendidikan tinggi di Indonesia dan Tiongkok. Penelitian ini menggunakan tinjauan literatur sistematis yang dikombinasikan dengan analisis dokumen kebijakan untuk menetapkan bagaimana kedua negara menerapkan kerangka kompetensi digital bagi pendidik. Sumber data meliputi artikel jurnal terindeks dan dokumen resmi yang memenuhi kriteria terkait pendidikan tinggi, dosen, dan kerangka DigCompEdu. Hasil penelitian menunjukkan bahwa di Indonesia, DigCompEdu lebih banyak diadopsi pada tingkat penelitian dan program studi, khususnya di lembaga pendidikan keguruan, sementara di Tiongkok, kerangka ini berfungsi terutama sebagai kerangka normatif pada tingkat kebijakan. Di kedua negara, area kompetensi yang relatif kuat meliputi penggunaan sumber daya digital, komunikasi, kolaborasi, dan keamanan, sedangkan asesmen digital, praktik reflektif, dan pemberdayaan peserta didik masih lemah. Penelitian ini merekomendasikan pengembangan instrumen terstandarisasi dan integrasi eksplisit area DigCompEdu ke dalam kurikulum pendidikan tinggi.*

**Kata kunci:** Digital Competence Education; Higher education; DigCompEdu in Indonesia; DigCompEdu in China

## INTRODUCTION

The development of digital technology over the past two decades has fundamentally changed the way individuals learn, work, and participate in social, economic, and educational life. In this context, digital competence is understood as a combination of knowledge, skills, and attitudes that enable the confident, critical, and responsible use of digital technology for the purposes of learning, working, and participating in society (Vuorikari et al., 2022). The European Union then formulated the Digital Competence Framework for Citizens (DigComp) as a reference framework for five areas of competence, including information and data literacy, communication and collaboration, digital content creation, safety, and problem solving (Ferrari, 2013; Vuorikari et al., 2022).

Furthermore, in the context of educators, a specific framework was developed, namely the European Framework for the Digital Competence of Educators (DigCompEdu), which maps the digital competencies of educators into six areas, ranging from professional practice, utilization of digital resources, management of learning and assessment, to the empowerment of students and the development of their digital competencies. However, at the higher education level, various scientific reviews show that research on the digital competence of educators and prospective educators originates more from Europe and America, with studies focusing on university lecturers and education program students,

and using different terms and analytical frameworks. Zhao et al. (2021) explain that in order to achieve uniform measurement and facilitate comparison of research results between studies, it is necessary to apply standard frameworks such as DigComp and DigCompEdu. Conversely, Sánchez-Caballé et al. (2020) and López-Núñez et al. (2024) emphasize that measurement instruments must be aligned with internationally recognized competency frameworks, and they also note that the DigComp/DigCompEdu framework has not been uniformly adopted in higher education institutions. This results in the mapping of educators' digital competencies in various countries often using measurement parameters that are not fully in line with international frameworks, making comparisons between studies and meta-analyses more difficult to conduct.

In Indonesia, the strengthening of digital competencies in higher education goes hand in hand with the digital transformation agenda and the discourse on "Society 5.0". Wicaksono and Prasetyo (2023), through a systematic review, show that research on the digital competencies of students in Indonesia emphasizes the importance of digital competencies for civic participation and work readiness, but the terms and dimensions used are still diverse and not always explicitly referred to in DigCompEdu. More recent empirical studies, such as Prasetyo et al. (2025), map the digital competencies of Indonesian students using the Rasch modeling approach and find variations in competency levels based on demographic factors and intensity of internet use, while highlighting the need for more structured mapping based on international competency areas.

In China, national strategies such as "Digital China" and education modernization encourage universities to strengthen the digital literacy and competencies of the academic community. Zhou et al. (2023) mapped the digital competencies of higher education students in China based on constructs aligned with DigComp and found that students performed best in the area of digital safety, while their digital content creation skills were relatively weaker; at the same time, digital competencies were found to be positively related to career adaptability. These findings confirm that digital competencies in China are viewed not only as an academic requirement but also as an important asset for transitioning into the workforce.

Although Indonesia and China both have strong policies and research to strengthen digital competencies in higher education, most studies still focus on one country, one type of institution, or one group of respondents. Cross-country systematic reviews that explicitly use DigCompEdu as a lens

to compare digital competency profiles by mapping study findings to competency areas are still very limited. A cross-country comparative approach with a single frame of reference is important because it allows for the identification of patterns, similarities, and differences in the operationalization of digital competence that cannot be seen in individual studies, while also providing a contextual perspective on the local factors that influence the adoption of international frameworks. In fact, various DigCompEdu validation studies in other contexts show that this framework is flexible enough to be adapted across contexts, while also revealing differences in mastery levels between competency areas.

