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Exploration of Digital Transformation Schema for Professional Degree Postgraduate Training

Man Liu

Information Network and Data Center, China University of Geosciences (Beijing), Beijing, China
Email: liuman@cugb.edu.cn

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Abstract

Professional degree postgraduate education is the strategic focus of the reform and development of postgraduate education in China, and the digital transformation of education is also the strategic theme of the reform and development of education in China. This paper analyzes the current situation of informatization of professional degree postgraduate training in China, and puts forward the construction scheme of digital comprehensive service platform for professional degree postgraduate education and teaching based on the actual situation of China University of Geosciences (Beijing). It focuses on three aspects: postgraduate education information management, intelligent online teaching and teachers' digital literacy improvement. The article also discusses the significance of the digital ecology of the education industry and the entire country for the evaluation of the cultivation of professional degree postgraduates in colleges and universities.

Keywords

Professional Degree Postgraduate, Information Technology, Education Digitization

1. Introduction

The Plan for the Development of Professional Degree Graduate Education (2020-2025) points out that facing the new requirements of the new era, there are still some problems in professional degree postgraduate education. The plan clarifies that the development of professional degree postgraduate education is an important path to actively serve the construction of an innovative country, and the development of professional degree is a strategic focus of degree and postgraduate education reform and development. The plan clearly states that the development goal of professional degree postgraduate education is to add a

group of master's and doctoral degree categories with a focus on national major strategies, key fields, and major social needs by 2025, expand the enrollment scale of master's and doctoral degree postgraduate students to about two-thirds of the total enrollment scale, significantly increase the enrollment number of doctoral degree postgraduate students, and further innovate the training mode of professional degree postgraduate students, make the mechanism for integrating industry and education more sound, connect professional degrees with vocational qualifications more closely, optimize the development mechanism and environment, significantly improve the level of education quality, and establish a flexible, standardized, integrated industry and education, high-quality, efficient, and compliant professional degree postgraduate education system. We will vigorously improve the quality of professional degree postgraduate education by strengthening the construction of the professional degree postgraduate supervisor team, deepening the reform of the integrated industry education professional degree postgraduate training model, and improving the evaluation mechanism of professional degree postgraduate education.

At the same time, the country has also put forward requirements for educational informatization. The 2022 National Education Work Conference proposed the implementation of the "Education Digitalization Strategy Action". In October 2022, the report of the 20th National Congress of the Communist Party of China clearly proposed to promote the digitization of education. The digital transformation of education has become an important strategic theme for China's education reform and development.

Under the dual background of the reform and development of professional degree postgraduate education in the new era and the digital transformation of education, how to use information technology to assist in the reform of professional degree postgraduate education and improve the effectiveness of professional degree postgraduate education is an important issue we are facing.

2. The Current Situation of Informationization in Professional Degree Postgraduate Education

In recent years, domestic universities have conducted many explorations and practices in the reform of the training mode for professional degree graduate students. China Agricultural University adheres to the "Science and Technology Academy" agricultural talent training model and vigorously promotes the high-quality development of characteristic professional degree graduate education [1]. Xi'an Jiaotong University deeply promotes the integration of industry and education with the "Hundred, Thousand, and Ten Thousand Excellent Engineering Talent Training Project" as the focus, and cultivates innovative talents that meet the needs of multiple fields [2]. South China University of Technology is building a four in one construction path that combines multiple forces, multi-dimensional integration, multiple measures, and multi-party construction. It actively explores and practices the integration of industry and education to cul-

tivate professional degree graduate students, providing talent support for the transformation, upgrading, and innovative development of industries in the Guangdong Hong Kong Macao Greater Bay Area [3]. Renmin University of China is leading innovative classroom teaching models with educational informatization, deepening the comprehensive reform of professional degree graduate education, exploring and trying the "3G + 6 + 2" professional degree graduate case teaching model, and practicing and promoting the digital teaching support service platform based on 3G courses [4]. Northeast Normal University has explored a new mode of education master's training that deeply integrates information technology with graduate education and teaching, taking the public funded teacher's education master's training as an example [5]. However, overall, the exploration and practice of the digital support service system for professional degree graduate education and teaching is not yet deep, and a considerable number of universities are still in an offline manual management mode for the professional practice management of professional degree postgraduate.

