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Research on the Cultivation of Intelligent Literacy of Preschool Education Majors in Higher Vocational Colleges under the Background of Industry – Education Integration

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ABSTRACT

Under the background in which industry–education integration and generative artificial intelligence are jointly reshaping the professional competence of preschool teachers, higher vocational preschool education programs urgently need to integrate intelligent literacy cultivation into the entire talent cultivation process. Based on the Modern Educational Technology course of the preschool education program in a higher vocational college, this study constructed a cultivation chain of "post tasks – platform tools – project works – competency profiles", and conducted an empirical study using 735 pre-test and 579 post-test questionnaires as well as 63 group final works from six classes. The results show that the overall mean score of students' intelligent literacy increased from 3.347 to 3.621 ($t = 8.155$, $p < 0.001$), with notable improvements in dimensions such as technical operation, resource acquisition and evaluation, and teaching integration and innovation; the mean score of the final works was 80.54 ± 8.43, with 65.1% of the groups reaching 80 points or above; and the correlation between post-test self-assessment and work performance was not significant. Accordingly, this paper proposes cultivation pathways including backward design of courses based on real post tasks, supporting the complete work process with "authoritative resources + professional intelligent tools + classroom interaction platforms", constructing competency profiles through multi-evidence evaluation, and connecting internship and employment through industry – education collaboration, so as to promote the transformation of intelligent literacy into verifiable and transferable professional competence.

KEYWORDS

Industry–education integration; Higher vocational preschool education; Intelligent literacy; Cultivation pathway

1 Introduction

Artificial intelligence is transforming from a general-purpose information tool into an important technical condition for educational resource generation, instructional design, interactive presentation, learning evaluation, and home – kindergarten communication. The Outline of the Plan for Building a Strong Education Nation (2024 – 2035) proposes opening up new tracks and shaping new advantages for educational development through educational digitalization , and the Opinions on Accelerating the Digitalization of Education further require integrating digital literacy into teacher education and the entire process of education and teaching[1]. The policy of industry–education integration in vocational education emphasizes that enterprise needs should enter the processes of specialty planning, curriculum design, teaching design, internship and practical training, and employment services[2]. This means that technology courses in higher vocational preschool education can no longer remain at the level of explaining software menus, but should face the real work processes of kindergartens, childcare institutions, and children's service organizations, cultivating students' ability to select, evaluate, and creatively use digital technology and artificial intelligence under the constraints of child development laws, educational goals, and professional ethics. Existing research mostly focuses on defining the connotation of intelligent literacy and constructing frameworks, while systematic exploration of cultivation pathways for intelligent literacy in the context of industry–education integration remains insufficient. Based on the curriculum reform practice of the preschool education program in a higher vocational college, this paper explores practical pathways for cultivating the intelligent literacy of higher vocational preschool education students, aiming to provide references for similar institutions.

2 Importance of Cultivating Intelligent Literacy of Higher Vocational Preschool Education Students

2.1 Inherent Requirement for Implementing the Policies of Educational Digitalization and Industry – education Integration

Educational digitalization is an important breakthrough for opening up new tracks and shaping new advantages in educational development. As the starting point of the national education system, preschool education is directly related to the quality of education through the digital and intelligent literacy of its teachers. Preschool teachers cultivated by higher vocational preschool education programs work long-term at the frontline of kindergartens and childcare institutions; they must not only master child development laws and childcare skills, but also possess the ability to use

digital technology to organize activities, observe and evaluate, and communicate between home and kindergarten. The Ministry of Education's industry standard Teacher Digital Literacy defines teachers' abilities in terms of digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development[3]. The industry–education integration policy further requires vocational colleges to integrate enterprise post needs into the entire talent cultivation process. Only by placing intelligent literacy cultivation in a prominent position within the curriculum system and cultivation links can higher vocational preschool programs ensure that talent cultivation keeps pace with the digital transformation of the industry. When revising its talent cultivation plan, a higher vocational college incorporated "the ability to use digital technology and artificial intelligence tools to support childcare and education work" into the graduation requirements of the specialty and added an intelligent tool application module to the Modern Educational Technology course, which is a concrete manifestation of implementing the policy requirements.