To address this gap, this study adopts a systematic literature review (SLR) approach that combines bibliographical research, documentary research, and comparative synthesis. This approach was chosen because it is capable of organizing scattered empirical research findings, systematically mapping the operationalization of DigCompEdu in both countries, and revealing similarities and differences in digital competency profiles based on the same international framework. In general, the research procedure includes four main steps: (1) identification and selection of scientific articles through SLR, (2) search and analysis of official documents/policies related to educators' digital competence, (3) preparation of a comparative analysis matrix, and (4) interpretive synthesis of findings related to the operationalization of DigCompEdu in both contexts.

Based on these gaps and methodologies, the research entitled Comparative Study of DigCompEdu-Based Digital Competence Education in Higher Education in Indonesia and China: A Systematic Literature Review aims to: (1) map how DigCompEdu is operationalized and measured in higher education institutions in Indonesia and China, (2) identify the digital competence profiles of educators and prospective educators based on the six DigCompEdu competence areas in both contexts, (3) reveal the similarities and differences in approaches to digital competence development and the contextual factors that influence them, and (4) formulate evidence-based recommendations for strengthening digital competence policies and practices relevant to the local context of each country.

## **LITERATURE REVIEW**

### **The Concept of Digital Competence Education and the DigCompEdu Framework**

The acceleration of digital transformation in the education sector requires educators to master a new set of competencies that are far more

complex than in previous eras. Digital competence at the citizen level is understood as a combination of knowledge, skills, and attitudes that enable individuals to interact with digital technology confidently, critically, and safely, including in responding to the emergence of cutting-edge technologies such as artificial intelligence-based systems (Vuorikari et al., 2022).

Within this framework, DigComp 2.2 was developed as a general reference for public digital competencies covering five main areas—information and data literacy, communication and collaboration, digital content creation, security, and problem solving. Each area is detailed into 21 competencies along with hundreds of observable indicators of knowledge, skills, and attitudes. (Ferrari, 2013; Vuorikari et al., 2022).



Figure 1 DigComp Framework

Based on this generic concept, international literature identifies teacher digital competence as the ability to integrate digital technology into all professional tasks, ranging from learning planning, learning resource management, learning process implementation, assessment, continuous professional development, to facilitating students' digital competence (Castañeda et al., 2018; Esteve et al., 2020). Systematic reviews confirm that educators' digital competence is not limited to technical mastery of ICT, but also includes pedagogical, didactic, ethical, and organizational dimensions that determine how technology can be used to improve the quality of learning in higher education (Esteve et al., 2020; Rodríguez-García et al., 2019).



Dendy Maulana Yusuf, Grace Tofer Claudius Close One Prinsen Wahyudiono, Alya Na'imatur Rosyidah, Faila Sufa Arum Agustina, Ratna Tri Hikmatas Zurro, Muhammad Fajar Wahyudi Rahman. Comparative Analysis of Digital Competence Education Based on DigCompEdu Framework in Indonesian and Chinese Higher Education.

In this study, the term digital competence education refers to the digital competence of educators as operationalized through the European Framework for the Digital Competence of Educators or DigCompEdu (Redecker & Punie, 2017). This framework is seen as a systematic initiative by the European Union to define the characteristics of "digitally competent" educators in facing the challenges of 21st-century learning. The emphasis is not only on technical skills but also on the use of digital technology to strengthen and transform the learning process (Caena & Redecker, 2019).

Structurally, DigCompEdu contains 22 competencies grouped into six areas. Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence (Redecker & Punie, 2017; European Commission, 2024).



Figure 2 DigCompEdu Framework

The Professional Engagement area focuses on the use of digital technology to support professional collaboration and institutional communication. Meanwhile, Digital Resources emphasizes educators' capacity to select, modify, and produce relevant and high-quality digital learning resources. The Teaching and Learning area focuses on planning, implementing, and managing learning experiences that utilize technology pedagogically. Furthermore, the Assessment area promotes the use of digital tools to support formative and summative assessments. The Empowering Learners area relates to differentiation strategies, the application of inclusivity principles, and efforts to encourage active student participation. Facilitating Learners' Digital Competence explicitly positions educators as agents responsible for facilitating the strengthening of

students' digital competence (Redecker & Punie, 2017; Caena & Redecker, 2019).

In addition to formulating competency areas, DigCompEdu also establishes proficiency levels ranging from Newcomer to Pioneer that describe the trajectory of educators' professional development. This framework is complemented by examples of learning practices for each area, which can serve as an implementable guide in the context of higher education. Research on instrument development shows that DigCompEdu can be converted into a self-assessment questionnaire with a high level of reliability. For example, Ghomi and Redecker (2019) reported excellent internal consistency in DigCompEdu-based instruments tested on educators from various European countries. These findings are reinforced by a study by Cabero and Palacios (2020), which shows how the "DigCompEdu Check-In" questionnaire was successfully adapted into Spanish and used as a means of self-reflection for educators to identify their strengths and areas for development in digital competence.

