The Practical Significance and Application of Book Reviews on the Quality of Variety Identification of 150 Sets of Chinese Herbal Medicine Atlas in China

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Abstract: Objective: Through school enterprise cooperation and resource sharing, the authors aim to learn from the advanced experience and modern technology of the United States and Europe in the comprehensive utilization of reference materials in the field of Chinese herbal medicine. With a focus on self-improvement and catching up, the authors will extensively utilize modern information technology to jointly carry out large-scale scientific research activities such as the "150 sets of Chinese herbal medicine atlas collection and species identification quality book review". The goal is to jointly build a digital resource library for Chinese herbal medicine identification and establish a semi-automatic rapid retrieval system for future use. Method: A fast scanning primary color high-definition photography device is used, combined with multiple computer software at home and abroad for information processing such as shooting, renaming, cropping, color restoration, text extraction, and watermarking. It is compared with the original self captured collection of Chinese herbal medicine maps in the same folder, and if necessary, the double comparison and judgment method is used. Result: In addition to obtaining basic data for book review activities, information on the authenticity and quality of many target Chinese herbal varieties was also obtained. It can also serve as a teaching case set for rapidly cultivating advanced practical talents in Chinese herbal identification with broad knowledge and profound skills.

Keywords: Information Processing Technology; Digital Imaging Technology; Graphic and Textual Reorganization; Double Comparison Analysis Method

1. Introduction

For five thousand years in China, there have been generations of heroes in the country, and the traditional Chinese medicine industry has also produced many talents to safeguard the health of all ethnic groups in China. Especially since the reform and opening up, many modern "Li Shizhen style", "Wu Qijun style", and "Zhao Xuemin style" Chinese herbal medicine identification giants have emerged[1-5]. How to inherit and utilize their research results well without being lost in various waves is a practical problem facing us. Since the reform and opening up in 1978, China (including Hong Kong, Macao, Taiwan and other regions) has received unprecedented attention and development in the field of traditional Chinese medicine, especially in recent years. As an important literature in the field of traditional Chinese medicine, the Chinese herbal medicine atlas has undergone tremendous changes in its development process. After the reform and opening up, with the continuous improvement of technological level, the compilation and publication of Chinese herbal medicine atlas gradually moved towards standardization and systematization. Numerous

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high-quality Chinese herbal medicine atlas collections are fascinating and diverse, not only enriching the literature resources of traditional Chinese medicine, but also providing strong support for clinical practice, scientific research, and teaching[6-8].

Thanks to the high attention paid by the governments at all levels, and the people to the traditional Chinese medicine industry, as well as the significant development of multidisciplinary technologies such as color printing, information processing, and digital imaging since the reform and opening up, and based on the progress needs of the traditional Chinese medicine decoction piece production and operation industry and the education and teaching needs of traditional Chinese medicine majors in universities, our project team has collected and evaluated nearly 600 sets of traditional Chinese medicine atlases for the first time, and further selected the top 150 sets of traditional Chinese medicine atlases for a second in-depth evaluation[1-5].

There are numerous types of Chinese herbal medicines in our country, with a total of over 12800 medicinal plants according to statistics [1], exceeding the capacity of drug quality standards. There are still many cases of homonyms, homonyms, and confusion among different varieties. The book review on the quality of variety identification of 150 sets of Chinese herbal medicine atlas in China (hereinafter referred to as the "book review") is a large-scale scientific research activity jointly carried out by our university and several professional technical backbone teams of traditional Chinese medicine enterprises in Guangdong. It has been approved as a key field special project (project number 2022ZDZW2088) of the provincial education department's scientific research platform (biomedicine and health) in 2022[6-8]. It is based on the urgent need of many traditional Chinese medicine enterprises, institutions, teaching and research units to understand the inherent quality of their professional books. Based on years of collecting information on the quality of Chinese herbal medicine variety identification from professionals both inside and outside the school, it can be found that there are indeed some irregularities and lax checks in the field of Chinese herbal medicine identification in the professional book market. This project aims to scientifically evaluate the quality of variety identification (accuracy of the entire book, error rate of individual drugs, etc.) involved in 150 sets of Chinese herbal medicine atlas published in China (including Hong Kong) in the past 40 years since the reform and opening up, which have a significant impact on the field of Chinese herbal medicine identification. The atlas involves a large number of Chinese herbal medicine varieties (about 5000 species) used in China, from pharmacopoeia products to local standard products in various provinces, autonomous regions, and municipalities directly under the central government. Intended to eliminate falsehood and preserve truth, point out fallacies (down to page numbers and even chart numbers), and avoid spreading misinformation and using medication incorrectly. When the standby edge is mature, it will be considered as an alternative image library for developing AI (artificial intelligence) software for identifying traditional Chinese medicine[9-12].

