

Evaluating Digital Competence in Early Childhood Care and Education among Preschool Education Students

Lingling Wu

Batangas State University, The National Engineering University, Batangas City 4200, Philippines
Email: 3273741096@qq.com

How to cite this paper: Wu, L. (2026). Evaluating Digital Competence in Early Childhood Care and Education among Preschool Education Students. *Education and Social Work*, 5(3), 1–12. ISSN Print: 3079-515X, ISSN Online: 3079-5168.
<https://doi.org/10.63313/ESW.9172>

Published: 2026-09-10

Copyright © 2026 by author(s) and Erytis Publishing Limited.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Abstract

This study develops a competency-based framework for evaluating how preschool education students use digital technologies in early childhood care and education. It addresses the emphasis on generic software operation, limited coverage of preschool work contexts, and insufficient attention to ethical issues raised by generative artificial intelligence. Policy document analysis, decomposition of representative kindergarten tasks, and course-objective mapping were used to align vocational education standards, teacher digital literacy requirements, kindergarten quality standards, and two technology courses. The framework contains five dimensions, 15 secondary indicators, and observable evidence covering digital ethics, resource development, care and education design, observation and family partnership, and human-AI collaboration. It also proposes a four-level performance rubric and continuous evidence collection across courses, projects, and workplace placement. Child-centered professional judgment, task authenticity, and traceable evidence take priority over isolated technical proficiency. Because the framework has not undergone large-sample validation, expert consultation, inter-rater analysis, and trials across vocational institutions are required.

Keywords

Preschool Education Students; Digital Competence; Competency Evaluation; Vocational Education; Generative Artificial Intelligence

1. Introduction

The revised national teaching standard for the preschool education major identifies information technology as part of students' foundation for sustainable development and requires digital skills that respond to the digital and intelligent transformation of the sector [1,4]. Preschool education students therefore need more than operational familiarity with software. They must be able to use digital tools to address concrete tasks in care, learning activities, play, observation, family

communication, and professional reflection.

Existing university student and teacher digital literacy frameworks provide a useful starting point [2,5-11], but direct application to preschool education leaves several gaps. Generic indicators may not distinguish between producing a technically competent presentation and designing a developmentally appropriate resource for children's play. Typical preschool tasks such as observation, growth portfolios, environmental design, and family partnership are also underrepresented. Generative artificial intelligence (AI) creates a further problem: a student may produce polished material while failing to verify facts, protect children's data, review age appropriateness, or define the boundary between automated assistance and professional responsibility [9,12].

This study constructs a framework for evaluating digital competence in early childhood care and education from the perspective of occupational tasks. It focuses on three questions: what should be evaluated, what observable evidence can support judgment, and how can evidence be collected across learning and workplace practice? The study does not assign permanent weights or claim that the proposed structure has been psychometrically validated. It provides a conceptual and operational basis for later expert review, empirical testing, and workplace validation.

2. Foundations and Evaluation Principles

2.1. Occupational Competence and Professional Standards

Vocational competence is demonstrated through action in a work process rather than through isolated technical operations. A student who can edit an image in class is not necessarily able to select an image for a kindergarten activity, control the amount of visual stimulation, respect copyright, and support children's active exploration. Digital performance should therefore be evaluated through a connected chain of task purpose, children's needs, technology selection, implementation effects, and subsequent revision.

The national teaching standard links information technology knowledge with the ability to organize and assess daily kindergarten activities, design environments, observe children, work with families, and improve practice [1]. These occupational requirements anchor the proposed framework. Digital competence is treated as part of professional action, not as an additional computer-skills module separated from care and education.

2.2. Teacher Digital Literacy and Child-Centered Quality

The national standard for teacher digital literacy covers awareness, knowledge and skills, application, social responsibility, and professional development [2]. Although vocational students are still preparing for the profession, these domains are relevant to their future responsibilities. Assessment must therefore consider technical use

together with ethical responsibility, continued learning, and reflective improvement. The Guidelines for Evaluating the Quality of Kindergarten Care and Education emphasize children's health, developmental patterns, learning through play, the quality of educational processes, and continuous improvement [3]. These principles change how digital quality should be judged. Frequency of use, visual polish, and device complexity are weak indicators unless the technology strengthens direct perception, practical manipulation, meaningful interaction, or documentation while protecting safety and privacy. Child-centered judgment is consequently the governing criterion for every dimension of the framework.