### **Digital Competence Education in Higher Education**

In the realm of higher education, a number of systematic reviews confirm that DigCompEdu has evolved into one of the most influential frameworks for mapping and evaluating the digital competence of lecturers (Esteve et al., 2020). Basilotta-Gómez-Pablos et al. (2022) found that various studies in European universities utilize DigCompEdu or its adapted versions as instruments for measuring lecturers' digital competence, and the results consistently show that the level of competence is in the moderate to moderate-low category, especially in the aspects of digital assessment and student empowerment. Meanwhile, Lopez-Núñez et al. (2024), through a systematic review of digital competency evaluation in higher education, showed that DigCompEdu is the dominant instrument used in Europe and Latin America. However, in Asia, there is still a research gap, both in terms of the number of studies and the quality of instrument validation. These findings indicate that the application of DigCompEdu as a global analytical framework is not yet uniform, requiring comparative research across countries including in Asia to understand how the framework is adapted and implemented in various educational contexts.

Conceptually, the use of DigCompEdu as the basis for digital competence education in higher education has several important implications. First, this framework serves to align the digital competencies of educators with those of students and with institutional policies that

encourage the transformation towards digital campuses (Caena & Redecker, 2019; López-Nuñez et al., 2024). Second, DigCompEdu provides a common terminology and conceptual structure for researchers, educators, and policymakers to design faculty training programs, develop assessment instruments, and formulate indicators for monitoring the gradual development of digital competence (Dias-Trindade & Ferreira, 2020; Cabero & Palacios, 2020). Third, because it is generic and adaptive, DigCompEdu can be adapted to various national contexts, making it relevant as a starting point for conducting comparative studies of educators' digital competence in different higher education systems, such as Indonesia and China. Thus, a comprehensive understanding of the concept of digital competence education and the DigCompEdu framework provides an essential theoretical foundation for the systematic comparative research proposed in this study.

### **Digital Competence Education (DigCompEdu) in Higher Education in Indonesia**

Research on digital competence in higher education in Indonesia in recent years has shown increasingly intensive development, especially in the context of students and pre-service teachers. A systematic review conducted by Wicaksono and Prasetyo (2023) of 20 articles related to the digital competence of students in Indonesia confirms that digital competence is seen as a fundamental prerequisite for academic, social, and civic participation in the era of network society 5.0. However, they note that the number of review studies available is still limited and does not yet show strong methodological coherence. The review identifies three main themes student digital competence, characteristics of digital natives, and engagement in digital learning and recommends the systematic integration of digital competence development into the learning process in higher education.

In the context of teacher education, studies in Indonesia show that digital competence is increasingly positioned as an integral part of digital competence education, which is a planned effort to equip education students with the knowledge, skills, and attitudes necessary for technology-based teaching. Through a systematic literature review of five studies on the digital competence of prospective teachers in Indonesia, Akbar and Biyanto (2022) found that digital competence serves as an indicator of literacy, contributes to improved learning outcomes, and supports a more interactive learning process. However, they also highlighted that a number of studies still refer to general digital competency constructs (based on



DigComp or other digital literacy models) and have not explicitly integrated specific frameworks for educators such as DigCompEdu.

Efforts to develop stronger instruments for mapping the digital competencies of students in Indonesia can be seen in a study mapping the digital competencies of prospective biology teachers conducted by Hidayat et al. (2025). The study developed a Digital Competency Framework-based Questionnaire (DFBQ) for 264 undergraduate education students at a university in Surakarta, consisting of 36 items based on the DigComp framework for citizens and the national digital literacy framework from the Ministry of Communication and Information Technology. The instrument covers the areas of data and information literacy, communication and collaboration, digital content creation, security, and problem solving. Rasch model analysis showed very high person and item reliability, so this instrument is considered effective for mapping the variations and gaps in the digital competencies of prospective teachers in Indonesia. The findings show that many education study programs still rely on the DigComp framework intended for citizens, while the pedagogical dimensions that are at the core of DigCompEdu such as professional engagement, teaching and learning, and assessment are only beginning to receive explicit attention.

The direct application of DigCompEdu in the context of higher education in Indonesia is more evident in a number of studies that assess the digital competence of prospective English teachers. Wardani and Santosa (2022) utilized the DigCompEdu framework and the Check-In instrument to map the digital competence level of prospective English teachers. This study which has since become an important reference in the literature on teacher digital competence in Indonesia shows that most participants are at level B2 (Expert), which describes the ability to use digital technology fluently, creatively, and critically in professional practice and learning. However, the proportion of individuals who have reached the highest levels (Leader and Pioneer) is still limited, requiring further competence development strategies.

These findings are in line with the results of Sumarni's (2023) study of 102 prospective English teachers at a teacher training college in Indonesia using a questionnaire aligned with DigCompEdu. This study identified strengths in the areas of organizational communication, professional collaboration, management and sharing of digital resources, collaborative and self-regulated learning, accessibility and inclusion, and digital content creation. However, relative weaknesses were found in the

Dendy Maulana Yusuf, Grace Tofer Claudius Close One Prinsen Wahyudiono, Alya Na'imatur Rosyidah, Faila Sufa Arum Agustina, Ratna Tri Hikmatas Zurro, Muhammad Fajar Wahyudi Rahman. Comparative Analysis of Digital Competence Education Based on DigCompEdu Framework in Indonesian and Chinese Higher Education. aspects of reflective practice and learning evidence analysis (assessment for and as learning), indicating the need for more targeted training and curriculum reinforcement. These findings indicate that the "technical-pedagogical" aspects of technology utilization in Indonesian higher education tend to be developing, but the dimensions of professional reflection and data-based decision-making which are core components of DigCompEdu still require more attention.