2.2 Responding to the Practical Needs of Intelligent Post Transformation

Currently, post work in kindergartens and childcare institutions is undergoing profound changes. Intelligent teaching all-in-one machines, child observation recording platforms, home–kindergarten communication apps, and generative AI courseware generation tools are gradually entering daily childcare and education scenarios. New requirements such as digital resource acquisition and evaluation, multimedia courseware and micro-lecture production, and informatized home–kindergarten communication have been added to the professional competence structure of preschool teachers, and employers increasingly value graduates' information technology application and digital resource integration abilities in recruitment. At the same time, artificial intelligence ethics issues are becoming increasingly prominent; preschool teachers need to judge the boundaries of technology use under the constraints of child-centeredness and childcare ethics, avoiding excessive reliance on technology and neglect of children's real experiences. These changes require talent cultivation in higher vocational preschool programs to shift from "knowing how to use software" to "making good use of technology for education". Therefore, intelligent literacy cultivation has become a key link in improving graduates' post adaptability.

3 Practical Difficulties in Cultivating the Intelligent Literacy of Higher Vocational Preschool Students

3.1 Disconnection between Course Content and Post Needs

In some institutions, modern educational technology courses still focus on generic skill training such as office software and courseware production; the course content lags behind and lacks alignment with real kindergarten work tasks. Zhao Yirong pointed out that under the background of "AI + education", higher vocational preschool education programs still face problems such as lagging course content, insufficient teacher digital literacy, and a lack of intelligent practical resources, and should carry out an overall reconstruction from the aspects of training objectives, curriculum system, practice fields, and evaluation mechanisms[4]. Fang Fengwen's survey of 2,066 higher vocational students also showed that students' overall artificial intelligence literacy is at an upper-middle level, but their understanding of basic principles, specialty integration, teacher support, and practice platforms remains insufficient[5]. There is a gap between the technical operations students learn and the intelligent tools actually needed at posts, and the problem of disconnection between learning and application is prominent.

3.2 Insufficient Support from Practice Platforms and Intelligent Tools

The cultivation of intelligent literacy requires sufficient practice fields. However, some institutions have limited practical training conditions, lacking support such as digital resource libraries for young children and virtual simulation teaching environments, so students lack opportunities to practice in environments close to real posts. The connection between on-campus practical training and kindergarten internships is not smooth; the informatized equipment students encounter during kindergarten internships is inconsistent with what they learn on campus, hindering competence transfer. Some institutions have not yet established mechanisms for the co-construction and sharing of digital resources, and duplicate construction and resource silos coexist, further exacerbating the insufficient supply of practical resources.

3.3 Imperfect Competence Evaluation Mechanism

Intelligent literacy is an implicit and comprehensive competence that is difficult to fully measure through end-of-term written examinations or operational assessments alone. Bai Hongli summarized the intelligent literacy of preschool normal students into four aspects—intelligent awareness, intelligent knowledge, intelligent application, and intelligent morality—and pointed out problems such as the disconnection between application and teaching and weak moral

responsibility[6]; Wang Xiaojin et al. found that students have low interest in self-directed learning of intelligent knowledge, with low scores in intelligent knowledge and intelligent application[7]. Gao Jingyi divided normal students' intelligent literacy into six dimensions—awareness and attitude, knowledge and skills, intelligent teaching, intelligent thinking, ethics and morality, and learning and development[8], while Zhang Yong et al. proposed a "four-in-one" artificial intelligence literacy framework of morality, teaching, educating, and development[9]. These studies jointly show that intelligent literacy cannot be equated with the ability to use a few tools; existing evaluations are mainly based on teachers' subjective scoring and questionnaire self-assessment, lacking support from multi-source data such as work evidence and process performance, making it difficult for evaluation results to reflect students' real intelligent application levels.

