

◆ Research Paper

DOI: [10.5281/zenodo.4278168](https://doi.org/10.5281/zenodo.4278168)

Construction of teaching quality control system for hydraulic and hydroelectric engineering

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Abstract: In the course teaching of introduction to Hydraulic and hydroelectric engineering in the hydrology and Water Resources Engineering major of China University of Geosciences (Beijing), to obtain teaching effect, and guide and adjust the teaching schedule and content. This paper studies and establishes two monitoring systems, the two-dimensional code anonymous grading system, and the teaching quality quantified grading system, to monitor the course. The two monitoring systems can be generally accepted by students and have positive effects. Through the use of a monitoring system in teaching from 2017 to 2019, remarkable results have been achieved, including a series of achievements in teaching reform, engineering practice, student innovation, and other aspects. At the same time, it has a good reference, reference, and promotion significance in courses with similar characteristics.

Keywords: hydraulic and hydroelectric engineering; monitoring system; two-dimensional code; teaching reform; anonymous evaluation

1. Characteristics of the Course introduction to hydraulic and hydroelectric engineering

China University of Geosciences (Beijing) is a research-oriented university with the main characteristics of geology, resources, and environment. Two disciplines, geology, geological resources, and geological engineering, have been selected into the national Double FirstClass University construction discipline. The university has complete geological characteristics, including teachers, majors, and equipment[1].

The hydrology and water resources engineering major of China University of Geosciences (Beijing) is hydraulic engineering. As the hydrogeology major has been deleted from the current undergraduate major catalogue of general institutions of higher learning, the postgraduate major of China University of Geosciences (Beijing) will be classified under the neo-Science category of geology independently. Among the undergraduate majors in colleges and universities, groundwater science and engineering are the closest things to hydrogeology. Therefore, the hydrology and Water Resources engineering major of China University of Geosciences (Beijing) is established by the class of hydrogeology and groundwater science and engineering. It is a major between geology science and water conservancy engineering and is gradually changing to the direction of authentic water conservancy engineering with geosciences characteristics.

In this context, the teaching of water conservancy and water conservancy courses in the atmosphere of strong hydrogeology color encountered great difficulties[2]. Introduction to hydraulic and hydroelectric engineering is the main course of hydrology and water resources engineering, using the teaching materials[3] as shown in Figure 1. The purpose of the course teaching is to make students understand and master the main structure of water

conservancy and hydropower projects and form the perceptual knowledge of these structures. Through learning, students should master some characteristics of China's hydropower resources, the basic concept and composition of water conservancy projects, and the development history of water conservancy and hydropower projects. Master the basic concept, characteristics, and working principle of various hydraulic structures; To master the construction methods and methods of water conservancy and hydropower projects; Grasp the significance of the mechanization of water conservancy projects, China's construction mechanization of water conservancy and hydropower projects. Through teaching, students can have a certain understanding of the classification of hydropower engineering machinery and the economic analysis and accounting of mechanized construction. To cultivate students' ability to systematically analyze the whole process of hydraulic and hydroelectric engineering from site selection to construction to operation. In the teaching process to guide the cultivation of students' engineering quality of water conservancy projects.

	第一章 绪论	
	第一节 水资源及水能资源	第六节 河岸溢洪道
	第二节 水利事业	第七节 水工隧洞
	第三节 我国的水利水电建设发展	第五章 取水、输水和平水建筑物
	第四节 本课程的特点及相关知识	第一节 取水建筑物
	第二章 水利水电基本知识	第二节 输水建筑物
	第一节 水文学及水力学	第三节 平水建筑物
	第二节 水利水电规划	第六章 水电站厂房建筑物
	第三节 工程地质	第一节 水电站厂房及其设备
	第三章 水利水电枢纽	第二节 厂房有特点的水电站
	第一节 水利枢纽	第三节 其他形式的水电站
	第二节 水利水电枢纽的组成和类型	第七章 过坝建筑物
	第三节 水工建筑物	第一节 通航建筑物
	第四节 枢纽布置	第二节 过鱼建筑物
	第四章 挡水建筑物和泄水建筑物	第三节 过木建筑物
	第一节 重力坝	第八章 水利水电工程建设和施工
	第二节 拱坝	第一节 水利水电工程的建设程序
	第三节 支墩坝	第二节 水利水电工程施工中的水流控制
	第四节 土石坝	第三节 施工总组织
	第五节 水闸	第四节 施工机械与机械化

Fig. 1 Teaching material and directory structure

The undergraduates from the provinces of the country, many students study in the university course, groundwater and geology, hydrogeology has a direct relationship, many aspects of knowledge are quite cross, so students of geology, hydrogeology, groundwater related courses are relatively easy, but can't have very good about water resources and hydropower engineering course, and repeat the edification of knowledge points. Students still have considerable difficulty in learning this course, many of the content do not understand, let alone form a common sense of knowledge.