Several other studies in Indonesia have adapted or modified the DigCompEdu Check-In for a broader context, although not all of them are in the realm of higher education. Ari (2023), for example, used a translated and modified version of the instrument to map the digital competencies of teachers in professional learning communities (PLCs) and reported a distribution of competency levels ranging from A2 (Explorer) to C2 (Pioneer), with most respondents at the B1 (Integrator) level. Although this research focuses on school teachers, its contribution is significant for higher education because it shows the existence of local adaptation efforts of DigCompEdu and the development of an Indonesian language version, thus opening up opportunities for its more systematic application in teacher training institutions (LPTK) and other study programs that prepare prospective educators.

Overall, Indonesian literature indicates that digital competence education in higher education is beginning to align with international frameworks such as DigComp and DigCompEdu, particularly in teacher education and English language education programs. However, most of the instruments and interventions used still focus on general digital competence or student digital literacy, while the application of the six full areas of DigCompEdu—professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence has only appeared in a few studies with very specific contextual coverage. This gap highlights the need for comparative research and systematic reviews that explicitly map how DigCompEdu is adapted, operationalized, and integrated into higher education curricula in Indonesia, while comparing the digital competence profiles of educators and prospective educators with international practices.

### **Digital Competence Education (DigCompEdu) in Higher Education in China**

The strengthening of educators' digital competence in Chinese universities is in line with the national smart education agenda and the "National Strategic Action for Education Digitalization" strategy, which

emphasizes improving the digital literacy of teachers and lecturers at all levels. Various policy documents, such as the Education Informatization 2.0 Action Plan, Modernization of China Education 2035, and the technical standard "Digital Literacy of Teachers," place the ability to utilize digital technology for learning, evaluation, and governance as the main targets of higher education transformation. This policy encourages universities to integrate ICT into teaching practices, provide national-scale digital learning resource platforms, and systematically improve the digital literacy and competence of the academic community (Zhou et al., 2023).

At the conceptual level, a number of Chinese academics have begun to adopt DigCompEdu as a reference framework for defining and developing educators' digital literacy or competencies. Feng and Xue (2023) explicitly use DigCompEdu to conceptualize teachers' digital literacy as a set of competencies that include professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence, accompanied by a six-level progression model of proficiency that is aligned with cognitive taxonomy. The article emphasizes that DigCompEdu has the potential to serve as the basis for designing teacher education curricula in Chinese universities and professional development programs for lecturers, as it provides a common conceptual language and a clear structure for strengthening the digital literacy of educators.

Complementing this, Su et al. (2023) conducted a comparative study of various international teacher digital competency frameworks and positioned DigCompEdu as the primary reference for aligning China's national standards on "digital literacy of teachers" with global practices. Their analysis shows that several dimensions of DigCompEdu, particularly professional engagement and empowering learners, are highly relevant to the demands of China's digital education policy, but still require contextual adaptation related to school culture, workload, and the availability of ICT infrastructure.

At the measurement level, the adoption of DigCompEdu in higher education is beginning to be seen through the development of assessment instruments that directly refer to this framework. Peng et al. (2024) adapted and validated DigCompEdu Check-In for the context of higher vocational and technical colleges (HVTCs) in Sichuan using the Rasch measurement model approach. The instrument, which covers the six DigCompEdu domains, was tested on 417 lecturers and was found to meet the criteria for

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At the empirical level, a number of studies have mapped the digital competencies of students and educators by referring to the DigComp and DigCompEdu structures. Zhou et al. (2023) examined the digital competencies of 298 college students in China based on the five areas of DigComp: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. They found that students performed best in the safety dimension but were relatively weak in digital content creation. MANOVA analysis showed significant differences based on gender, type of institution, and level of study, while structural equation modeling showed that digital competence was positively associated with career adaptability, mediated by digital informal learning and academic performance.

On the educator side, a review by Lan et al. (2024) shows that most studies on lecturers' digital competence in China still use the diverse frameworks of "ICT competence" or "digital literacy," and only a few adopt DigCompEdu comprehensively. This study also reveals that research tends to focus on general competency levels, without mapping lecturer profiles based on the six DigCompEdu domains or linking them to teaching effectiveness and student learning outcomes.

In addition to permanent lecturers, a number of studies target pre-service teachers at universities. Dai (2023), for example, used a DigCompEdu-based questionnaire to assess the digital competence of prospective English teachers. The results showed a moderate level of competence with variations between domains: respondents were more confident in the aspects of digital resource utilization and online security, but less confident in digital assessment and learner empowerment. Another study on foreign language teachers in higher education also noted that the instruments used did not refer to proficiency levels such as DigCompEdu Check-In, thus recommending the use of this framework for more precise competency mapping.

