Based on "Internet+" Flipped Classroom Exploration and Practice in Teaching

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Abstract: *This paper aims to explore the use of "Internet+" technology to flip the traditional classroom teaching model in order to better enhance students' learning outcomes in the fields of medical microbiology and immunology. Through research and practice, it has been found that the flipped classroom approach can stimulate students' interest in learning, enhance their ability for self-directed learning, and promote deep learning. This paper will combine specific cases with the latest research findings to propose more concrete teaching strategies and suggestions, and discuss how to effectively evaluate the application effects of the flipped classroom in the teaching of medical microbiology and immunology. The goal is to provide reference and inspiration for educational reform.*

Keywords: *Internet+; Flipped Classroom; Teaching Practice*

1. Introduction

With the rapid development of information technology, the field of education continues to explore ways to better utilize internet technology to enhance teaching effectiveness. The flipped classroom, as an innovative teaching model, has garnered significant attention in the context of "Internet+". A flipped classroom is a teaching model where students learn the course content in advance and then engage in discussions and practical activities during class time, promoting active participation in learning and enhancing students' interest and ability to grasp knowledge. As an emerging teaching

model, the flipped classroom combines the transmission of knowledge with practical learning through the use of online platforms and multimedia technology, gradually attracting attention and recognition within the education sector, allowing students to engage in deep learning both inside and outside the classroom[1]. The flipped classroom can improve students' learning outcomes and motivation, benefit their self-directed learning and critical thinking development, and help break down traditional teaching models, promoting active and collaborative learning. After previewing course content, students can better understand and assimilate knowledge; engaging in practice and discussion in class deepens their understanding and application of that knowledge[2]. Through theoretical research and analysis of practical cases regarding the flipped classroom teaching model, this paper will explore how to optimize course design, enhance teaching interaction, and stimulate student interest in learning by integrating internet technology, thereby achieving more effective knowledge transmission and skill development[3].

2. Implementation Strategies for "Internet+" Flipped Classroom in Medical Microbiology and Immunology Teaching

In the context of "Internet+", students can utilize online platforms at home to preview basic concepts and knowledge. In class, teachers can provide guidance and discussions based on students' understanding levels, encouraging more active student participation in learning. This interactive teaching approach can stimulate students' interest in learning and increase their engagement in the learning process.

2.1 Pre-Class Self-Directed Learning Stage

To cultivate student-centered self-directed learning abilities, teachers should set clear learning objectives, upload resources such as videos and animations related to key knowledge points to a group chat platform and provide pre-class learning task sheets. Taking the course on the Human Immunodeficiency Virus (HIV) in medical microbiology and immunology as an example, as shown in Table 1.

Students can complete learning tasks by researching information and watching videos online. The contents of the task sheet include a learning guide, learning tasks, and questions and suggestions. To better accommodate students' personalized learning needs, a combination of linear and non-linear course models is used in the course design. On one hand, in the linear course model, course knowledge points are clearly presented by chapter through videos, with related questions linking the micro-courses together. On the other hand, the non-linear course model allows students to selectively choose course nodes and content based on their interests, existing knowledge levels, and learning objectives. Online assessments, relying on the internet, can track and manage each student's learning progress, allowing students to monitor their learning status in real-time and make reasonable adjustments, thus achieving personalized teaching plans. In this modular setup, teachers and students are not in the same space and time. Students become the primary subjects of self-directed learning ("front stage"), while teachers operate as the designers and facilitators of autonomous learning "backstage." This marks the beginning of the teacher's transformation from a traditional performer to a director in a modern educational context.

2.2 In-Class Discussion and Inquiry Phase

In the discussion and inquiry phase of the flipped classroom, the following strategies and methods can be employed to guide students in deep discussions and thoughtful engagement.

2.2.1 Learning Reports and Organized Discussions

Students work in groups to report on the pre-assigned learning tasks, primarily using PowerPoint presentations. Other groups can ask questions and provide additional comments on the presented content. Engaging questions should be posed to stimulate curiosity and desire for inquiry, guiding students to think deeply and explore topics further.