2.3. Definition of Digital Competence in Early Childhood Care and Education

Digital competence in early childhood care and education refers to the integrated occupational capacity of preschool education students to select, use, evaluate, and create digital technologies and AI tools under the requirements of child-centered practice, integration of care and education, and professional ethics. The competence supports daily routines, play and learning activities, environmental design, observation and assessment, family partnership, and professional reflection. It combines digital skills, preschool education knowledge, contextual judgment, and ethical responsibility.

2.4. Evaluation Principles

Five principles guide the framework. First, tasks should come from real or closely simulated kindergarten work rather than decontextualized software exercises. Second, assessment should retain process evidence because a final digital product does not show how information was retrieved, generated, checked, revised, or discussed. Third, every judgment should consider whether technology serves children's development and whether a non-digital approach would work better. Fourth, privacy, copyright, AI hallucination, algorithmic bias, and age appropriateness should function as baseline requirements. Fifth, evaluation should record growth from basic courses to professional courses and workplace placement so that differences in students' starting points do not determine the entire result.

3. Framework Development and Structure

3.1. Development Procedure

The initial indicators were generated by mapping three sets of materials. National vocational education and preschool education standards established the training goals and professional boundary [1-4]. Representative kindergarten tasks, including resource preparation, activity planning, environmental design, support for daily routines, observation, family communication, and reflective teaching, provided the occupational context. Objectives and learning tasks from Information Technology

and Application of Digital Educational Technology were then used to determine whether each indicator could be taught and observed within the curriculum. Candidate indicators were retained when they represented professional practice, could be demonstrated through observable action, allowed feasible evidence collection, and addressed risks associated with AI.

3.2. Five Dimensions and Observable Indicators

The framework contains five primary dimensions and three secondary indicators within each dimension. Dimension A examines whether students use technology within children's rights and professional responsibilities. Dimension B concerns the retrieval, appraisal, adaptation, and creation of appropriate digital resources. Dimension C evaluates the integration of technology into authentic care and education tasks. Dimension D covers the responsible organization of observation information, growth portfolios, feedback, and family communication. Dimension E focuses on task formulation for AI, output verification, revision, and continuing professional learning. Table 1 summarizes the indicators and their core evidence.

Table 1. Dimensions, secondary indicators, and core behavioral evidence

Primary dimension	Secondary indicators	Core behavioral evidence
A Digital awareness and ethics	A1 Child-centered and proportionate use; A2 Data privacy and security; A3 Copyright and AI responsibility	Technology-choice rationale; risk list; privacy-processing record; source and AI disclosure
B Digital resource use and development	B1 Information retrieval and appraisal; B2 Multimodal resource creation; B3 Adaptation and accessibility	Retrieval record; resource appraisal; thematic resource package; revision history
C Digitally supported care and education design and implementation	C1 Activity design; C2 Support for routines and play; C3 Implementation and adjustment	Activity plan; teaching simulation; digital environment plan; observation notes
D Digital observation assessment and family partnership	D1 Observation-record organization; D2 Growth portfolio and feedback; D3 Digital family communication	De-identified record; portfolio sample; communication draft; interpretation note
E Human-AI collaboration innovation and reflective development	E1 Task formulation and prompting; E2 Output verification and revision; E3 Reflection and continued learning	Prompt iterations; verification checklist; version comparison; reflection log

The indicators use observable actions instead of abstract traits. Examples include explaining the risk of uploading identifiable child data, applying de-identification, comparing an AI-generated proposal with an independently developed version, and documenting the basis for accepting or rejecting suggestions. This wording allows teachers to translate the framework into task rubrics and helps students connect ratings with evidence in their own work.

4. Dimensions and Behavioral Evidence

4.1. Digital Awareness and Ethics

This dimension defines the professional baseline. Child-centered and proportionate use requires students to determine whether digital technology is necessary rather than treating screen display as evidence of innovation. Data privacy and security require the minimum necessary use of children's photographs, videos, observation records, health information, and family information, together with de-identification, access control, and a stated purpose. Copyright and AI responsibility require source acknowledgement, disclosure of generated content when appropriate, and verification before use. Evidence may include technology-choice rationales, risk lists, privacy-processing notes, source records, AI-use logs, and oral defense.

4.2. Digital Resource Use and Development

Resource competence extends beyond production technique. Students should retrieve material from traceable and credible sources and identify commercial promotion, misinformation, and content that is unsuitable for young children. Images, audio, video, presentations, and digital stories should be clear, restrained, age appropriate, and aligned with the activity purpose. Adaptation should account for age, developmental differences, and additional learning needs through changes to text size, sound, pacing, and interaction. Theme-based resource packages, appraisal forms, retrieval records, and before-and-after versions provide useful evidence.