Overall, the literature review shows that in Chinese higher education, DigCompEdu is used more as a normative and conceptual framework in the formulation of policies, indicators, and instruments for assessing educators' digital competencies than as a basis for comprehensive empirical research. Many studies only adopt some dimensions of the framework, have not mapped competencies across domains and proficiency levels

comprehensively, and rarely link the DigCompEdu profile to actual pedagogical practices or student learning outcomes. This condition opens up opportunities for comparative research across countries, such as Indonesia and China, which explicitly use DigCompEdu to analyze how educators' digital competencies are operationalized, measured, and developed, as well as to identify gaps between competency areas as a basis for strategies to strengthen digital competence education in higher education.

## METHODS

This study applies an exploratory approach with a comparative analysis design that combines bibliographical research, documentary research, and systematic literature review (SLR) to examine and compare DigCompEdu-based digital competence education in higher education in Indonesia and China. This approach was chosen because it allows for systematic mapping of existing models, instruments, and research findings, while providing a strong basis for identifying similarities and differences between the two countries.

In general, the research procedure consists of four main steps: (1) Identification and selection of scientific articles through SLR, (2) Search and analysis of official/political documents related to educators' digital competence, (3) Preparation of a comparative analysis matrix, and (4) Interpretative synthesis of findings related to the operationalization of DigCompEdu in both contexts.

## Data Sources

The search for scientific articles was conducted through a number of reputable international and national journal databases, including Scopus, supplemented by Google Scholar to minimize the potential for missing relevant publications. The search time frame was limited to the period after the initial publication of DigCompEdu (2017) to the most recent year, considering that prior to that year, the DigCompEdu framework had not been widely adopted in research. In addition to empirical articles, the search also included conceptual reviews and instrument development studies that explicitly used DigComp or DigCompEdu as the main theoretical basis (Redecker & Punie, 2017; Caena & Redecker, 2019).

## Inclusion and Exclusion Criteria

Articles obtained from the initial search were selected based on the following inclusion criteria:



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1. Published in peer-reviewed scientific journals or reputable conference proceedings.
2. Available in full text in English, Indonesian, or Mandarin (with an English translation provided).
3. Focused on the context of higher education (universities, higher vocational colleges, or teacher training institutions).
4. Examine the digital competencies of educators (lecturers, in-service teachers involved in higher education, or pre-service teachers).
5. Using DigComp, DigCompEdu, or a framework explicitly aligned with DigCompEdu areas/levels in the operationalization of concepts and instrument development.

Meanwhile, articles are excluded if:

(1) only discusses general digital literacy among students without linking it to DigComp/DigCompEdu; (2) is in the context of primary or secondary education without direct relevance to higher education; or (3) is in the form of opinion articles, editorials, or practical reports that do not adequately present research methodology.

### **Analysis of Policy Documents and National Standards**

To reinforce the findings obtained through the Systematic Literature Review (SLR), this study also conducted an in-depth review of policy documents and regulations related to digital transformation in education as well as literacy standards and digital competencies of educators in Indonesia and China. In the Indonesian context, the analysis focused on national digital literacy policies, higher education regulations, and various operational guidelines published by relevant ministries. Meanwhile, in the Chinese context, the review focused on strategic policies such as the Education Informatization 2.0 Action Plan, Modernization of China Education 2035, and digital competency standards for educators relevant to higher education.

All documents were analyzed using a content analysis approach to identify how educators' digital competencies were formulated, the categories of competencies that were emphasized, and the extent to which there was explicit or implicit correspondence with the competency areas outlined in the DigCompEdu framework.

### **Development of a Comparative Matrix and Data Synthesis**

Articles that met the inclusion criteria were extracted into an analysis matrix containing key information, including author names and year of publication, country context and type of institution, respondent characteristics, the theoretical framework used, the DigComp/DigCompEdu

area operationalized, the type and characteristics of the measurement instrument (e.g., adaptation of DigCompEdu Check-In, development of a new questionnaire, or application of the Rasch model), the analysis technique used, and key findings related to the digital competence profile of educators.

The matrix was then classified by country (Indonesia and China) to facilitate the identification of comparative patterns, including: (1) how DigCompEdu is understood and implemented, (2) the most frequently measured competency areas, (3) reported proficiency levels, and (4) the relationship between digital competencies and other variables such as learning outcomes, career adaptability, or professional identity. The synthesis process was carried out using a narrative-comparative approach, highlighting patterns of similarity, difference, and gaps that emerged in each country context.

## RESULT AND DISCUSSION

### Findings on Digital Competence Education Practices in Indonesian Higher Education

Overall, the practice of digital competence education in Indonesian higher education is reflected in three main trends: (1) efforts to map the digital competencies of students and prospective educators, (2) the development of assessment instruments that refer to the DigComp and DigCompEdu frameworks, and (3) analysis of the role of digital competencies in improving academic performance and shaping digital citizenship. A summary of ten practices and relevant main frameworks is presented in Table 4.1.