In the United States, some famous universities have launched degree programs based on online courses on online teaching platforms, which is a bold attempt at digital education models. It has the advantages of convenience and flexibility, and can to some extent meet the needs of personalized learning and achieve learning outcomes certification.

3. Digital Support Schema for Professional Degree Postgraduate Training

Based on the reform and informatization status of academic and professional postgraduate education at China University of Geosciences (Beijing), a digital comprehensive service platform for postgraduate education and teaching is constructed, as shown in **Figure 1**. It mainly includes three parts: postgraduate education management information platform, smart online teaching platform, and teacher digital literacy improvement platform.

3.1. Postgraduate Education Management Information Platform

At present, most universities have established postgraduate education management information systems, which mainly focus on the information management of academic postgraduates. The process of student registration management, daily affairs management, and degree application and award management for professional postgraduates is similar to that of academic postgraduates, but the training process for professional postgraduates focuses more on the exercise of practical abilities and the improvement of professional literacy. We balance academic and professional postgraduates to share a set of postgraduate education management information platform. This means that the unique digital management of professional practice for professional degree postgraduates is added to the existing graduate education management information platform, fully utilizing the old while meeting the needs of professional degree postgraduate business

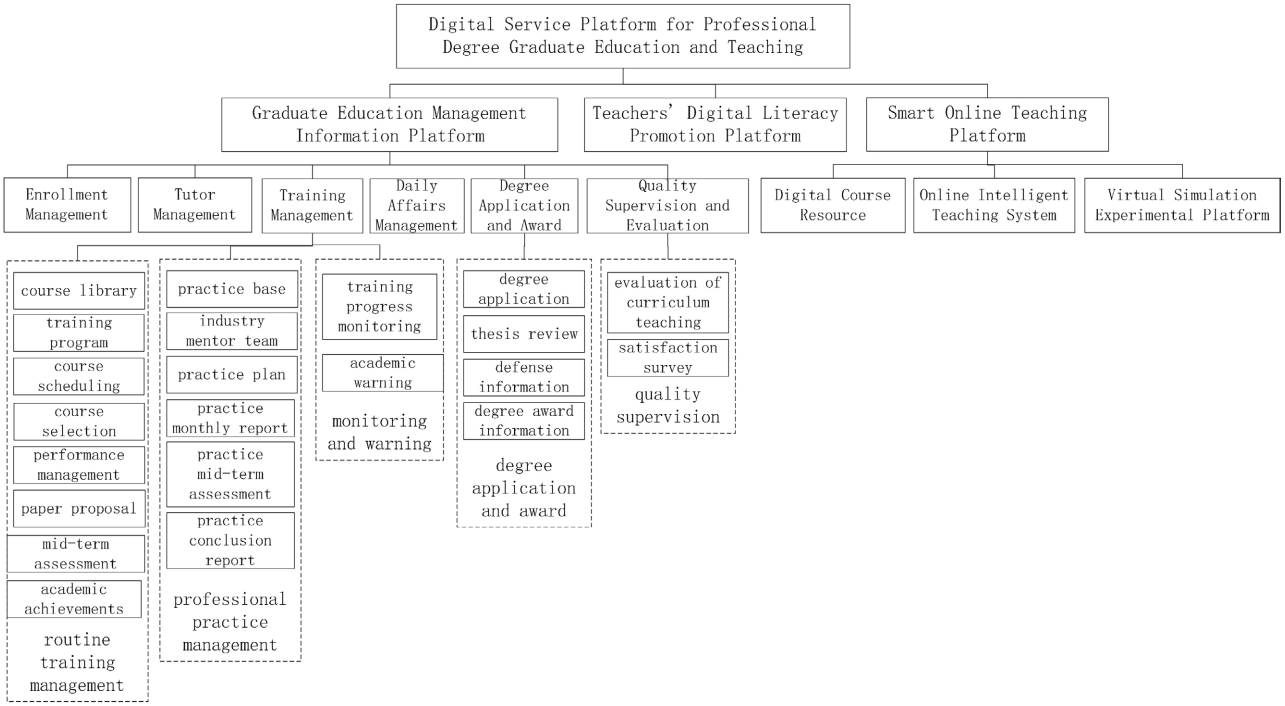

Figure 1. Functional architecture of digital comprehensive service platform for professional degree graduate education and teaching.