2.2.2 Teacher Feedback:

The teacher should provide feedback on each group's presentation. For common problems that cannot be resolved, a categorized explanation can be given, while individual issues can be addressed during follow-up support. Students should be divided into small groups to discuss problems collaboratively, sharing their perspectives and insights. Group cooperation can promote brainstorming and inspire more creativity and insights among students.

2.2.3 Summary of Key Difficulties

Based on the issues raised during the pre-class discussions and the classroom presentations, a summary of the key difficult content from the relevant chapters can be created, facilitating the internalization of knowledge for students. Critical thinking should be encouraged, fostering an environment where students can challenge and question concepts, guiding them to consider problems from different angles and developing their critical thinking skills. Timely summaries and feedback should be provided after discussions, capturing the core content and conclusions from each group's dialogue while offering targeted suggestions to promote further thought and learning.

By employing these strategies and methods, students can be effectively guided to engage in deep discussions during the inquiry phase of the flipped classroom, fostering the development of their critical thinking and teamwork skills, thereby improving learning outcomes and academic inquiry ability.

2.3 Post-Class Consolidation and Improvement Phase

Post-class reflection is essential, considering students' learning status prior to class and their in-class performance. This entails identifying issues, adjusting teaching pacing, and modifying teaching approaches and methods to address challenges, thereby improving teaching effectiveness. Formative assessment should be implemented, including performance scores from task sheets after viewing micro-courses and contributions during in-class PowerPoint lectures and group discussions.

This research applies the "flipped classroom" teaching method to the medical microbiology course, engaging in thorough exploration, continuous improvement, and refinement to ultimately develop a comprehensive methodological framework. There are plans to apply this teaching method to varied majors and courses in the next semester, further illustrating the advantages and disadvantages of this system within the teaching process and its applicability. Through this study, the traditional model of "students passively receiving information" is transformed into "students engaging in self-directed learning," establishing a student-centered approach that promotes knowledge internalization, skill expansion, and cultivates lifelong self-directed learning habits, research skills, and collaborative learning spirit, ultimately developing competitive talent in traditional Chinese medicine.

2.4 Assessment of Teaching Effectiveness

2.4.1 Research Subjects

A random sample of 56 students from the 2021 cohort majoring in Integrated Traditional Chinese

and Western Medicine was selected. The evaluation focuses on learning achievements and knowledge retention: a comparison of students' exam results and classroom interaction performance under the flipped classroom model versus the traditional teaching model to determine if there are significant differences.

2.4.2 Teaching Methods

The 56 students were divided into 2 groups: the experimental group consisted of 28 students using the "Internet+" based flipped classroom teaching model, while the control group also contained 28 students following the traditional teaching approach. Student engagement and interest were assessed through surveys and classroom observations to gauge students' attitudes toward the flipped classroom and their participation levels.

2.4.3 Assessment Methods

The evaluation consisted of practical assessments (20%), in-class quizzes (20%), and a final theoretical exam (60%), with a total score of 100 points. The assessment also focused on students' self-directed learning abilities and problem-solving skills developed through the flipped classroom model, evaluating their critical thinking abilities and capacity for addressing challenges.

2.4.4 Statistical Analysis

Statistical analysis of the assessment results in medical microbiology revealed that students taught using the Internet+ flipped classroom model achieved significantly higher overall scores than those taught through traditional methods, with minor discrepancies. An analysis of the utilization of internet resources assessed how students engaged with online materials and their mastery of online learning tools, including teaching platforms, live streaming, and online discussions. Continuous feedback and improvement: Timely collection of student feedback regarding the flipped classroom, including course design, teaching content, and methods, would guide future teaching improvements.

The above are common assessment methods, which can be adjusted and supplemented based on specific circumstances. In evaluations, it is essential to consider both quantitative and qualitative data comprehensively and objectively to assess the effectiveness of the flipped classroom in teaching medical microbiology and immunology.

