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REVIEW Enhancing Pathology Education: a Hybrid Approach Leveraging Digital Pathology and Micro-Video Resources

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Abstract

In the context of the rapid evolution of "Internet + Education," the domain of pathology education has embraced novel dimensions and attributes. This research focuses on the Chaoxing Learning Platform, highlighting the strategic utilization of digital pathology resources from authentic cases and micro-video educational materials aligned with textbook content as primary components of online courses. The study aims to elucidate the benefits of these resources in enhancing educational outcomes, broadening student access, and reducing instructional expenditures. Through a detailed exploration of effective implementation strategies and methodologies for these teaching aids, the paper seeks to refine operational aspects and frameworks, identify patterns of application, and examine their efficacy in fostering students' holistic skills. Additionally, it evaluates the contribution of these educational tools in elevating the quality of pathology instruction, augmenting faculty teaching capabilities, enriching the pathology curriculum, and bolstering institutional prestige and scholarly impact.

Introduction

The integration of online and offline pedagogical approaches in pathology education transcends traditional barriers of time and space, facilitating multidisciplinary academic synthesis and contributing to the advancement of the discipline (Xie et al., 2019). Over the last three decades, significant strides in immunology, cell biology, molecular biology, cellular genetics, alongside advancements in immunohistochemistry, specialized staining, image analysis, flow cytometry, and other techniques, have enriched our understanding of diseases from the organ, tissue, cellular, and sub-cellular levels to the molecular sphere. This evolution has shifted morphological observations from mere localization and qualitative assessments to quantitative analyses, enhancing their objectivity, repeatability, and comparability. Pathology, through the detailed examination of anatomical structures, tissue morphology, cellular features, and ultra-molecular configurations, addresses clinical inquiries, predominantly utilizing morphological imagery as its primary medium of expression and analysis (Xu et

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al., 2020). The undergraduate curriculum in pathology leverages morphological imagery and multimedia materials to elucidate disease mechanisms, pathological transformations, and prognoses (Zhang et al., 2023). Our educational team employs a combination of remote digital pathology diagnostic platforms, actual case studies, micro-videos, and textbookbased theoretical explanation videos as central components of the online pathology course, significantly augmenting students' engagement, comprehension, and practical application skills, while also fostering the development of medical ethics and political education.

Construction Significance

The development of diverse online educational materials through the Chaoxing Learning Platform aligns with contemporary educational quality standards, merging seamlessly with conventional offline methods to enhance instructional quality, educator skillsets, resource sharing, and scholarly impact.

1. Enhancing Instructional Quality

Mitigating the constraints imposed by limited in-person instructional hours on knowledge dissemination. Independent pre-study and review activities, facilitated through digital devices without spatial or temporal limitations and grounded in actual case studies, alongside pathology textbooks and fundamental professional knowledge, particularly through micro-videos, foster a deeper understanding of pathology among students. Clinical scenarios, encompassing patient histories, gross specimen imagery, digital pathology slides, and synopses of sessions, alongside introductions to frontier developments, invigorate students' curiosity and analytical skills, thereby cultivating comprehensive competencies. Directionally focused case-based teaching accentuates critical concepts and challenges, thereby elevating instructional quality.

2. Augmenting Educators' Comprehensive Skillsets

The Chaoxing Learning Platform, equipped with forums for discussion and modules for statistical analysis, supports effective teacher-student communication, monitoring of learning progress, and evaluation of academic performance. Educators are enabled to tailor instruction based on constructive student feedback and in accordance with the syllabus. The continuous refinement and integration of online resources, facilitated by information technology, allows for their streamlined presentation to students, encouraging educators to stay abreast of new educational methodologies, technological advancements, ongoing professional research, pedagogical innovations, and to enhance collaborative exchanges within the academic community.

3. Facilitating Resource Sharing Online

Utilizing online platforms to distribute pathology educational materials, within the bounds of legality and reasonableness, devoid of temporal, spatial, and demographic limitations, effectively promotes the sharing and utilization of premier instructional resources, mitigates disparities in educational materials across different locales, and fosters uniformity in educational delivery.

4. Amplifying Scholarly Influence

The dissemination of remote digital pathology slides, case introductions, and micro-video presentations, all underpinned by standardized digital pathology protocols within our department, collaborative efforts across various units and multidisciplinary integration, propels the specialization of pathology, talent development, increases engagement in teaching, and elevates research and instructional standards. This embodies the synergy of clinical practice, education, and research, thereby enhancing academic prestige.