transformation. Overall, sharing a set of management information platforms to cover both academic and professional postgraduate education management processes is more scientific. Firstly, it is easy to manage; Secondly, statistical analysis of various graduate data is easier; Thirdly, public information resources such as courses and mentors are easily shared.

The postgraduate education management information platform mainly includes several sections: student status management, training management, daily affairs management, degree application and award, quality supervision and evaluation, and talent training statistical analysis. Student status management mainly covers functions such as maintaining student status information, student status changes, and semester registration. Tutor management mainly covers functions such as mentor selection, mentor assessment, and mentor enrollment qualification review. Training management includes routine training processes, professional practice training processes, and monitoring and warning. The routine training management mainly covers functions such as course library management, training program management, course scheduling and selection, performance management, paper proposal management, mid-term assessment management, and scientific research achievement management. The professional practical training process is specifically designed for professional degree postgraduates, mainly covering functions such as practice base management, industry mentor team management, practice plan management, practice monthly report, practice mid-term assessment, and practice conclusion report. The monitoring and warning mainly covers the visualization display of training progress

and academic risk warning [6]. Daily affairs management mainly includes functions such as awards, evaluations, loans, and grants. Degree application and award management mainly includes functions such as degree application, thesis review, defense information, and degree award information. Quality supervision and evaluation mainly cover the functions of course teaching evaluation and satisfaction survey. The above management modules are not isolated, but interconnected, and the entire management process of postgraduate education is regulated and constrained through the configuration of rule bases. For example, if a student undergoes a change in their academic status due to suspension, the list of student aid payments will naturally be updated synchronously; If the student's training process is not completed (such as failing to meet the course scores, failing the proposal report, or failing the mid-term assessment), the system will prohibit the student from applying for a degree and provide a detailed explanation of the reasons.

3.2. Smart Online Teaching Platform

During the COVID-19, online teaching ensured "non-stop classes", played an important role in the normal development of educational activities, and also played an important role in our digital education process. Online teaching platforms can break the limitations of time and space, allowing students to learn anytime and anywhere, which is one of the important manifestations of promoting the digital implementation of education. The smart online teaching platform includes three sub platforms: digital course resource platform, online intelligent teaching platform, and virtual simulation experiment platform.

The digital course resource platform gathers three types of online courses: one type is the excellent MOOCs provided by well-known MOOC platforms both domestically and internationally, and **Table 1** shows some famous MOOC platforms; one type is the advantageous disciplines MOOCs and SPOCs established by the university itself; one type is recording and broadcasting resources for daily courses.

The national smart education public service platform has set up a section for postgraduate education (https://www.gradsmartedu.cn), which integrates online open courses, case teaching, and industry-university-research services related postgraduate. The "Online Course Public Platform for Engineering Professional Degree Postgraduates" (https://degreecourse.xuetangx.com) is integrated on the Xuetang Online.

The online smart teaching platform supports the release of preview content and notice announcements before class, and supports live recording, speech recognition, classroom interaction, classroom discussion, in-class test, etc. After class, you can submit homework, course review, exchange questions and so on. Furthermore, using AI intelligent analysis, the knowledge points of the course can establish a multi-level topological relationship with micro-video, courseware and other resources through intelligent tags, forming a knowledge map of the

Table 1. Some famous MOOC platforms.