2. Overview of the Background and Methods of the Era

2.1 Overview of the Development and Book Review Activities of the Chinese Herbal Atlas Collection after the Reform and Opening Up

As early as more than a decade ago, developed countries and regions such as the United States and Europe were proficient in using automatic page by page high-definition scanning instruments to extract, process, and apply information from library collections (such as producing e-books for internal communication), which had unparalleled advantages over developing countries at that time. Today, various industries in China, including modern manufacturing and logistics, are developing rapidly, and the speed of information processing and integration is significantly accelerating. Our school's Chinese medicine inspection skills master studio has conducted in-depth school enterprise cooperation with senior technical personnel from multiple Chinese medicine enterprises, including private leading enterprises, in a certain delta region. We have jointly carried out large-scale scientific research activities in the key fields of biomedicine and health, such as the "150 sets of Chinese herbal medicine atlas collection, variety identification quality book review" of the Provincial Department of Education. We have used unique methods to jointly build a large-scale digital resource library for provincial Chinese herbal medicine identification (covering nearly 5000 varieties in

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pharmacopoeia and provincial standard catalog), and have basically completed the research on representative herbal works/atlases of well-known Chinese medicine identification experts in China in the past 40 years (1980-2022; including Taiwan, Hong Kong and Macao). Selection (nearly 300 copies) Scanning and cutting (divided into the smallest unit with pictures and text for easy retrieval based on the variety and authenticity), combined with several sets of high-definition original color spectra of nearly a thousand kinds of Chinese medicinal materials and Chinese herbal decoction pieces jointly produced with school enterprise cooperation units, are arranged to obtain relatively rich first-hand information and literature materials.

The book review aims to provide a fair, impartial, open, scientific, rigorous, and comprehensive professional evaluation as a third-party professional quality inspection agency, clarify and eliminate errors, avoid life and health accidents caused by the use of wrong drugs, strive for excellence, never stop, and effectively guide book purchases. Especially for the excellent representative works that "never waste the river and flow for eternity", it fully affirms and sets an example. For those with many errors, it also clearly points out and guides their use, so as not to spread rumors and circulate endlessly. This project is ranked from high to low in accuracy, and evaluated comprehensively based on the clarity, color reproduction, typical representativeness, artistic appreciation, etc. of the map, to eliminate falsehood and retain truth, and point out errors (clearly down to page numbers and even map numbers). The atlas covers a large number of Chinese herbal medicine varieties (approximately 5000) used domestically, ranging from pharmacopoeia products to local standard products in various provinces, autonomous regions, and municipalities directly under the central government. The Chinese herbal medicines referred to in this project include traditional Chinese medicinal materials, Chinese herbal decoction pieces and their original plants, original animals, and processed products. The vast majority of the research objects are selected color photo atlas collections. Comparison reveals true knowledge ". In order to minimize misjudgment as much as possible, this project adopts a unique double comparison method for a few difficult varieties [2], which selects works from as many authors as possible for horizontal comparison, and after rigorous identification by as many members of the project team as possible, the one with the same number is considered correct.

This project can also obtain a list of Chinese herbal medicines that are prone to errors in variety identification through statistical analysis of error rates in various books, providing useful references and necessary warnings for the Chinese herbal medicine identification industry.

2.2 Method Overview

The 'Book Review' section of this project alone is already a complex and massive undertaking, requiring the extensive use of modern information technology processing methods and the adoption of the most efficient selection methods based on the content. It mainly includes the following steps:

2.2.1 Learn from others' strengths and select the best ones

Through extensive research by professionals from both schools and enterprises, as well as the selection of high-quality books from electronic resources or physical paper materials, an additional 150 sets of more practical and influential target books will be selected from the 600 sets of optimal selection list, in preparation for the gradual completion of high-definition primary color digital processing. The essence of this stage is to strive for the integration of the highest quality books, so that project team members can have a wide range of knowledge, grow rapidly, and be competent in evaluation. (* refers to excellent books in terms of variety identification quality, clarity of spectra, color reproduction, and other comprehensive quality aspects).