3.4 Weak Teacher Literacy and Industry–education Collaboration Mechanisms

Intelligent literacy cultivation places higher demands on teachers. Some teachers themselves have insufficient digital literacy and limited understanding of new tools such as generative artificial intelligence, making it difficult for them to demonstrate and lead in teaching. Meanwhile, school–enterprise cooperation mostly remains at the level of internship placement; kindergartens and childcare institutions are not deeply involved in curriculum construction, teacher training, or project guidance, and a genuine mechanism for industry–education collaborative education has not yet been formed.

4 Practical Exploration of Intelligent Literacy Cultivation under Industry–Education Integration

To address the above difficulties, the preschool education program of a higher vocational college carried out reform relying on the Modern Educational Technology course, constructing a cultivation chain of "post tasks–platform tools–project works – competency profiles" and implementing industry – education integration requirements throughout curriculum design, teaching implementation, evaluation feedback, and internship and employment.

4.1 Backward Design of Course Content based on Real Post Tasks

The course takes the real work tasks of preschool teacher posts as its logical starting point and transforms post tasks into learning projects. The teaching team conducted research in kindergartens and childcare institutions, sorted out typical tasks such as digital resource acquisition and evaluation, multimedia courseware production, micro-lecture video shooting, home–kindergarten communication graphic production, and digitalization of children's growth archives, and accordingly designed a project sequence of "digital resource retrieval and copyright judgment—courseware and poster design—micro-lecture production—platform article creation—digitalization of children's archives". Each project specifies clear post scenarios, task requirements, and outcome standards, enabling students to simultaneously develop intelligent awareness, intelligent knowledge, and intelligent application abilities in the process of completing projects. Here, industry–education integration is reflected in the shift of course objectives from a technology-knowledge logic to a complete-work-process logic, with the minimum unit of technology learning transformed from "function buttons" to "complete work processes"[10].

4.2 Supporting the Complete Work Process with Professional Tool Platforms

The course established a trinity support system of "authoritative resources + professional intelligent tools + classroom interaction platforms". At the resource level, the National Smart Education Platform for Primary and Secondary Schools and preschool education digital resource libraries were integrated to ensure the authoritative sources and clear copyrights of materials; at the tool level, general tools such as Seewo whiteboard, WJX (Questionnaire Star), and Jianying (CapCut) were introduced, together with intelligent tools suitable for preschool education scenarios such as courseware generation and poster design, covering resource acquisition, content generation, media processing, and interactive presentation; at the platform level, classroom interaction platforms were used to realize work submission, peer evaluation, and data traceability. All outputs must pass the five-step review of "source verification—age-appropriateness review—objective review—copyright and privacy review—manual rewriting", guiding students to form the professional habit of "judge first, then use". Given the young age of preschool children, risk control should be stricter; high-risk data involving children's real photos, health conditions, and family information should, in principle, not be uploaded to public generative artificial intelligence services[11].

4.3 Forming Competence Evidence with Project Works

The course organizes learning outputs in an outcome-oriented manner. Each student group completes several

displayable works around real tasks, including teaching courseware, themed posters, parent–child activity albums, micro-lecture videos, and platform articles. Works are both learning outcomes and visualized evidence of competence. Teachers formulate itemized scoring standards, evaluating work quality from dimensions such as content scientificity, technical standardization, child appropriateness, and creativity and expression, and invite kindergarten teachers to participate in scoring, enhancing the industry credibility of evaluation and helping students establish the professional awareness that "works are proof of competence".

4.4 Constructing Competency Profiles with Multi-dimensional Evaluation

To overcome the limitations of a single evaluation, the course established a multi-evidence evaluation mechanism of "questionnaire self-assessment + work scoring + process performance". Self-assessment questionnaires on intelligent literacy were conducted before and after the semester to collect data on changes in students' awareness, knowledge, skills, application, and ethics; itemized scoring was conducted on group works at the end of the semester; and process performance such as classroom participation and group contributions was recorded on a regular basis. Multi-source evidence converges to form student competency profiles, which are used both to diagnose teaching weaknesses and to provide a basis for subsequent internship post arrangement and employment services.