Name	Website	Description
National Higher Education Smart Education Platform	https://higher.smartedu.cn/	The largest and most comprehensive higher education smart service platform with the world's largest curriculum scale and categories.
iCourse	https://www.icourses.cn/	The education course resource sharing platform hosted by Higher Education Press provides MOOC from well-known Chinese universities to the public.
Xuetang Online	https://www.xuetangx.com/	Gathering over 3000 high-quality courses from domestic and foreign universities such as Tsinghua University, Peking University, and Stanford University, covering 13 university disciplines.
Zhihuishu	https://www.zhihuishu.com	Zhihuishu is affiliated to Shanghai Excellent Ruixin Digital Technology Co., Ltd. It is a large-scale credit course operation service platform in the world, which realizes cross-school course sharing and mutual recognition of credits, and completes cross-school elective courses. In addition to extracurricular activities, it also supports synchronous classrooms.
Chaoxing Erya	https://erya.mooc.chaoxing.com/	A general education learning platform with a total of 521 online courses, covering dimensions such as comprehensive literacy, general abilities, innovation and entrepreneurship.
Chinese MOOCs	http://www.chinesemooc.org/	Sponsored by Peking University, a Chinese-based MOOC service platform
UMOOCs	https://moocs.unipus.cn/	MOOC Platform for Foreign Languages in Chinese Universities
Coursera	https://www.coursera.org/	Founded by Stanford University, collaborates with leading universities and institutions around the world to offer thousands of courses including computer science, business, humanities, arts, and more.
edX	https://www.edx.org/	Founded by Harvard University and Massachusetts Institute of Technology, it offers over 2500 online courses covering various fields such as humanities, science, computer science, engineering, and business.
Udacity	https://www.udacity.com/	A technology-led online education platform provides "nano-degree" certificates, mainly focusing on computer science, data science, artificial intelligence, autonomous driving, machine learning and other fields.

course, which is convenient for students to learn personalized according to their actual situation [7]. The integration of online smart teaching system and smart classroom can easily cope with the teaching scenarios that traditional classroom teaching cannot achieve, as shown in Table 2 below.

Table 2. Business scenarios supported by smart online teaching platform.

No.	Name	Description
1	distance learning	The largest and most comprehensive higher education smart service platform with the world's largest curriculum scale and categories.
2	1+N Synchronized Classroom	A teaching master teaches in the main classroom, multiple classrooms can be synchronized, and audio and video interaction between these classrooms and the main classroom.
3	Same class across campuses	Students in different campuses of the same school can be taught by a famous teacher in real time.

The virtual simulation experiment training platform can solve the pain points and difficulties of high investment, high loss, high risk, difficult implementation, difficult observation and difficult reproduction in the process of experimental training teaching. It can innovate and reconstruct the traditional training teaching mode, and realize the vivid, interesting, interactive and autonomous training teaching. While greatly reducing the cost and risk of the experiment, it can also achieve the goal of cultivating students' practical and innovative ability. Virtual simulation experiment teaching or training includes two types: online and offline. At present, China has launched a national virtual simulation experiment teaching course sharing platform (experimental space: https://www.ilab-x.com/cloud). It has gathered together 3532 virtual experiment centers, including virtual simulation experiment courses of most subject categories. We can also independently develop and construct virtual simulation laboratories and virtual simulation experimental courses based on projects.

3.3. Teachers' Digital Literacy Promotion Platform

In 2021, the Central Commission for Cybersecurity and Information Technology issued the "Action Outline for Enhancing Digital Literacy and Skills of the Whole People", proposing to make enhancing digital literacy and skills of the whole people a fundamental, strategic, and pioneering work in building a strong network country and a digital China. In 2022, China's "14th Five Year Plan for the Development of the Digital Economy" proposed to implement a plan to enhance the digital literacy and skills of the entire population, expand the supply of high-quality digital resources, and encourage the wider opening of public digital resources to society. In 2023, the "Overall Layout Plan for the Construction of Digital China" proposed the construction of a digital literacy and skills development and cultivation system that covers the entire population and integrates urban and rural areas.

