

Research on Development and Application for Micro-Course Resources of *Advanced Mathematics* Under Background of Educational Informatization

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Abstracts

As a public compulsory course offered for the most of majors, *Advanced Mathematics* will significantly influence learning of subsequent courses during university and play an important role in cultivating logical thinking of students. However, due to massive contents and short class hour, it is impossible for teachers to spend too much time in imparting knowledge beyond teaching requirements. In view of this, this research will solve existing teaching and learning problems through deeply discussing topics about micro-course teaching, completely searching micro-course related resources, scientifically designing special micro-course, specially recording micro-course teaching and strengthening application of micro-course teaching resources in the course of research and development for micro-course teaching resources of *Advanced Mathematics*.

Key words: Educational informatization; Advanced mathematics; Micro-course resources; Development and application

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INTRODUCTION

According to *2016 Work Points of Education Informatization* issued by Ministry of Education, we

shall strengthen development and application of high-quality digital education resources for higher education and promote digitized transformation for higher education courses. As main development and design staff, teachers in universities and colleges shall comply with development trends of educational informatization and accelerate construction of digitalized teaching resources. The scholar Huang Kuanna took the first important limit for an example to discuss design and application of micro-course teaching for *Advanced Mathematics* based on MOOC. (Huang, Liu, & Jiang, 2016) The scholar Lai Yongqiang studied problems existing in the process of developing and applying micro-course resources and corresponding measures. (Lao, 2019) The scholar Huang Yonghui made deep thinking for integrating MOOC into teaching reform of *Advanced Mathematics*. (Huang, 2017) These researches have provided important enlightenment for deploying micro-course. Foreign micro-course resource website is relatively novel and perfect and has been applied to daily teaching. However, practice of domestic micro-course resources in teaching has been developing in exploratory stage. Although there are many high-quality single micro-courses, few systematic micro-courses have not been formed, while single micro-course plays slight role in teaching reform and improving teaching quality. In view of this, existing teaching and learning problems will be solved through overall research and development and application for micro-course teaching resources of *Advanced Mathematics*. Through micro-course, on the one hand, students can explore independently, find out missing points, apply flexibly and think actively, which will effectively strengthen interesting and active learning for *Advanced Mathematics* and improve comprehensive learning capacities; on the other hand, teachers will deeply and completely prepare lessons and improve teaching level in the process of building and applying digital teaching resources.

1. SIGNIFICANCES OF DEVELOPMENT AND APPLICATION FOR MICRO-COURSE RESOURCES OF *ADVANCED MATHEMATICS*

1.1 Promoting Construction of Digital and High-Quality Teaching Resources and Expanding Teaching Tasks

The formation-based teaching is the foundation of research and development for digital teaching resources. development design for micro-course resources of *Advanced Mathematics* will promote improvement of construction and professional level of digital teaching resources and help teachers deeply explore teaching resources, completely study teaching materials, promote construction and innovation upon development and improvement and therefore further promote construction of digital teaching resources for *Advanced Mathematics*.

1.2 Promoting Student-Centered Teaching Reform and Optimizing Learning Method

The micro-course realizes microminiaturization for learning contents, which will provide fragmented, mobile and dynamic learning experience for learners. The knowledge points of *Advanced Mathematics* can be made into different micro-courses of which four to five will generate into a topic, therefore, students can conveniently integrate and compare knowledge points and then further grasp contents from a high level, which will effectively improve their learning efficiency.

1.3 Promoting Formation of Interactive Teaching Mode and Improving Teaching Quality

Online interactive teaching activities are deployed through micro-course video, which will promote formation of interactive teaching mode for *Advanced Mathematics*. The interactive teaching mode considers teaching as a uniform and dynamically developing interaction and interactive activity process between teaching and learning, which brings harmonious interaction between students, students and teachers, individual and teaching intermediary through optimizing teaching interaction to generate teaching resonance and improve teaching efficiency.

1.4 Promoting Improvement of Information-Based Teaching Level and Raising Teaching Capacity

Through searching digital teaching resources of *Advanced Mathematics* from domestic similar colleges and universities and deeply analyzing these resources, we have researched and developed digital micro-course teaching resources of this university. Through making micro-course videos, implementing online micro-course teaching and Q&A on “duifene” platform, we have deepened curriculum reform and enriched extracurricular materials to accelerate improvement of information-based teaching capacities of teachers.

1.5 Motivating Students in Learning Interest

Searching related materials from various aspects and views to enrich micro-course teaching resources and vivify boring mathematics will strengthen students' enthusiasm for learning *Advanced Mathematics* and improve their independent learning and innovation capacities. Online teaching platform has realized mobile learning from simple class learning to better implement individualized and selective learning as required for knowledge points of *Advanced Mathematics*, which helps students strengthen knowledge and promote development of innovative student-centered learning mode.

