

Reform and Exploration of Teaching Modes in Data Processing Courses for Humanities and Social Sciences Majors

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ABSTRACT

This article explores innovative teaching methods such as personalized instruction, fostering students' self-learning abilities and creative thinking, integrating multimedia technology for blended learning both online and offline, incorporating research into teaching, diversifying evaluation methods, and enhancing teachers' self-efficacy for improving teaching effectiveness. Taking the course "Python Data Processing and Analysis" as a case study, the article applies these approaches in practical teaching. The research findings indicate a significant improvement in teaching effectiveness, with noticeable enhancements in student engagement and performance.

KEYWORDS

Personalized Teaching; Independent Learning Ability; Innovative Thinking; Self-efficacy; Diversified Evaluation.

1. INTRODUCTION

Teaching methods are essential means for teachers to impart knowledge and skills, guide students' independent thinking, and help them master subject knowledge and improve learning and thinking abilities. Different teaching methods are suitable for different subjects and stages of student learning. Therefore, the choice of teaching methods should be designed according to the characteristics of the subject, teaching objectives, and the actual situation of students. Teaching effectiveness is one of the important indicators for measuring teaching quality. Good teaching effectiveness should be reflected in several aspects such as high mastery of knowledge, improved learning and thinking abilities, stimulated interest and motivation for learning, and deepened understanding of the subject. In order to achieve good teaching effectiveness, teachers need to have professional literacy and teaching ability, scientifically design teaching content and methods, flexibly apply different teaching strategies, pay attention to students' learning status and needs, and adjust teaching strategies in a timely manner to maximize the improvement of students' learning effectiveness. In addition, teachers also need to continuously learn and update educational concepts and methods to adapt to the changing educational environment and requirements. Traditional teaching methods often focus on teacher-centered knowledge imparting, neglecting students' initiative and participation, which may lead to students' lack of thinking and innovation abilities and inability to adapt to new environments and problems. Each student has their own unique learning style and pace; however, existing teaching methods often overlook this point, leading to students not receiving personalized guidance and support.

By using various teaching methods and measures such as personalized teaching^[1], cultivating students' independent learning ability^[2] and innovative thinking^[3], fully utilizing multimedia technology for blended online and offline teaching^[4], and integrating scientific research into teaching,

enhancing teachers' self-efficacy^[5], and process assessment method, etc . This paper conducted teaching practices on "Python Data Processing and Analysis" course.

2. INNOVATIVE CLASSROOM TEACHING METHODS

2.1. Personalized Teaching

Each student has their unique learning style and pace. Personalized teaching methods can ensure that each student can learn in the way that suits them best, thereby improving teaching effectiveness. During the teaching process, through laboratory sessions and offline communications, understanding the individual differences of students, personalized teaching methods are adopted to implement guidance and education in different ways to meet specific needs of students. For students with weak conceptual understanding, visualized presentations of knowledge points are provided, with rich charts and images to enhance students' perceptual cognition. For example, when explaining list slicing operations, visualization of the slicing effect can be demonstrated using a certain website. For students who are hands-on and practical, experimental projects are arranged in the system for students to practice and exercise offline, with complex tasks arranged for students with a strong foundation and learning ability, and simple tasks arranged for weaker students, allowing students to implement a certain function by writing code themselves to enhance students' sense of achievement. During this process, teachers can discover problems through communication with students in a timely manner.

2.2. Cultivation of Students' Independent Learning Ability

Cultivating students' independent learning ability is an important goal of innovative classroom teaching methods. In face to face teaching, students are guided to explore and learn autonomously through the design of tasks and activities, cultivating students' independent learning ability. At the same time, online teaching the paper adopt Educoder platform. The Educoder platform provides students with rich learning resources, such as exam practice systems, teaching videos, etc., allowing students to learn independently according to their own needs and interests; Encourage independent learning and cooperative learning, advocate for students to learn independently, encourage them to independently complete tasks and solve problems. At the same time, cooperation in learning is also encouraged, allowing students to learn to cooperate with other classmates, share information and experiences; Enhance students' confidence and self-efficacy, positive encouragement and affirmation are given to students in theoretical and experimental classes, allowing them to believe in their own abilities and potential. At the same time, help them establish correct self-awareness and evaluation, enhance self-efficacy; Set challenges and encourage innovation, set appropriate challenges for students, encourage them to try new things and innovate. In the experimental class, students are encouraged to learn more complex function usage methods using the thinking methods provided by the teacher, which helps to cultivate students' innovative thinking and problem-solving abilities.

2.3. Flexible Use of Multimedia Technology

Multimedia technology can provide more vivid, visual, and intuitive teaching content and learning resources for classroom teaching. Since this course is aimed at all students in the university, and they are all freshmen with little knowledge of computer-related fields, pure theoretical explanations can be difficult to understand, causing students to lose interest and motivation in learning. Therefore, in the teaching of Python data processing and analysis, multimedia technology is used to design teaching materials, collect related knowledge points' videos, animations, etc., and simultaneously use the Internet to present abstract knowledge to students in a more intuitive and vivid way, helping students better understand and memorize knowledge, such as slicing, set attributes, etc.