2. Significance of curriculum teaching monitoring

Monitoring classroom teaching has the following significance: (1) It can better understand students' learning status, learning attitude, and learning interest; (2) It can have a good understanding of students' mastery of knowledge. (3) Teachers can make good adjustments to this course, including adding or deleting the course content, adjusting the teaching schedule, and adjusting the teaching methods and methods. By monitoring the introduction to hydraulic and hydroelectric engineering, students can have a good understanding of their love for and interest in this course. Students' knowledge of water conservancy projects can be understood in real time. The course content and schedule can be adjusted by the teacher with a specific aim. Finally, achieve a better teaching effect.

3. Blind spot of the current school and college teaching monitoring

(1) The teaching supervision of the Academic Affairs Office and the college is the supervision and guidance in the form of spot checks and after-class supervision.

The main way to do this is by the leadership of the academic affairs school of the relevant school, entering the classroom from time to time, or attending lectures online. After class, students will discuss the college and school level. Invite teaching supervisors to participate in relevant lectures; Through the old teachers to the young teacher's classroom teaching supervision and guidance.

This supervision and guidance are not universal. The characteristics and teaching methods of different courses are quite different from each other[4]. Therefore, they cannot be carried out fixedly and conservatively. At the same time, this monitoring is spot check type, which cannot be completely done to the full range of monitoring. This monitoring is still a kind of superficial monitoring and guidance on the surface and form of the course, such as course discipline, teaching language and expression, and the monitoring of the internal knowledge points of the course is rarely involved.

(2) Online grading system for academic affairs. At the end of the course, the academic Affairs office simply completes the examination review of the paper, uploads the score, and the student gives the grade to the teacher. Then the student can see his/her score.

The disadvantages of this scoring system are as follows: on the one hand, there is great randomness and randomness in students' scoring. The rules are as follows: before students see their test scores, they have a certain burden on their mood, because they are eager to know their test scores, so they do not spend too much time thinking about the teachers' scores, but many students give the scores at will. As a result, the teacher's score may not be so real.

The other disadvantage is that the system has the characteristics of lag and untimeliness. This system is a system of educational administration, which is only opened once a semester. Teachers need to wait a long time for feedback. Only after the end of the course can be graded, so teachers cannot be urged to modify and change the teaching methods and strategies. The effect is greatly reduced.

Keeping the system open at all times is difficult. The school involves a lot of courses, the teaching progress and content of these courses are very different, the characteristics of the course, the characteristics, and progress of teachers teaching are also different. If you use this system in real-time, then it is too tedious to open and close, sometimes there may be some problems; The cost of communication between teachers and academic staff is too high.

4. Two big monitoring systems

(1) Develop an anonymous two-dimensional code grading system for teaching quality

The two-dimensional code system of teaching evaluation, combined with the widespread popularity of mobile phones at present, develops the students' feeling evaluation and scoring system of teaching quality, which has the characteristics of students' rapid evaluation, real evaluation and anonymity, easy to use, low cost.

The workload of teachers increases very little, the work efficiency is improved, according to the teaching progress can be opened and used for many times. The interface of the scoring system. It has solved the deficiency of the educational administration grading system thoroughly.

The two-dimensional code is objectively graded and monitored, which is used at the three-time points after the mid-term, final, and exam scores respectively. Specific two-dimensional code examples are shown in Figure 2 and Figure 3. The real anonymous network scoring system (two-dimensional code scoring system) for hydraulic and hydroelectric engineering independently developed by the lecturer enables students to systematically score their real evaluations in three periods, and the lecturer can have a more objective and comprehensive understanding and evaluation of his/her teaching situation and make real-time improvements. The real-time, anonymous, and direct teaching of the course of introduction to Hydraulic and hydroelectric engineering is realized.



Fig. 2 Four examples of two-dimensional code in the two-dimensional code anonymous scoring system

(2) Quantitative grading of teaching quality

Three-time points and annual level monitoring, annual and annual level monitoring. Objective questions in examination papers are established, and a certain amount of knowledge points are examined over the years. At the end of each test, a statistical analysis

is carried out on the grades of the whole class, as well as standardized test questions on the test paper, and annual monitoring of students' level.



Fig. 3 two-dimensional code scoring system

- a) The interface of the scoring system displayed by the computer; b) two-dimensional code;
c) The rating system interface displayed on the mobile phone; d) The same Two-dimensional code can only be graded once

Knowledge points have the following characteristics: with a certain degree of coverage, that is, it can cover the whole course; The standard used in the test questions is to cover the textbook chapters and standardize the answers. With some objectivity, objective answers,

objective scores; Make the students answer the question rule of the truth, that is, cannot answer the blank cannot blindly write, to achieve the students' actual level of inter-annual evaluation. So that these topics have good monitoring; Can be more accurate to obtain the level of knowledge of these grade students, and a good comparison with previous students' learning status and level. It is an innovation of teaching interannual monitoring methods.

5. Conclusions

Established a real anonymous course grading network system (TWO-DIMENSIONAL code grading system). Students can systematically score their real evaluations, and the lecturers can have a more objective and comprehensive understanding and evaluation of their teaching conditions, and make real-time improvements. Teachers have improved their teaching and monitoring skills[5].