2.2.2 Conduct preliminary digital processing

The target book will be scanned page by page or shot in a scanning style by members of the school project team, and renamed, split and edited, merged into similar categories, and color restoration and other processing work will be done in advance according to the color scheme.

2.2.3 Deep digital processing

In the early days, the best critical point (such as Adobe Acrobat X+with a limit of 99 images per merge and a pixel control of 45 × 45 square inches per frame) was used for OCR (automatic text recognition) editing, translation, etc., to obtain internal electronic resources that can be retrieved (quickly search for target varieties), and to produce color reduced PDF e-books. After

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comparing the results, Hanwang OCR was used in the mid-term because it can recognize page numbers at once without restrictions. In the later stage, AI technologies such as WPS for batch image to text conversion will be utilized.

2.2.4 Embrace diverse opinions and gather collective wisdom

Regularly hold Tencent meetings to invite members of the school enterprise cooperation team to analyze the correctness of varieties, evaluate the quality, and input data.

2.2.5 Timely summary and collection of results

Based on the meeting minutes, carry out subsequent processing, organization, and summary, collect results in a timely manner, and prepare materials for the monograph.

2.2.6 Checking for deficiencies, filling in gaps, and self-improvement

For styles and varieties that are not ideal in existing maps, additional processing such as self photography or integrated processing should be carried out as much as possible.

2.2.7 Writing books, expressing opinions, and continuously improving

Timely start researching reports and writing monographs to carry out a series of follow-up project improvements, organization, and enhancement work.

2.2.8 Moving forward together and successfully closing the problem

Take into account all aspects and stages of the project, including pre -, mid -, and post project phases, and carry out mid-term inspections, improvements, and final work.

For example, in the mid-term inspection stage, the main progress of the research work is as follows: firstly, based on the emphasis in the expert questioning section of the project proposal on "establishing a scientific, fair, and practical evaluation index system first", and also in response to the controversial "150 sets of Chinese herbal medicine atlas collections that have a significant impact on the field of Chinese herbal medicine identification", the project team conducted multi-party research (such as the borrowing situation classified as "reference books" and "in memory books" in the Zhongshan Library and Guangzhou Library of Guangdong Province), adopted appropriate measures to expand the scope and enrich the connotation, and established the "three domains of large, medium, and small" (to verify the fields of the larger level and the smaller level, such as the 1-9 volumes of "Color Atlas of Chinese Higher Plants" edited by Wang Wencai). Volume 1-5 of "Chinese Herbal Medicine Chronicles" edited by Yan Ye Huagu; Based on national and regional verification, such as verifying volumes 1-12 of "Chinese Medicinal Plants" edited by Ai Tiemin, volumes 1-6 of "Legal Medicinal Plants" edited by Zhao Weiliang, volumes 1-6 of "Color Atlas of the Complete Collection of Chinese Medicinal Plants" edited by Zhang Houliang, volumes 2 of "Illustrated Catalogue of Chinese She Medicinal Plants" edited by Mei Xudong, etc., the target atlas sets are set at 600, 300, and 150 sets respectively. In addition to including all books belonging to "National Publishing Fund Projects" (especially major national publishing projects such as "12th Five Year Plan" and "13th Five Year Plan" national key books), some foreign countries (mainly Japan and the UK) in the field of pharmacognosy in recent years are also included. Selected atlas collections (such as "Illustrated Encyclopedia of Chinese Medicinal Materials and Traditional Chinese Medicine" edited by Kenichiro Tanaka in Japan, and "DK" edited by Andrew in the UK) The Encyclopedia of Herbal Medicine is also used for verification. Secondly, in response to the problems of small and unclear illustrations in certain atlas sets, which are not conducive to subsequent communication or teaching, the project team has used domestic and foreign image processing software to carry out targeted secondary processing such as "sharpening (or lossless enlargement; therefore, higher definition than the original image)" and "color restoration" (and added a watermark processing step to prevent printing). Most color image pages have been upgraded from 8M to 38M, resulting in a significant increase in resolution. Scanning (or scanning style shooting) obtained a total of about 800000 pages of atlas, and nearly 500000 frames of high-definition color photos of actual Chinese herbal medicines were also taken. Furthermore, considering the great convenience of the combination of electronic image libraries and network cloud disks (which can be retrieved anytime and anywhere), in order to implement the development of "strengthening the foundation and promoting innovation" in the traditional Chinese medicine industry and educational technology, the project team has purchased a large capacity of 10T and uploaded it all to the network cloud disk. In recent years, especially from January 2020 to December 2022, there have been many newly added national key published