2.4. Integrating Research Findings into Teaching

Content Research and teaching complement each other; research findings are the results of teachers' in-depth exploration in their respective professional fields. Integrating these findings into teaching content enables students to access the latest knowledge, technologies, and research methods. Such enriched teaching content is more comprehensive and profound. If students can understand the teachers' latest research findings and if these findings are closely related to their learning content, it will stimulate their interest in research. Moreover, it provides them with new possibilities for future academic research. By integrating research findings into teaching content, teachers can guide students to understand new knowledge and ponder new questions, thereby nurturing their innovative abilities. The process of research often requires innovative thinking, which can cultivate students' abilities for independent thinking and problem-solving. Integrating research findings into teaching content is also beneficial for teachers themselves. To effectively convey the latest research findings to students, teachers need to continuously update their knowledge base and enhance their teaching abilities. In the "Python Data Processing and Analysis" course, most of the instructors are experts in machine learning and deep learning. For instance, basic operations such as association rule analysis in project recommendation algorithms, handling outliers, missing value processing, normalization, etc., are integrated into teaching activities. This approach not only stimulates students' interest but also emphasizes the importance of fundamental knowledge. It benefits both students and teachers in their professional development.

3. DIVERSIFIED EVALUATION METHODS

The comprehensive assessment method is an approach that considers multiple factors in evaluation, including students' academic performance, regular participation, practical abilities, and overall qualities. This method enables a comprehensive assessment of students' abilities and potentials, thereby enhancing the accuracy and fairness of evaluations. Building upon this foundation, various evaluation methods such as process evaluation, differential evaluation, and performance evaluation are integrated. Factors such as students' classroom participation, group discussions, laboratory work, project completion, and practical report assignments are proportionally incorporated into the overall grades. Personalized evaluation criteria and contents are formulated based on differences in students' backgrounds, interests, and levels of ability. For students with strong learning capabilities, assessment difficulty may be increased, while for those with weaker abilities, encouragement measures may be employed.

This integrated evaluation approach better caters to students' needs and development, facilitates the timely identification of learning issues, provides feedback and guidance, enhances the specificity and effectiveness of evaluations, assesses students' practical abilities and problem-solving skills, aids in improving learning methods, and enhances learning outcomes. It serves as a crucial basis for the comprehensive assessment of students' overall qualities.

4. ENHANCING TEACHER SELF-EFFICACY

Nurturing teacher self-efficacy is a complex and crucial task, involving teachers' confidence and attitude towards their own abilities and educational work. The enhancement of teacher self-efficacy signifies an increase in teachers' confidence in their teaching abilities and educational work. Confident teachers are more motivated and courageous to explore new teaching methods, tackle challenges, continuously enhance their professional competence, and improve their teaching standards, thereby enhancing teaching quality. The institution provides various forms of assistance and support for course instructors: multiple systematic course trainings help teachers acquire new teaching skills, educational theories, and practical experiences to continuously enhance their

professional levels. Through teaching research activities, teaching observations, and teamwork, collaboration and cooperation among teachers are promoted, encouraging collaborative learning and mutual growth, sharing teaching experiences, exchanging teaching methods, providing mutual support, and learning from each other. Regular teaching reflection meetings, personal development plans, and other methods are employed to promote teachers' self-growth and improvement, encouraging teachers to reflect and self-assess, recognize their strengths and weaknesses, and actively take action to improve and adjust. Modern technological means are utilized to provide teachers with teaching resources, teaching tools, and teaching support. Convenient resource acquisition pathways for teachers are provided through online platforms, educational applications, and other means.

5. IMPROVEMENT IN TEACHING EFFECTIVENESS

By adopting new teaching methods, cultivating teacher self-efficacy, and diversified evaluation method on the "Python Data Processing and Analysis" course during the first semester of 2023-2024, we have achieved significant results. These improvement measures have had positive impacts on the course instruction.

The application of new teaching methods has injected fresh vitality and creativity into the teaching activities. The introduction of personalized teaching, multimedia technology, and blended learning approaches has stimulated students' interest and enthusiasm for learning. In the Hedger system, the average participation rate in various tasks and projects reached 95%, with an overall average score increase of 5 points. The increased student engagement and improved learning outcomes reflect the effectiveness of these teaching methods.

The cultivation of teacher self-efficacy has also significantly influenced teaching effectiveness. Through professional development training and regular reflection and learning, teachers have strengthened their confidence in their teaching abilities and educational work. This confidence has empowered teachers with the motivation and capability to tackle challenges in teaching, as well as the patience and perseverance to guide student learning, thereby enhancing the overall quality of the course.

The improved assessment methods have played a crucial role in course instruction. The combination of various assessment techniques has enabled a more comprehensive and accurate evaluation of student learning. This not only allows for the timely identification of student learning issues and difficulties but also provides valuable feedback and guidance for teachers, assisting them in adjusting teaching strategies promptly and enhancing teaching effectiveness.

6. CONCLUSION

The new teaching methods, cultivation of teacher self-efficacy, and diversified evaluation method, have not only enhanced students' academic performance and engagement but also bolstered teachers' confidence and capabilities in instruction, laying a solid foundation for the continuous improvement and advancement of course instruction. Next research will continue to explore and implement innovative teaching approaches and methods, make greater contributions to nurturing future talents with innovative spirit and comprehensive abilities.

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