4.3. Digitally Supported Care and Education Design and Implementation

Activity plans should state the function of technology, such as presenting an otherwise inaccessible object, documenting a process, or supporting children's expression. Phrases such as 'use multimedia to stimulate interest' are insufficient because they do not explain the educational decision. Assessment should also cover digital support for daily routines, play materials, environmental design, and safety education. During simulation or placement, students should adjust equipment, timing, and organization in response to children and return to a non-digital alternative when technology fails. Activity plans, simulated-teaching videos, environmental designs, and observation notes can document this performance.

4.4. Digital Observation Assessment and Family Partnership

Digital tools can organize observation records, but students must separate observed facts from interpretation and suggested action. AI output or spreadsheet summaries should not be used to label a child or convert limited observations into a diagnosis. Growth portfolios should contain representative work, photographs, and records, be managed lawfully, and show change over time. Digital family communication should be accurate, respectful, proportionate, and consistent with the kindergarten's norms. AI-assisted replies require professional revision. De-identified observation records,

portfolio samples, communication drafts, and revision notes provide evidence.

4.5. Human-AI Collaboration Innovation and Reflective Development

The relevant question is not whether a student can obtain an AI output, but whether the collaboration improves professional work without displacing judgment. Students should specify the role, audience, goal, and constraints of a task; check factual accuracy, policy consistency, developmental appropriateness, copyright, and possible bias; and revise the output substantially when required. They should also document their contribution, identify limitations, and decide whether AI was necessary for the task. Prompt iterations, verification checklists, version comparisons, and reflective logs make this process visible.

5. Four-Level Performance Rubric

Each secondary indicator can be described across four performance levels rather than through labels such as excellent, good, pass, and fail. The levels specify what students can do and how independently they can justify a decision. Table 2 presents the common progression that should be adapted to the behavior measured by each indicator.

Table 2. Four-level performance descriptors

Level	Performance characteristics	Main evaluation question
1 Entry	Completes basic operations under explicit guidance; depends on examples; provides limited professional justification	Can the student complete the basic task safely?
2 Competent	Completes common contextual tasks independently and generally follows child-centered and professional requirements	Can the student transfer the tool to a care and education task?
3 Proficient	Selects technology, verifies information, adapts the plan to children and context, and explains the decision	Can the student justify the choice with a traceable evidence chain?
4 Advanced	Integrates tools and professional knowledge to address complex tasks, manages risk, iterates the solution, and supports peers	Does the work demonstrate transferable professional judgment and responsible innovation?

For AI output verification, for example, an entry-level student largely accepts generated text and changes only the language. A competent student identifies and checks obvious factual errors. A proficient student reviews policy, child development, language appropriateness, copyright, and bias, then explains the revisions. An advanced student develops a repeatable verification process, compares AI output with professional literature, workplace experience, and peer feedback, and considers whether AI added value.

Several practices should be treated as threshold violations. Uploading identifiable information about a real child to an unauthorized platform, presenting AI-generated health advice as a professional conclusion, or publicly distributing children's

photographs from an unknown source requires the task to be redone even when the product is technically accomplished. This rule makes digital ethics a condition of professional acceptability rather than an optional source of additional marks.

6. Implementation Across Courses and Workplace Practice

6.1. Information Technology

The foundation course establishes baseline evidence in information retrieval, file collaboration, data processing, multimedia production, online security, and basic AI use. Its materials should already reflect preschool contexts. Students might structure a kindergarten activity-material list from public or simulated data, convert policy information into a table, or compare the credibility of two online parenting resources. The course ends with a baseline portfolio that the professional course can use as a starting point.

6.2. Application of Digital Educational Technology

The professional course tests whether foundational skills transfer to care and education tasks. Projects can include thematic digital resources, digital stories, environmental designs, observation tools, and family communication materials. A single task should normally provide evidence for several dimensions. An AI-assisted science activity, for example, can assess resource development, activity design, output verification, and ethical judgment at the same time.

6.3. Shared Portfolio and Integrated Project Defense

A shared electronic portfolio should organize work by the 15 indicators rather than by textbook chapters. It may include an initial draft, teacher and peer feedback, AI suggestions, a revised version, and a short reflection. This organization makes the development process visible and gives teachers in different semesters a common evaluation language.

At the end of the professional course, students can complete a digital care and education project package based on a theme or daily kindergarten situation. The package should include an activity plan, resources, an observation tool, family communication material, and a risk statement. During the defense, teachers should ask why technology was chosen, whether the goal could be achieved without it, how the choice supports children, what risks remain, and how AI output was changed. These questions reveal professional judgment more clearly than a list of software operations.