Construction Philosophy

With robust backing from our institution, we have progressively explored and implemented a hybrid model of online and offline teaching, leveraging the Chaoxing Learning Platform's digital pathology resources and micro-video content relevant to textbook materials.

1. Hybrid Online and Offline Teaching

Positioning the Chaoxing Learning Platform as the foundation for online courses, in conjunction with traditional classroom instruction, our pathology department has adopted a blended teaching strategy, continuously refining the curriculum and instructional content. Educators pre-assign tasks and provide guidance, enabling students to independently explore and discuss content, engage in analytical problem-solving during sessions, and reflect post-class, with educators fine-tuning the educational content to establish a comprehensive, multi-faceted learning ecosystem.

2. Resource Diversification

Instructional materials are systematically uploaded to the Chaoxing Learning Platform, ensuring uniform management of the teaching process, routine updates of resources, and ongoing system maintenance. The spectrum of online educational resources spans foundational materials, multimedia content, and interactive segments, encompassing educator-generated slides, digital textbooks, syllabi, schedules, micro-videos of case studies aligned with the syllabus, theoretical lecture videos, practical demonstration videos, and case analysis discussions, alongside feedback mechanisms, notifications, homework interactions, and forums for dialogue during and post-instruction, as well as analytics on student engagement.

3. Focused Support for Theoretical and Practical Instruction

Given pathology's emphasis on morphological science, both lecture and laboratory sessions are crucial components of the educational framework. Our targeted reform initiatives, aimed at enhancing both theoretical understanding and practical exposure, have led to the creation of distinct online courses for "Pathology Theory" and "Pathology Lab," each incorporating essential resources to support comprehensive learning. Theoretical instruction prioritizes the dissemination of extensive knowledge through segmented lecture videos and case-based micro-videos, facilitating an in-depth and intuitive grasp of disease pathology. Laboratory sessions are designed to encourage detailed examination and analysis of gross and microscopic specimens, thereby reinforcing the integration of theoretical knowledge with practical application, foundational to elevating instructional quality.

4. Methodological Diversification

The Chaoxing Learning Platform facilitates interactive discussions between educators and students, addressing challenges encountered before, during, or after instructional sessions, with active participation also observed in digital forums such as QQ groups and WeChat. End-of-semester surveys incorporating feedback on digital pathology and micro-video resources further attest to their effectiveness. These communication channels enable educators to gauge student learning experiences and adjust instructional content dynamically, fostering autonomous critical thinking among students and promoting a vibrant educational environment that motivates educators to enhance their commitment to knowledge dissemination and pedagogical excellence.

5. Effective Evaluation Framework

Completed micro-videos, centered on cases from remote digital pathology, constitute a core component of the undergraduate pathology syllabus, significantly contributing to assessments ranging from quizzes to final examinations. Lecture content rigorously aligns with syllabus-specified key concepts and challenges, necessitating student engagement with online course requirements on the Chaoxing Learning Platform, including participation in exams, discussions, and attendance protocols.

Implementation Pathway

Our educational team is dedicated to refining pathology teaching resources that cater to students from diverse disciplines within our institution, crafting a multifaceted course resource system. This system encompasses foundational course data, instructional slides, syllabi, case-based micro-videos, and videos elucidating theoretical concepts.

1. Comprehensive Development of the Teaching Resource Repository

We systematically upload an array of materials to the Chaoxing Learning Platform, including course overviews, syllabi, examination formats and requirements, assignments, instructional plans, educator's slides, and videos for both theoretical and laboratory sessions. This repository also features micro-videos that demonstrate real cases via remote digital pathology. Our approach organizes these resources by chapter within designated teaching modules, facilitating digital course construction, assisting educators in designing instructional activities, and enabling students to efficiently target their study focus and schedule. This method overcomes the traditional constraints of guiding student self-study in terms of both time and location.

2. Development of the Teaching Case Library

A primary focus of our pedagogical design is the creation of a teaching case library. This involves analyzing learning scenarios, setting objectives, and identifying key concepts, challenges, methods, tools, and timings within the curriculum. Teaching cases are then applied flexibly across various educational stages and presented via the remote digital pathology diagnostic platform, providing an in-depth and intuitive view of each case's clinical journey. This strategy not only enriches students' understanding of pathology beyond microscopic diagnosis but also enhances their overall disease knowledge. The dynamic capabilities of digital slides for lesion observation on the platform improve student engagement and learning efficiency. These cases are presented as micro-videos on the Chaoxing Learning Platform, incorporating ideological and political education seamlessly into the curriculum, thereby reinforcing moral education and fostering correct value systems among students.