**Table 1.** Summary of Digital Competence Education Practices in Indonesian Higher Education

| Author & Year                           | Context/<br>Respondents                                                  | Form of Digital<br>Competence<br>Practice                                                                         | Main Framework/<br>Instrument                                                          | Findings                                                                                                                                    |
|-----------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Wicakso<br>no &<br>Prasetyo<br>o (2023) | 20 articles on<br>the digital<br>competence of<br>Indonesian<br>students | A systematic<br>review of<br>research on<br>digital<br>competence in<br>Indonesian<br>education,<br>including the | General digital<br>competency<br>framework based on<br>DigComp and digital<br>literacy | Digital<br>competence is<br>seen as a<br>prerequisite for<br>academic and<br>civic<br>participation; the<br>theme is still<br>scattered and |

| Author & Year          | Context/<br>Respondents                                             | Form of Digital<br>Competence<br>Practice                                                                                                        | Main Framework/<br>Instrument                                   | Findings                                                                                                                                                                             |
|------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |                                                                     | context of higher education                                                                                                                      |                                                                 | not yet coordinated with DigCompEdu.                                                                                                                                                 |
| Akbar & Biyanto (2022) | 5 studies on the digital competencies of prospective teachers       | <i>Systematic literature review</i> of digital competencies of prospective teachers as part of professional education preparation                | General digital competency and digital literacy models          | Digital competence serves as an indicator of literacy and a supporter of learning outcomes; most studies have not explicitly adopted DigCompEdu.                                     |
| Prasetyo et al. (2025) | Indonesian students from various study programs                     | Mapping students' digital competency levels using Rasch analysis as a basis for planning competency strengthening in companies                   | The DigComp based instrument was analyzed using the Rasch model | Demonstrating variations in competency levels based on demographic factors and internet usage; emphasizing the need for mapping based on international competency areas.             |
| Hidayat et al. (2025)  | 264 undergraduate education students (prospective biology teachers) | Development of a DFBQ questionnaire to map the digital competencies of prospective teachers as a basis for designing ICT-based learning programs | DFBQ based on DigComp citizens & national digital literacy      | A reliable instrument for 5 areas of citizen competencies; indicating that the focus in many teacher training institutions is still on DigComp citizens, not DigCompEdu pedagogical. |

| Author & Year            | Context/<br>Respondents                                                  | Form of Digital<br>Competence<br>Practice                                                                                                      | Main Framework/<br>Instrument                            | Findings                                                                                                                                                                                         |
|--------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wardani & Santosa (2022) | Prospective English teachers at Indonesian teacher training institutions | Assessment of prospective teachers' digital competencies using DigCompEdu Check-In as part of technology-based teaching practice preparation   | DigCompEdu framework + DigCompEdu Check-In questionnaire | Most prospective teachers are at level B2 (Expert); their use of technology is quite proficient and creative, but the Leader–Pioneer level is still minimal, so further strengthening is needed. |
| Sumarni (2023)           | 102 prospective English teachers at LPTK                                 | Mapping the strengths and weaknesses of prospective teachers' digital competencies as feedback for curriculum and training based on DigCompEdu | Questionnaire aligned with the areas of DigCompEdu       | Strong in communication, professional collaboration, digital resource management, collaborative learning, accessibility & content; weak in reflective practice and assessment for/as learning.   |
| Aningrum et al. (2022)   | Prospective English teachers in Indonesia                                | Measurement of digital competency levels of prospective English teachers based on the /DigCompEdu/ categories                                  | DigCompEdu framework                                     | Mapping the digital competency level of prospective teachers and identifying areas requiring strengthening (particularly in the pedagogical and assessment domains).                             |

| Author & Year | Context/<br>Respondents                                                 | Form of Digital Competence Practice                                                                                                   | Main Framework/<br>Instrument                          | Findings                                                                                                                                                                                                 |
|---------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ari (2023)    | Teachers in <i>Professional Learning Communities</i> (PLC) in Indonesia | Adaptation & use of the translated version of DigCompEdu Check-In for self-reflection and mapping teachers' digital competency levels | Translated and modified version of DigCompEdu Check-In | Shows distribution of levels A2–C2, with a majority at B1 (Integrator); proves that local adaptation of DigCompEdu allows for wider application in teacher training institutions and education programs. |

### Findings on Digital Competence Education Practices in Chinese Higher Education

In the context of China, the practice of digital competence education in higher education is mainly reflected in three key aspects: (1) the integration of the DigComp and DigCompEdu frameworks in the study of educators' digital literacy, (2) the development and validation of instruments to map the digital competencies of lecturers and students, and (3) the strengthening of digital capacity through various national policies, including Education Informatization 2.0, China Education Modernization 2035, and the Digital China initiative. A summary of ten relevant practices is presented in Table 4.2.