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books. The project team has increased the utilization of major libraries in Guangzhou, especially Guangzhou Library and Guangdong Provincial Zhongshan Library, to seek support from industry organizations and relevant enterprises and institutions for the project.

In terms of new technology application, the project team took the lead in using a specially designed high-definition scanning photography device and modern information processing technology for batch color reproduction (determining the best color matching scheme), color removal (color) degradation (reducing pixels), automatic editing and typesetting, text recognition and conversion, saving a lot of manpower, material resources and transmission reading time; Due to the unique approach taken by our project team in research and exploration, we have initially obtained a successful solution for color reproduction. In most cases, it is possible to read high-definition, original color maps of Chinese herbal medicine without the need to transport physical books, avoiding misjudgment phenomena such as Huangqin turning into "Green Qin" (Huangqin quality variation product) due to color distortion. During project implementation, online (Tencent Meeting, Classroom Dispatch, etc.) and offline methods can be flexibly selected.

In terms of process, we first apply the reliable skills mastered by the project team for identification, and use a larger (scale) graph set compiled later to verify the graph set compiled earlier; In addition to utilizing the "Flora of China" and its electronic resources, as well as the current smartphone plant identification APP software platform, we also combine the "Flora of Chinese Medicinal Plants" (edited by Pei Jian, Zhou Taiyan, etc.), "Color Atlas of Chinese Higher Plants", "Flora of Chinese Medicinal Plants" (edited by Ai Tiemin), "Flora of Traditional Chinese Medicine", "Newly Compiled Flora of Traditional Chinese Medicine" and other vertical and horizontal comparisons and multi-party verifications to establish the standard of authentic products. Once the problematic variety is identified, it will be compared with the comprehensive established standards.

In the implementation process, we adhere to the basic principles. The identification of Chinese herbal medicine varieties involved in this project is based on the current 2020 edition of the Chinese Pharmacopoeia Part I and the corresponding local standards of each province, autonomous region, and municipality directly under the central government. If there are discrepancies, we will conduct rigorous verification with the Flora of China. On the other hand, this project adopts a more rigorous and slightly flexible classification method for variety selection. The simplest and most easily identifiable level (including nearly 3000 Chinese herbal varieties including original plants, medicinal herbs, and decoction pieces; designated as level A) only needs to be independently judged by several key members of the project with intermediate and senior professional titles. The slightly more difficult intermediate level (nearly 1500 Chinese herbal varieties, designated as level B1 and B2); The specific division is determined by the less common and less common categories, using the comparative analysis method (i.e. horizontal comparative analysis method between the author's works or project team members), while the most difficult and highest level of difficult varieties (nearly 500 difficult or controversial Chinese herbal varieties, such as certain ethnic minority medicines; classified as level C) are subjected to the strictest dual comparative analysis method, which selects authentic standards established by selecting works from as many authors as possible for horizontal comparison, and further rigorously identifies the relevant color maps by as many members of the project team as possible, with the map of the majority of supporters being considered correct.

In order to facilitate the protection of intellectual property rights in our country, this project mainly uses black and white images of Chinese herbal medicine that have been transformed, color removed, and pixel reduced for external communication and transmission. If necessary, batch watermarking (with a light blocking rate of over 33% to prevent piracy) is used; In addition, some parts adopt internal reference standards for self captured Chinese herbal medicine maps. Since the early stage of scanning, it has been more than ten years and there has never been any leakage or infringement of copyright.