A set of effective course effect monitoring system is formed: anonymous grading and examination paper three-point grading system, examination paper setting system, the teaching method of combination of regular lecture - multimedia animation and video. And adjust the teaching in progress.

6. Promotion value and application effect results

In many years of teaching, remarkable results. The teaching method has the mission responsibility, the active promotion, is recognized; Students' comprehensive quality and

practical ability have been improved comprehensively. Students' academic confidence, satisfaction, and comprehensive quality have been greatly improved.

(1) Responsible for the mission of teaching methods, active promotion, and recognition

This method is used to teach a course to undertake the task of water conservancy engineering of the first-level discipline, and make up for the deficiency of hydrology and water resources majors in other second-level disciplines of water conservancy engineering. Taking on the mission of transforming hydrogeology and engineering geology into water conservancy engineering has increased the knowledge connotation of students and enriched the extension of students' major. It enables students to have extensive employment in hydrology and water resources engineering in the first-level discipline. It has innovated the teaching method of this course, which is operable and practical and has good promotion value.

Research paper participated in the 2017 Beijing tenth young teachers teaching the basic paper game and "frame rolling teaching method in the application of water resources and hydropower engineering teaching" won third prize, is professional water only, is not easy, as it is also one of the schools only three award-winning paper, results of recognition. At the same time, in the Beidaihe teaching seminar organized by Beijing Education Trade Union, the applicant actively promoted his teaching achievements and teaching experience, which was unanimously recognized by more than a dozen universities in Beijing.

(2) Students' comprehensive quality and practical ability have been improved comprehensively

The course leader guided the students to develop "a new type of oxygen increasing device for shallow water with temperature difference", and won the first prize in the fifth National University Students Hydraulic Engineering Innovation Competition, which achieved a breakthrough in China University of Geoscientific (Beijing), which is very rare in geological universities that teach and research based on discovery. At the same time, he instructed the students to win the second prize in the sixth National College Students Water Conservancy Innovation Competition for "a water conveyance device across the seismic fault zone". It has gradually become the norm for students in this major to actively participate in the national water Conservancy competition and strives for awards.

The students of our college have a stronger sense of innovation and participation in the competition, which prompted the college to successfully organize the first Energy Conservation and Emission Reduction Competition of China University of Geosciences (Beijing) in 2019. Even after the deadline for registration was closed, there were still many registration requests. The growing student participation has attracted students from other departments of the university to take part in such innovative design competitions. Students of this major lead the school's innovation competition to a certain extent.

(3) Students' academic confidence and satisfaction have been greatly improved

After several years of teaching, the students' professional quality and satisfaction have been greatly improved. According to preliminary statistics, from 2017 to 2020, the number of undergraduate theses on water conservancy and hydropower project construction, disaster, urban water conservancy, and other topics has reached 16.

Through the monitoring system, annual standardized scores, anonymous Two-dimensional code scoring satisfaction, scoring participation, and other indicators show that students' professional literacy has been improving year by year, as shown in Table 1.

After three years of operation, the degree of participation and score of anonymous two-dimensional code satisfaction has improved year by year, as shown in Table 1.

In 2017, the average score was 5 points in the mid-term (full score was 5 points), 4.74 points in the final, 4.14 points after the exam, and 72.97%, 62.16%, and 59.46% respectively participated in the exam. In 2018, the average score is 5 in the mid-term (full score is 5), 4.81 in the final, and 4.25 after the exam. The participation rate is 89.47%, 84.21% and 73.68% respectively. In 2019, the average score is 5 in the mid-term (full score is 5), 4.86 in the final, 4.54 after the exam, 91.18%, 85.29%, and 76.47% respectively in participation.

The annual standardized test scores of students increased year by year. The annual standardized scores for the three years from 2017 to 2019 are 22.89 (out of 40), 26.37, and 29.47, respectively.

Table 1 From 2015 to 2019 students fill in the blank, self-assessment scores, final total scores and anonymous grading

year	Number of people taking the exam	Number of students choosing the course	Fill-in-the-blanks test	Students' self-rating scores of test paper	Self-assessment scores	Scours in final exam	Total scours	Anonymous score during the semester	Turnout during the semester	Anonymous scores at the end of the semester	Turnout at the end of the semester	Anonymity after distribution	Voting rate after scoring
2015	38	40				74.38	78.35						
2016	41	41		76.78	84.48	79.10	87.05						
2017	37	37	22.89	65.86	76.49	70.27	78.38	5	72.97	4.74	62.16	4.14	59.46
2018	38	38	26.37	73.13	86.85	76.03	85.03	5	89.47	4.81	84.21	4.25	73.68
2019	34	35	29.47	71.41	81.50	75.79	83.71	5	91.18	4.86	85.29	4.54	76.47

Note: The above is the average score. In 2015 and 2016, only part of the anonymous scoring system was not fully implemented and therefore no statistics were available. There are no fill-in scores for 2015 and 2016. There are no statistics on students' self-assessment scores in 2015. Voter turnout is the ratio of the number of people who actually took the anonymous test to the number who actually took it.

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This paper DOI: [10.5281/zenodo.4278168](https://doi.org/10.5281/zenodo.4278168)

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