**Table 2.** Summary of Digital Competence Education practices in Chinese higher education

| Author & Year     | Context/<br>Respondents                    | Form of Digital Competence Practice                                            | Main Framework/<br>Instrument | Findings                                                               |
|-------------------|--------------------------------------------|--------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------|
| Feng & Xue (2023) | Conceptual (teachers/lecturers in general) | Conceptualization of teacher digital literacy based on six areas of DigCompEdu | DigCompEdu Framework          | Offers a definition and model of teacher digital literacy aligned with |

| Author & Year      | Context/<br>Respondents                         | Form of Digital<br>Competence<br>Practice                                                                                         | Main Framework/<br>Instrument                                                                                                 | Findings                                                                                                                                                  |
|--------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                                 |                                                                                                                                   |                                                                                                                               | DigCompEdu as the basis for teacher education curricula and lecturer training.                                                                            |
| Su (2023)          | EFL teachers in the context of formal education | Analysis of teachers' digital literacy within the framework of TPACK and national standards, with strong reference to DigCompEdu  | Analysis of teachers' digital literacy within the TPACK framework and national standards, with strong reference to DigCompEdu | Analysis of teachers' digital literacy within the TPACK framework and national standards, with strong reference to DigCompEdu                             |
| Peng et al. (2024) | 417 HVTC lecturers in Sichuan                   | Adaptation and validation of the DigCompEdu instrument for vocational college lecturers using the Rasch model                     | Adaptation of the DigCompEdu Check-In questionnaire                                                                           | The instrument meets reliability and validity criteria; DigCompEdu can be used as a standard tool for mapping the digital competencies of HVTC lecturers. |
| Zhou et al. (2023) | 298 higher education students in China          | Mapping of students' digital competencies based on five DigComp areas and analysis of their relationship with career adaptability | DigComp Framework (citizens)                                                                                                  | Students are strong in safety, weak in content creation; digital competencies are positively related to career adaptability & academic performance.       |



| Author & Year        | Context/<br>Respondents                                           | Form of Digital<br>Competence<br>Practice                                                                                          | Main Framework/<br>Instrument                   | Findings                                                                                                                                          |
|----------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Lan et al.<br>(2024) | Studies of university lecturers in China (systematic review)      | A systematic review of research on the digital competence of university lecturers, including those referring to DigComp/DigCompEdu | Various frameworks (ICT competence, DigCompEdu) | Most studies still use general frameworks; full adoption of DigCompEdu and reporting on the six domains plus proficiency levels is still limited. |
| Dai<br>(2023)        | Prospective English teachers (preservice) at Chinese universities | Measuring the digital competence of prospective teachers with a DigCompEdu-based questionnaire                                     | DigCompEdu framework                            | Moderate competency level; strong in digital resources & security, weak in digital assessment and student empowerment.                            |

### Comparative Analysis of Indonesia–China

A comparative analysis of Indonesian and Chinese literature reveals a number of significant similarities and differences for the development of DigCompEdu-based digital competence education in higher education.

First, at the macro policy level, China has a more explicit, comprehensive, and integrated strategic framework in supporting the digitization of education and strengthening the digital literacy of educators. Policies such as Digital China and the National Strategic Action for Education Digitalization directly link the agenda of higher education modernization with improving the digital competencies of teachers and lecturers, so that the integration of DigComp/DigCompEdu is in line with national standards. Meanwhile, in Indonesia, although the national digital literacy agenda and digital transformation of education are developing, the link between DigCompEdu and higher education policy has not been explicitly formulated; its implementation is more often initiated by researchers and study programs than directed by national policy.

Second, at the level of practice and empirical research, Indonesia actually shows a more direct application of DigCompEdu, especially in

studies of prospective teachers—particularly prospective English teachers—and has begun to test instruments such as DigCompEdu Check-In in the local context. On the other hand, in China, DigCompEdu is mostly used as a conceptual framework in policy and regulation, while empirical research tends to use the term digital literacy in general or a multi-framework approach. As a result, the DigCompEdu profiles of lecturers and students have not been systematically documented across the six domains and proficiency levels.

Third, both countries show relatively similar patterns of strengths and weaknesses in competency areas. Indonesia and China both display stronger competencies in the aspects of digital resource use, communication and collaboration, and digital security. Conversely, competencies in the areas of complex digital content creation, digital assessment, reflective practice, and learner empowerment are consistently the weakest areas. These findings indicate that the transition from mere "ICT literacy" to mastery of transformational digital pedagogy remains a major challenge in both contexts.

Fourth, in terms of instrument development and methodological approaches, both countries are still dominated by the use of cross-sectional descriptive surveys with basic statistical analysis. Although studies based on Rasch modeling, confirmatory factor analysis, and mixed methods designs have begun to emerge (e.g., Hidayat et al., 2025; Peng et al., 2024), their number is still limited. Furthermore, in both Indonesia and China, the relationship between educators' DigCompEdu profiles and outcome indicators such as pedagogical innovation, learning quality, student learning achievement, or institutional performance has not been studied in depth.