3. Expected Results and Practical Significance

Due to the fact that this project has attracted the hearts of many Chinese medicine enterprises and institutions who actively participate in the research project, especially the exchange and sharing meetings between schools and enterprises,

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it naturally and effectively triggered their interest and enthusiasm for learning a series of practical technologies. Compared with the theoretical and textual learning of "one by one" squeezing toothpaste, the teaching effect and efficiency of the "open and close" panoramic learning based on image identification cannot be compared.

In addition, this project incorporates a lot of modern information technology and makes comprehensive use of it. Relying on disciplines such as "Medicinal Plant Identification Technology," "Traditional Chinese Medicine Identification Technology," and "Traditional Chinese Medicine Processing Technology," as well as modern education and teaching platforms, it is more conducive to accelerating the cultivation of many practical and innovative talents in traditional Chinese medicine identification who are "knowledgeable and have a solid foundation." It also creates favorable conditions for international exchange and cooperation.

After analyzing the practical significance of this book review, it is of great practical Significance to review the 150 sets of Chinese herbal medicine atlas involved.

Firstly, improving the quality of traditional Chinese medicine literature. Through book reviews of the atlas, errors can be discovered and corrected, and awareness of the atlas can be improved. Through "complementary advantages and image text recombination", more reliable revised reference materials can be provided for traditional Chinese medicine practitioners.

Furthermore, in promoting academic exchanges in traditional Chinese medicine, book reviews can facilitate academic exchanges among practitioners and promote the sustained and stable development of the traditional Chinese medicine industry [12-14].

Thirdly, in terms of inheriting traditional Chinese medicine culture, the collection of Chinese herbal medicine atlases is an important component of Chinese medicine culture. Reviewing it can help better inherit and promote traditional Chinese medicine culture.

Finally, in guiding clinical practice, book reviews can provide useful references for clinical workers, helping them accurately identify Chinese herbal varieties and ensure medication safety.

4. Exploration of Application Value

Firstly, in terms of education and training, the Chinese herbal medicine atlas (image library) with "complementary advantages and image text recombination" can serve as a high-quality electronic textbook for traditional Chinese medicine education and training, helping students to master the professional knowledge of Chinese herbal medicine in a fast, efficient and cost-effective manner.

Furthermore, in terms of scientific research, the atlas provides researchers with rich resources of traditional Chinese medicine in various fields, which is helpful for conducting in-depth research in related fields and teaching research on traditional Chinese medicine courses and related courses [15].

Finally, in terms of medicinal herb cultivation, the description and images of Chinese herbs in the atlas can provide accurate and reliable references for medicinal herb grothe authorsrs, improving cultivation efficiency.

This article has selected some pictures of Chinese herbal medicines, as shown below, for readers' reference.

Example of Chinese herbal medicine color photo (10 frames), Please refer to Figure 1-10 for details.

Figure 1. Ginkgo biloba L.

Figure 2. Houttuynia Cordata Thunb.

Figure 3. Morus Alba L.

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Figure 4. Belamcanda Chinensis (L.) Redouté

Figure 5. Chrysanthemum Indicum L.

Figure 6. Agrimonia Pilosa L db.

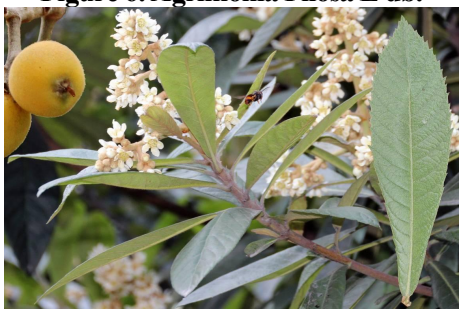

Figure 7. Eriobotrya Japonica (Thunb.) Lindl.

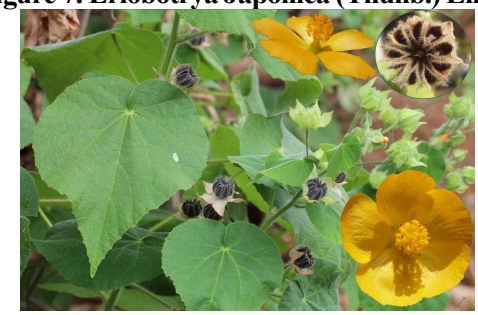

Figure 8. Abutilon Paniculatum Hand. -Mazz.