3. Development of the Teaching Slides Library

Instructional slides serve as a critical resource for online teaching. Our team ensures alignment with educational goals and syllabi, focusing on content accuracy, chapter structure, and addressing teaching challenges. The integration of ideological and political education within the curriculum is carefully considered, with slides undergoing thorough review for standardization in template, language, and academic integrity. Regular collective lesson planning sessions are held to review and update slides, ensuring consistent instructional quality.

4. Development of the Micro-video Library

We have converted textbook content into micro-videos, which are then published on the Chaoxing Learning Platform. These videos, catering to both theoretical and laboratory sessions, adopt varied presentation styles. Theoretical videos cover pathology knowledge, related fields such as embryology and anatomy, recent advancements, course-related ideological and political content, national health policies, and case analyses. Laboratory videos aim to reinforce basic knowledge, presenting teaching objectives, specimen images, digital slides, and guiding through clinical case analyses and lab assignments. All micro-videos are aligned with the teaching syllabus and tailored to student learning scenarios, serving as primary online teaching tools to enhance reflection and evaluation.

Existing Challenges

1. Faculty Team Development

The creation, updating, and management of digital teaching resources, alongside the operational maintenance of the teaching platform, necessitate a dedicated and professionally trained pathology faculty team. Addressing the specialized needs and managing faculty allocation pose significant challenges in our team's development.

2. Limitations on Student Access

Although the Chaoxing Learning Platform has been operational for over three years, offering a user-friendly interface and a wealth of knowledge modules, software limitations and access restrictions impede the wider distribution and utilization of our teaching resources.

3. Module Setting Rationality

The effectiveness of our blended teaching model hinges on engaging students' learning motivation and fostering their independent learning capabilities. Current challenges include attracting students to engage with the content actively and establishing efficient communication channels for addressing difficulties encountered during self-study.

4. Homogenization of Instructional Delivery

Ensuring consistent instructional quality across different educators using the same materials presents a challenge. Despite the homogenizing potential of the Chaoxing Learning Platform resources, variations in teaching styles, methods, and the value placed on pathology courses by different disciplines affect the uniformity of education delivery.

Solutions

1. Faculty Team Strengthening

Our team comprises 16 dedicated educators engaged in both theoretical and practical pathology instruction. We focus on enhancing faculty capabilities through continuous professional development, participation in teaching technology training, and engagement in educational competitions, thereby advancing our team's instructional competence.

2. Expanding Online Course Access

By distributing Chaoxing Learning Platform invitation codes and encouraging resource sharing, we aim to broaden the reach of our online courses, inviting feedback and making adjustments based on best practices observed in peer institutions.

3. Resource Optimization

Continual refinement of module content and structure is a priority. Decisions on whether to adapt existing modules or develop new ones are guided by the goal of enhancing student engagement and the practical application of knowledge in clinical pathology.

4. Strategies for Enhancing Teaching Quality Through Diverse Methods

Utilizing the Chaoxing Learning Platform, we aim to enhance the construction and practical application of our teaching framework through scientific planning. This involves a gradual refinement of course content via modular management and the amalgamation of existing instructional resources. Key to our strategy is addressing the dynamic nature of student learning needs and the evolving context of educational environments. We encourage instructors to adopt a proactive approach in deploying case-based teaching methods, primarily leveraging remote digital pathology and micro-videos. This approach facilitates the integration of positive medical and political ideologies within the curriculum, thereby enabling students to engage more effectively with pathology. Additionally, we periodically recommend a variety of educational resources, including pathology reference books, expert lecture slides, updates on recent advancements, multimedia learning materials, and pathology-focused WeChat public accounts.

In conclusion, the mission of enhancing pathology education is both challenging and enduring. Our teaching collective, while retaining elements of traditional instruction, has embraced the Chaoxing Learning Platform to introduce and manage graphical and audiovisual pathology teaching resources, particularly those centered on digital pathology and micro-videos. The establishment of online pathology courses and the expansion of communication channels between teachers and students are pivotal in fostering a learning environment that heightens student engagement, autonomy, and adaptability in studying pathology. These efforts have not only improved the information technology competencies and educational proficiency of our teaching staff but have also facilitated the dissemination of educational resources across various institutions and levels. By effectively advancing the hybrid online-offline teaching model for "Pathology," we have observed positive student feedback and a broader implementation of this innovative educational approach.

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