6.4. Continuity into Workplace Placement

Coursework demonstrates what students can do in simulated settings; placement shows whether they can sustain the same judgment with real children and actual work rhythms. College and kindergarten mentors can jointly select a small group of

high-value indicators, such as proportionate technology selection, alignment between resources and activity aims, child-data protection, observation quality, professional family communication, and responsible AI use. Evidence should come from naturally produced plans, records, reflections, and mentor observations so that evaluation does not create an additional assessment burden for children.

Workplace feedback should also revise the curriculum. If students produce attractive resources but struggle to regulate activities, campus tasks should include equipment failure, changes in children's attention, and other complex situations. If students depend on generic AI templates for family communication, instruction should give more attention to individualization, respectful language, and factual boundaries. Evaluation then becomes a source of course improvement as well as a method of grading.

7. Assessment Tasks and Evidence Collection

7.1. Resource Appraisal

Students can be given materials on the same theme from an education authority, a commercial platform, social media, and AI generation. They determine whether each item is suitable for kindergarten use and explain the decision in terms of accuracy, age appropriateness, copyright, bias, and intended purpose. Higher performance includes proposing a credible replacement or a justified adaptation rather than merely ranking sources.

7.2. Activity Design

A useful design task follows a human-first sequence. Students first draft the activity objective and core process independently, then ask AI for alternatives, and finally submit a comparison explaining what the system contributed, which suggestions were rejected, and why the final plan better fits children's development. This process can provide evidence for activity design, task formulation, output verification, and reflective development without turning prompt production into the sole criterion.

7.3. Observation and Family Communication

A simulated observation record can combine observable behavior, a teacher's interpretation, and an unsupported AI inference. Students reorganize the material under facts, possible interpretation, further observation, and communication suggestions, then prepare a message for the family. Assessment focuses on whether they avoid labeling a child on the basis of one event and use digital tools to organize evidence rather than replace professional judgment.

7.4. Integrated Project and Lightweight Evidence

An integrated task can require a digital resource package, activity plan, observation

tool, family communication material, risk list, and reflection for a theme week or daily schedule. The materials must be internally consistent. A plan that emphasizes children's exploration but relies on uninterrupted explanatory video should be rated as poorly aligned even if the video is polished.

Evidence collection should remain proportionate. Each task may retain three meaningful versions, one source record, one AI-use note, and a focused reflection instead of every click or system log. Teachers should be able to reconstruct the student's decisions from this limited record. Collecting excessive data in the name of digital assessment would contradict the framework's own privacy and workload principles.

8. Scoring Feedback and Continuous Improvement

8.1. Roles and Rubric Calibration

Students, peers, course teachers, and workplace mentors can all contribute evidence, but their ratings should not be averaged mechanically. Self-assessment promotes understanding of the target and reflection. Peer review expands exposure to alternative cases. Course teachers retain responsibility for academic evaluation, while workplace mentors comment primarily on authenticity and usability.

Before scoring, teachers should calibrate the rubric with two or three anonymous samples representing different levels. When two teachers or two courses use the same rubric, they should first score the samples independently and then discuss differences in interpretation. Later validation can estimate inter-rater reliability, but sample-based calibration already reduces impressionistic grading in routine teaching.

8.2. Self Peer and Workplace Feedback

Self-assessment should take place before final submission and cite evidence from the work. A student should not simply claim proficiency, but identify the comparison made, the criterion used, and the revision completed. Peer review is more manageable when it focuses on a few questions, such as child-centered use, information accuracy, and AI verification, and produces one actionable suggestion. Workplace mentors should address whether the resource fits the children's experience, increases teacher workload, follows local communication norms, and has a practical alternative if technology fails.

8.3. Diagnostic Profiles and Reassessment

A single total score conceals important differences. A student may be proficient in resource development but remain at entry level in privacy protection, or may have modest technical skills and sound professional judgment. Feedback should therefore provide a dimension profile and a specific next task. Class-level results can also identify curriculum weaknesses, such as low performance in output verification,

implementation control, or family partnership.

Students who need further development should be allowed to revise a product and resubmit the critical evidence. Reassessment fits the iterative nature of digital work and makes growth visible. For employment or placement, students should select a small evidence package rather than disclose every process record. A resource appraisal, a teaching simulation, an observation record, and an AI-verification note often show occupational competence more clearly than a single software certificate.