Figure 9. Andrographis Paniculata (Burm.F.) Nees

Figure 10. Antidesma bunius (L.) Spreng

5. Conclusion

This project carries out provincial-level large-scale research and popularization activities on the authenticity identification of traditional Chinese medicine varieties through school enterprise cooperation, which has long-term benefits for Chinese medicine colleges and enterprises, as well as the country and society. It also reflects the deep patriotism and glorious mission of Chinese medicine professionals. The book review of 150 sets of Chinese herbal medicine atlas published since the reform and opening up and having a significant impact on China in terms of variety identification quality has important practical significance and application

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value. Through this large-scale book review event, we can continuously promote the improvement of the quality of Chinese herbal medicine image and text production and Chinese herbal medicine identification teaching, and contribute to the vigorous development of traditional Chinese medicine in the new era.

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References

[1] Chen Huifang Wait Research progress on the pharmacological effects of Huangqi. Physician Online. 2018.5:120-126

[2] Cao Hua, Chen Huifang. et al. Research on the Production Process of Strengthening the Spleen and Nourishing the Stomach. Uyghur Medicine. 2018.2:80-86

[3] Chen Huifang. et al. Pharmaceutical Administration and Regulations. Wuhan: Huazhong University of Science and Technology Press. 2021.9:235-240

[4] Zhong Qian, Chen Huifang et al. Effects of intestinal microorganisms on influenza-infected mice with antibiotic-induced intestinal dysbiosis, through the TLR7 signaling pathway. Frontiers In Bioscience-Landmark.2023;28(3):43,21-32

[5] Li Ping, Zhang Sheng, Wang Fei. Comparative Study on the Development Trends of Traditional Chinese Medicine Research and Development at Home and Abroad. World Science and Technology - Modernization of Traditional Chinese Medicine, 2010, 12 (4): 624

[6] Xu Youyi, Chen Huifang. et al.. Creation and Research of Rapid Retrieval Database for Chinese Herbal Medicine Identification. Medical and Health. 2018:105-120

[7] He Yongjia Chen Huifang. et al. Research on Comprehensive Reform and Innovative Implementation of Pharmaceutical Marketing Technology Course. Scientific Consultation 2020.6:18-24

[8] Chen Huifang. et al. Research on the Teaching Reform of Pharmacy in Higher Vocational Medicine Major Based on Skill Training. Medical and Health 2019.6:20-24

[9] Chen Huifang et al. Risk Factors for Progression of Interstitial Lung Disease and Construction of Risk Prediction Model. Journal of Investigative Medicine. SCI Collected at 20225.02:110-124

[10]Chen Huifang Yi Jianhua. et al. Research on the Application of Multiple Teaching Methods in the Teaching of "Human Anatomy and Physiology" Course for Pharmaceutical Majors in Higher Vocational Education. Aviation Military Medical. 2017: 100-103

[11]Peng Zhenfu, Chen Huifang. et al. Exploration of in-depth teaching reform of biochemistry in higher vocational and pharmaceutical colleges. Medicine. 2020.6.: 120-125

[12]Xu Youyi, Chen Huifang Application research of comparative analysis method in the preliminary stage of creating a three-dimensional three distance Chinese herbal medicine image library. Frontiers of Medicine, June 2013

[13]Chen Huifang et al. Study on the treatment of vertigo patients by Hu Jinming named the traditional Chinese medicine doctor in Guangdong Province. MEDS. Clinical Medicine. Clausius Scientific Press, Canada.DOI:10.23977/medsc.2023.040308 2023.5:25-30

[14]Chen Huifang et al. A Network Pharmacology Approach to Investigate the Underlying Mechanisms of Alpinia Katsumadai Hayata on Acne Vulgaris. Medicine. SCI include 2023.6.28:220-230

[15]Chen Huifang et al. A Deep Study on Curriculum Reform in Higher Vocational Medical Colleges — — Taking the Application Research of Computer Information Technology and Mind Mapping in the Teaching Reform of Traditional Rehabilitation Therapy Technology as an Example. Medicine. SCI Collected on September 24, 2024: 118-132.

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