4.5 Connecting Internship and Employment Services Through Industry–education Collaboration

The curriculum reform is connected with internship and employment services. The college and partner kindergartens jointly formulated internship task lists, incorporated course project outcomes into internship archives, and internship kindergartens arranged appropriate posts based on competency profiles, realizing continuous evaluation of on-campus learning and post practice. At the employment stage, the college matches competency profiles with post needs, providing portfolios and competency certificates when recommending students to employers, and enhancing the explainability of recommendations. Industry–education collaboration extends intelligent literacy cultivation from within the course to the post field, forming a closed loop in which cultivation and employment reinforce each other.

5 Implementation Results and Discussion

5.1 Significant Improvement in Students' Intelligent Literacy

After the course implementation, the research team conducted pre-test and post-test comparisons. A total of 735 valid questionnaires were collected in the pre-test and 579 in the post-test; after data cleaning, 460 paired samples were obtained, and 63 group final works from six classes were included. The results show that the overall mean score of students' intelligent literacy increased from 3.347 to 3.621, with an average increase of 0.274; the paired-sample t-test result was $t(459) = 8.155$, $p < 0.001$, Cohen's $d_z = 0.380$. All six dimensions showed positive changes; among them, technical operation, resource acquisition and evaluation, and teaching integration and innovation increased by 0.362, 0.365, and 0.363 points respectively, with the most notable improvements, indicating that the synergy of real tasks and tools can effectively promote the formation of operable and displayable abilities. The increases in digital ethics and safety and communication and collaboration were relatively small, suggesting that ethical judgment and team responsibility still require more real conflict scenarios and continuous tracking. The differences among the six classes were not significant, indicating that the reform effect has universality.

5.2 Structural Characteristics of the Project Works

The final works generally reached a good level, with a mean score of 80.54 ± 8.43 and 65.1% of the groups reaching 80 points or above. By item, posters and parent–child albums had the highest average scoring rate of 86.40%, indicating that students performed well in resource acquisition, layout design, and visual expression; micro-lecture videos and platform articles had scoring rates of 77.30% and 76.67% respectively, which were relatively weak, reflecting that teaching presentation and home–kindergarten communication abilities still need to be strengthened. The correlation between post-test self-assessment and work performance was not significant ($r = 0.119$, $p = 0.355$), indicating that self-assessment, works, personal operation, and process contribution measure different aspects and must jointly enter competence judgment.

5.3 Existing Problems and Optimization Directions

The practice also revealed some problems. First, no control group was set up in the course, so the pre-test–post-test

changes should not be interpreted as strong causal evidence; second, group work scoring makes it difficult to fully identify individual contributions; third, the research mainly used one semester of questionnaires and course works, and still lacks tracking evidence from the internship period and after employment. In the future, individual operation tests, on-site defenses, and real-task evaluations in kindergartens should be added to improve the intelligent literacy evaluation system; collaboration with kindergartens and childcare institutions in course co-construction, dual-mentor guidance, and post practice should be deepened; and the sample scope should be expanded with continuous tracking of graduates' post adaptation, so as to test the long-term effects of the cultivation pathways[12].

6 Conclusion

Cultivating the intelligent literacy of higher vocational preschool students is a systematic project requiring overall efforts in curriculum, platforms, evaluation, teachers, and industry–education collaboration. Taking the reform of the Modern Educational Technology course as an example, this paper constructed a cultivation chain of "post tasks–platform tools–project works–competency profiles". The study shows that reconstructing courses with real post tasks, supporting the complete work process with professional tool platforms, constructing competency profiles with multi-evidence evaluation, and connecting internship and employment through industry–education collaboration can effectively improve students' intelligent literacy and promote its transformation into professional competence. In the future, school–enterprise collaboration should be further deepened, evaluation mechanisms improved, and the cultivation of intelligent literacy promoted from curriculum reform to the systematic reconstruction of the entire talent cultivation process.

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