Digitalization of education is a new track for educational development and a breakthrough point for shaping new advantages in educational development. Higher education is the "leader" in the construction of a strong education coun-

try, and we must bravely stand at the forefront of educational digitization. The key factor in the digital transformation of postgraduate education is the improvement of teachers' digital literacy. The first is the establishment of teachers' digital consciousness and thinking, the second is the mastery of digital technology knowledge and skills, and then the digital application. The digital era has arrived, and reality requires teachers to be familiar with the digital lesson preparation and teaching environment, master the production of MOOCs and virtual simulation courses, understand information technologies such as artificial intelligence and big data, use information technology to effectively improve the quality of education and teaching, and promote personalized and equal education.

In order to enhance teachers' digital literacy, in addition to organizing offline visits, training and exchanges, a platform for improving teachers' digital literacy is constructed, providing guidance on the use of commonly used digital teaching tools, providing online courses how to create MOOCs and SPOCs, and collecting lesson preparation resources and virtual teaching and research rooms from the national higher education smart education platform.

4. Statistical Support for the Industrial Demand and Employment Situation of Professional Degree Postgraduate

Professional degree postgraduate education is closely aligned with industry and innovation needs, focusing on cultivating practical abilities and professional qualities, and solving prominent practical problems. For universities, the subject allocation and enrollment scale of professional degree postgraduate should be closely related to industry demand and employment situation, and the evaluation of the quality of professional degree postgraduate training should also be closely related to the job performance, work achievements, and social contribution of graduates. The digitization and precision of professional degree postgraduate enrollment and training work should be supported by internal departments such as alumni offices and employment centers, as well as relevant national departments such as the Ministry of Education, the Ministry of Human Resources and Social Security, and the State Administration of Taxation, with a good big data ecosystem. For example, the Ministry of Education or the Ministry of Human Resources and Social Security can provide universities with intuitive and quantitative industrial talent demand for various disciplines by creating a unified talent supply and demand service platform; The human resources and social security departments or national tax departments and other relevant departments can use big data statistical analysis results based on income and individual income tax payment as an important dimension of graduates' social contribution to support our accurate evaluation of the quality of graduate education. At present, the National Smart Education Public Service Platform has built a national college students' employment service platform and a supply and demand docking employment and education platform to support digital services for tal-

ent supply in higher education for social industry needs, but this is still far from enough. The planning and implementation of digital China and education digitization strategic actions are gradually building a digital ecosystem that is jointly built, shared, integrated, and empowered by digital aggregation, with a promising future.

5. Conclusions

At present, China University of Geosciences (Beijing) has expanded the practical management modules of professional degree postgraduates in the existing postgraduate management information system, and has basically built a compatible academic and professional graduate management information platform, which has been running well. The smart online teaching platform is also making overall planning according to the process of digital construction in school education.

In the future, improving the quality of professional degree postgraduate training should be more based on the current and future important needs of the industry, to design and adjust the training program, curriculum setting and teaching content of professional degree postgraduate education. Professional practice is based on the project to solve practical problems and provide students with more high-level career development support through in-depth guidance from enterprise tutors and industry experts, so that our high-level professional personnel training can indeed meet the needs of national industry development. Enterprise mentors and industry experts should deeply participate in the entire process of professional degree postgraduate training, including the formulation of training plans, curriculum design, teaching content, thesis and other links, in addition to professional practice [8]. In addition, we should establish a multidimensional professional degree postgraduate education evaluation system with the participation of students, teachers, tutors, enterprises and society. The digitization of the management process of professional degree postgraduate, the digitization of the teaching process and the digitization of students' personalized learning should be able to support the digitization of its evaluation system.

Holographic remote interactive teaching and metaverse teaching based on 5G networks have become a hot research topic in digital education and teaching. Integrating holographic technology, VR/AR technology, and metaverse technology into practical teaching for professional degree postgraduates is a promising aspect of digital education for professional degree postgraduates. In addition, micro majors based on online courses, inter school credit recognition, and online degree programs also require more attempts and practices from domestic universities.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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