2. CONTENTS OF DEVELOPMENT FOR MICRO-COURSE RESOURCES OF *ADVANCED MATHEMATICS*

Research and development for micro-course resources of *Advanced Mathematics* can be deployed through:

i. Deeply exploring topics of micro-course teaching.

Through deeply analyzing syllabus and textbook of *Advanced Mathematics* and designing micro-courses with topics of differential calculus and integral calculus based on students' feedback information and teaching experience, we can design 15 key and difficult points and easily confused points for each topic, with 30 micro-course resources in total, to lay solid foundation for developing micro-course teaching resources.

ii. Completely searching micro-course related resources.

Through searching materials and resources related to micro-course topics developed by the research group via zhihuishu.com, iCourse, Netease Online Open Courses, we can closely combine *Advanced Mathematics* with practices, further collect applications of *Advanced Mathematics* in building, economy and engineering, strengthen combination between teaching of *Advanced Mathematics* and the history of mathematics and increase interesting and scientific level of courses.

iii. Scientifically designing special micro-course.

Through collecting and classifying knowledge points and materials of the same topic and logical relationship, we can conduct micro-teaching design for each knowledge point, ensure its representativeness, hierarchy and systematization, make corresponding micro-courseware and expand students' scientific thinking and scope of knowledge.

iv. Specially recording micro-course teaching.

Through applying these videos to classroom teaching, based on students' feedback, we can analyze teaching effects and constantly make further improvements for teaching resources to achieve satisfactory effect and popularize to other classes and academies.

v. Applying micro-course teaching resources.

Micro-course teaching resources are uploaded to online teaching

platform “duifene” where pre-class push, online practice, interactive discussion and other interactive teaching contents can be implemented.

The research and development for micro-course resources of *Advanced Mathematics* propose to solve the primary problem of selecting and designing micro-course topics. Selecting and analyzing knowledge points of mathematics are extremely important for achieving good teaching results. Based on features of *Advanced Mathematics* and related materials, we have selected key and difficult points to make scientific analysis and processing, which will satisfy students’ demands of individualized learning for knowledge points of *Advanced Mathematics* and strengthen knowledge learning. In addition, teaching design of micro-course shall focus on positive heuristic and guidance to complete teaching tasks within valid time with refined words and rigorous inference. Second, it is also extremely important to search and integrate topic materials. Finally, the key to achieve good results depends on high-quality micro-course recording and application. High-level recording, wonderful demonstration and accurate commentary will ensure quality of micro-course. Strengthening teachers’ awareness for teaching reform and improving their teaching capacities and multimedia technology level will help make innovative, high-quality and multi-element micro-courseware to better record high-quality micro-course video.

3. FEATURES OF DEVELOPMENT AND APPLICATION FOR MICRO-COURSE RESOURCES OF *ADVANCED MATHEMATICS*

i. Starting from background of educational informatization and grasping main problems existing in teaching will promote innovative and practical teaching reform. Through designing micro-courses with two topics of differential calculus and integral calculus and enriching each micro-course with rich materials, we can make high-quality teaching resources, break traditional teaching mode and advocate independent learning and heuristic teaching.

ii. Following basic rules of higher education, we can strengthen application, enhance practice, and focus on actual effects and feasibility to realize promotional

values in and out of the university. Micro-course is not simple repeat of classroom teaching, but deep processing for teaching materials to build the teaching idea that “mathematics roots from life and life reflects mathematical principles”. Introducing practical mathematical questions to classroom will help students apply their knowledge in actual life. Through building a new bridge between students and teachers and starting from cultivating individualized and independent learning, we can manage and control teaching activities from different levels, strengthen application and practice and focus on actual effects to share resources between students and teachers.

iii. The online teaching platform “duifene” will provide new learning space for students, guide students to learn independently, and change their awareness of “I shall learn” to “I want to learn”, thus promoting formation of student-centered teaching mode.

Through research on topics and application of achievements, we can better comply with requirements for educational informatization in university stipulated in “Quality Project” of Ministry of Education to provide direct, objective and practical bases for design and organization of interactive activities for *Advanced Mathematics* under resource sharing environment; gradually realize construction of elite courses and teaching resources for *Advanced Mathematics*, multi-mode teaching and informatization support; practically accelerate construction of education informatization of our university, promote application of modern educational technologies in teaching of *Advanced Mathematics* and other activities and realize network and digital teaching and administration to provide individualized service for students, increase time and space for independent learning and promote quality improvement for talent cultivation.

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