9. Implementation Safeguards and Future Validation

9.1. Safeguards

Implementation should avoid five distortions. More technology should not automatically receive a higher rating; a low-technology or non-digital solution may demonstrate stronger judgment. AI-detection scores should not replace review of the student's process, oral explanation, versions, and sources. Personal data collection should follow the minimum necessary principle and favor simulated or de-identified records with clear access and retention rules. Stable principles, including child-centered practice, integration of care and education, information security, and professional responsibility, should be reviewed separately from rapidly changing tool operations. Finally, the same indicator language should appear in task briefs, feedback, peer review, and reflection instead of being introduced only for final grading.

9.2. Contributions Limitations and Validation

The framework can support curriculum mapping by showing where an indicator is missing, duplicated, or confined to a course with limited teaching time. It can guide course teams in identifying shared weaknesses, help students understand the progression from operation to selection and revision, and give college and kindergarten mentors a common language for discussing performance. These uses remain proposals until they are tested in practice.

The present study develops a conceptual framework and preliminary behavioral indicators. It does not test the dimensional structure with a large sample or establish statistical weights. Further work should use Delphi consultation with specialists in preschool education, educational technology, and kindergarten practice; examine inter-rater agreement on student products; conduct trials in different types of vocational institutions; and compare indicator performance across courses, training projects, and workplace placements. Digital portfolios and AI-assisted evidence organization may be explored under strict privacy controls, but final professional judgment should remain with qualified teachers and workplace mentors.

10. Conclusion

Digital competence in early childhood care and education is demonstrated when students turn technical resources into responsible professional action. An evaluation centered on software operation or product appearance cannot capture the judgments required in preschool practice or the new risks associated with generative AI. The proposed framework organizes those judgments into five dimensions and 15 observable indicators, supported by a four-level rubric, varied evidence, and continuous assessment across courses and workplace placement. Its central criteria are whether technology serves children's development, fits the task, protects rights and information, and can be explained and improved. The next step is empirical validation and revision based on scoring evidence and workplace use.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During manuscript preparation, the author used OpenAI's ChatGPT to improve readability and English expression. The author subsequently reviewed and revised the material and accepts full responsibility for the published content.

References

- [1] Ministry of Education of the People's Republic of China. (2025). Teaching standards for the preschool education major in higher vocational education [Standard].
- [2] Ministry of Education of the People's Republic of China. (2022). Notice on issuing the education industry standard Digital Literacy for Teachers (Jiao Ke Xin Han [2022] No. 58) [Policy document].
- [3] Ministry of Education of the People's Republic of China. (2022). Guidelines for Evaluating the Quality of Kindergarten Care and Education (Jiao Ji [2022] No. 1) [Policy document].
- [4] Ministry of Education of the People's Republic of China. (2025, February 11). 758 revised vocational education teaching standards released [Online document].
- [5] Feng, J. F., Wang, Y. N., & Bai, Y. T. (2022). The landscape and prospects of research on teachers' digital competence: An analysis of international literature. *Teacher Education Research*, 34(2), 118-128. [In Chinese]
- [6] Li, X. J., & Wang, Y. (2021). Technology empowerment: The meaning, challenges, and improvement of digital literacy among vocational college teachers. *Chinese Vocational and Technical Education*, (23), 31-37, 45. [In Chinese]
- [7] Zhou, L. B., Zhang, M. Y., & Zhang, C. H. (2023). Cultivating teachers' digital literacy amid digital transformation: Contemporary value, practical difficulties, and paths forward. *China Educational Technology*, (10), 98-105. [In Chinese]
- [8] Wang, Y. Z., Cheng, Y., & Li, L. J. (2023). The expanded meaning, practical difficulties, and development paths of vocational college teachers' digital literacy in the digital-intelligence era. *Education and Vocation*, (9), 87-90. [In Chinese]
- [9] Zhu, S., Li, J. Y., Kuang, X. L., et al. (2025). How generative artificial intelligence can support students' digital literacy: Evidence from information technology courses. *China Educational Technology*, (2), 75-83. [In Chinese]
- [10] Gao, X., Shi, Y. Z., & Peng, M. H. (2026). Research on teachers' digital literacy: Theoretical meaning, evaluation systems, and development paths. *Vocational Technology*, 25(4), 8-18. [In Chinese]
- [11] Li, S., & Zhao, X. (2026). The meaning, practical difficulties, and implementation paths of digital literacy development among higher vocational students. *Vocational Technology*,

- 25(4), 68-75. [In Chinese]
- [12] Chen, L. J., Wang, X. Q., & Lin, P. P. (2026). AI-enabled design and implementation of whole-group teaching activities in kindergartens. *China Educational Technology & Equipment*, (7), 44-48. [In Chinese]