3. Teaching Strategies and Recommendations

The "Internet+" flipped classroom model combines online resources with face-to-face teaching, expanding potential teaching possibilities. Students should be guided to engage in self-directed learning. While implementing the flipped classroom approach, students should be encouraged to prepare for and review materials at home, and to engage in practice and discussions in class. Through collaborative learning and problem-solving approaches, students can develop their self-learning and problem-solving skills.

Teaching Strategies and Recommendations for "Internet+" Based Flipped Classroom:

- Set Clear Pre-Learning Tasks: Prior to class, relevant learning resources, video courses, or online reading materials should be published on digital platforms, directing students to engage in self-guided learning that allows for deeper in-class discussions and practical activities.

- Provide Diverse Learning Resources: Leveraging internet resources, such as virtual laboratories, online courses, and interactive games, cultivates student interest and enriches their learning experiences.

- Encourage Interaction and Collaborative Learning: Utilize online discussion forums and collaborative platforms to foster interaction and cooperative learning among students, enhancing learning effectiveness.

- Establish Personalized Learning Paths: Tailor different learning tasks and challenges to accommodate students' learning needs and interests, providing personalized support to help them achieve their learning objectives.

- Timely Feedback and Assessment: By utilizing online quizzes, assignment submissions, and other methods, timely information on students' learning can be gathered to inform teaching adjustments and personalized tutoring, ensuring continuous improvement of student learning outcomes.

By implementing these strategies in conjunction with the "Internet+" flipped classroom model, teachers can more effectively guide students toward deep learning, enhancing their motivation and sense of achievement. This approach also fosters the development of students' self-directed learning capabilities and critical thinking skills.

4. Conclusion

This project implemented the "Internet+" flipped classroom model in the teaching of medical microbiology and immunology within the Integrated Traditional Chinese and Western Medicine program at our university. This teaching model aids in transitioning the educational focus from knowledge transmission to a collaborative construction of knowledge between teachers and students, and from primarily assessing learning inputs to evaluating learning outputs [4]. Moreover, this model integrates the advantages of physical classrooms and online education, highlighting students' active roles and stimulating their exploration and independent learning capabilities [5]. It contributes to the cultivation of students' innovation abilities and overall competencies, laying a solid foundation for their transition into clinical practice and community service. This is crucial for the long-term development of clinical and public health sectors in our country. In the field of medical microbiology and immunology, employing the "Internet+" flipped classroom model enhances students' learning outcomes, ignites their learning interests, and promotes their capacity for self-directed learning [6]. Through teaching practices, it has been observed that the flipped classroom yields positive teaching outcomes and promising application prospects, providing new ideas and methods for educational reform.

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Table 1. Self-Directed Learning Tasks for the Course on Human Immunodeficiency Virus

Learning Guidelines, Tasks, and Recommendations

1. Learning Guidelines

1. **Learning Objectives**
   - Human Immunodeficiency Virus

2. **General Requirements**

   (1) Understand the biological characteristics and pathogenic mechanisms of Human Immunodeficiency Virus.

   (2) Familiarize with the transmission routes and clinical manifestations of Human Immunodeficiency Virus.

   (3) Learn about the detection methods and prevention principles for Human Immunodeficiency Virus.

3. **Learning Methods and Recommendations**

   Watch the teacher's uploaded videos on Human Immunodeficiency Virus (already uploaded to QQ group), and read relevant materials on Human Immunodeficiency Virus and related diseases.

2. Learning Tasks

Complete the following tasks through teaching content related videos, audio, Flash, PPT, etc.:

(1) What are the transmission routes of Human Immunodeficiency Virus?

(2) What are the pathogenic mechanisms of Human Immunodeficiency Virus?

(3) What are the clinical symptoms of Human Immunodeficiency Virus?

3. Questions and Suggestions

(Based on students' written questions and suggestions related to the course)