Overall, both countries are in a similar transitional phase: they both recognize the urgency of educators' digital competence and have begun to adopt the DigComp/DigCompEdu framework, but have not yet fully utilized the potential of this framework to integrate policies, curricula, assessment instruments, and empirical evidence related to its impact on learning practices in higher education.

| Aspect                        | Indonesia                                                                                                                                  | China                                                                                                                          |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Macro policy framework</b> | Digital literacy and digital transformation in higher education are being developed, but explicit references to DigCompEdu are still rare. | The national <i>Digital China</i> strategy and digital education place teacher digital literacy/competence as a key objective. |

| Aspect                               | Indonesia                                                                                                                                        | China                                                                                                                                     |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Position of DigCompEdu</b>        | It appears more frequently in the realm of research and study programs (especially teacher training institutions and English language programs). | It has become a normative reference in policy studies and standards /digital literacy of teachers/.                                       |
| <b>Empirical research focus</b>      | Mapping of students' and prospective teachers' digital competencies; some studies use the DigCompEdu directly.                                   | Combination of policy studies, DigCompEdu instrument development, and empirical studies; many studies still use a general framework.      |
| <b>Strengths</b>                     | Digital resources, communication & collaboration, collaborative learning, accessibility, and basic content.                                      | Digital safety, communication & collaboration, use of digital resources.                                                                  |
| <b>Weak areas</b>                    | Digital assessment, reflective practice, student empowerment, and transformational level (Leader–Pioneer).                                       | Creation of complex digital content, digital assessment, student empowerment; cross-domain mapping across 6 domains is still limited.     |
| <b>Instruments &amp; methodology</b> | Several DigComp-based instruments and adaptations of DigCompEdu Check-In; descriptive surveys are dominant.                                      | Adaptation of DigCompEdu Check-In with Rasch; many studies still use general digital literacy instruments.                                |
| <b>Relationship with outcomes</b>    | Rarely links DigCompEdu profiles to learning outcomes, pedagogical innovation, or institutional performance.                                     | Several studies have linked digital competence with career adaptability and academic performance; among lecturers, this is still minimal. |

### Theoretical and Practical Implications

Theoretically, these research findings confirm that DigCompEdu can be positioned as a shared analytical framework that enables a more

systematic comparison of digital competence education between countries. In both Indonesia and China, this framework demonstrates sufficient flexibility to be adapted into assessment instruments, policy indicators, and curriculum development references. However, in order to conduct cross-context comparisons on an equal footing, consistency is needed in the application of the six areas of competence and proficiency levels of DigCompEdu, accompanied by explicit reporting of results in accordance with the structure of the framework.

In practical terms, these findings have several important implications: Development of a Digital Competence Roadmap for Lecturers and Prospective Lecturers Universities in both countries need to formulate a roadmap for the development of educators' digital competencies based on the DigCompEdu framework. The roadmap should include the establishment of targeted proficiency levels, the determination of priority competency areas such as digital assessment and student empowerment, and mechanisms for periodic monitoring of competency development.

### **1. Roadmap for the development of digital competencies for lecturers and prospective lecturers**

Higher education institutions in both countries need to formulate a roadmap for the development of educators' digital competencies based on the DigCompEdu framework. The roadmap should include the establishment of target proficiency levels, the determination of priority competency areas such as digital assessment and student empowerment, and the formulation of mechanisms for periodically monitoring competency progress.

### **2. Standardization and Local Adaptation of DigCompEdu Instruments**

Standardization and Local Adaptation of DigCompEdu Instruments  
The adaptation process of instruments, including DigCompEdu Check-In, needs to be strengthened through comprehensive psychometric testing in the Indonesian and Chinese contexts. The availability of empirically validated instruments in Indonesian and Mandarin will enable broader, more consistent, and standardized mapping of the digital competencies of lecturers and prospective lecturers.

### **3. Integration of DigCompEdu into teacher training institution (LPTK) curricula and lecturer training**

Dendy Maulana Yusuf, Grace Tofer Claudius Close One Prinsen Wahyudiono, Alya Na'imatur Rosyidah, Faila Sufa Arum Agustina, Ratna Tri Hikmatus Zurro, Muhammad Fajar Wahyudi Rahman. Comparative Analysis of Digital Competence Education Based on DigCompEdu Framework in Indonesian and Chinese Higher Education.

Teacher education and lecturer professional development programs need to integrate DigCompEdu not only as a theoretical foundation, but also as an operational framework for designing technology-based learning, assessment, and pedagogical reflection. This integration can be done through ICT Education courses, professional development workshops, and the formation of professional learning communities (PLC).

#### **4. Strengthening impact-oriented research**

Future research directions need to go beyond descriptive mapping to analysis that assesses the relationship between educators' digital competencies and the quality of learning, pedagogical innovation, and student learning outcomes. The use of mixed methods and longitudinal designs will provide a deeper understanding of how improving digital competencies contributes to real changes in teaching practices and learning outcomes.

Overall, these findings show that although Indonesia and China started from different starting points and policy paths, both are in the process of consolidating DigCompEdu as a reference for the development of educators' digital competencies. Comparative studies such as those presented in this research can be an important foundation for formulating strategies to strengthen digital competence education in higher education that are more focused, evidence-based, and open to cross-country learning.

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