



# Online Video Learning Design of Civil Engineering and Architecture Education in Higher Vocational Education Based on Streaming Media Technology

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**Abstract.** The streaming media online video education model is comprehensively promoting the reform of college education, and the construction of online video learning courses is in full swing. Based on this, the design method of online video learning for education based on streaming media technology is summarized. Taking civil engineering majors and graduates of higher vocational colleges as objects, the research is carried out, and the necessity and common problems of the current online video learning design of civil engineering education based on streaming media technology are analyzed, and targeted Solution. Finally, a questionnaire survey was conducted. Based on the analysis and summary of the survey data, we explored suitable ways of constructing quality online courses in civil engineering in higher vocational colleges in order to design more high-quality and practical online courses.

**Keywords:** Streaming media technology · Higher vocational colleges · Civil engineering and construction · Education online video

## 1 Introduction

With the continuous development of science and technology, streaming media technology has become a new form of education in the field of Internet line vision teaching. Online video course is a typical one. The Ministry of Education encourages higher education institutions to actively carry out the construction of excellent online courses, and promote the construction of online open courses and platforms suitable for China's national conditions. In recent years, educational online video learning has sprung up in various Internet platforms. The construction of online video course of civil and Architectural Education in higher vocational colleges is to play a better role in teaching and avoid being mere formality. Targeted selection of the online video learning mode of civil engineering majors in higher vocational colleges for quality education provides more reasonable reference and support for the construction of quality online courses in civil

engineering in higher vocational colleges, so as to make higher vocational colleges high-quality, advanced and Convenient online courses. Due to the poor effect of traditional online video learning in Higher Vocational civil and architectural education, this paper designs an online video learning in Higher Vocational civil and Architectural Education Based on streaming media technology. Firstly, it analyzes the current situation of online video learning in Higher Vocational civil and architectural education, and then according to the analysis results, combined with streaming media technology, it provides more understandable video learning resources for online learners, Design the online video learning mode of education, and realize the online video learning of civil architecture education. Finally, the effectiveness of the design is verified by simulation.

## **2 Current Situation of Online Video Learning in Civil and Architectural Education in Higher Vocational Colleges**

The production of online courses is reflected in the visual effects of learners. There are many forms, such as PPT + screen recording, classroom recording, physical demonstration, studio recording, production animation, white paper + mobile phone recording, etc. Teachers should choose suitable production methods for different professional courses and content. Online video learning for civil engineering education in higher vocational education is not a movie. It does not require full production, but a practical and applicable form. Too much attention to visual effects will not only increase production costs, but also distract learners from irrelevant aspects [1, 2]. The length of the online video learning and production of civil engineering education in higher vocational education should be moderate. Too short will make the learner have not mastered the knowledge. If the online video learning time of higher vocational civil engineering education is too long, it will make the learner easily distracted, and it is not conducive to anytime and anywhere Do fragmented learning. Teachers should make a comprehensive decision according to the characteristics of network video learning, the level of learners and the content of knowledge points. Mainly people appear on the camera, sound on the camera, or a combination of the two.

In recent years, the construction of online courses in China has made remarkable achievements. Video is the main form of online courses. The design and development of high-quality video learning resources has always been the primary task of online course construction. However, there are still some potential problems to be solved in the current situation of resource application and design.

The online video learning of civil engineering education in higher vocational education is carried out by learners independently on the Internet, and no teachers can communicate face to face [3]. This will make it easy for learners to lose focus and lose concentration. Therefore, teachers can increase the teaching effect by adding some interaction in the curriculum. Common interactive methods for online courses include online exercises, homework after class, online exams, study forums, etc. However, if the frequency of interaction is too frequent, it will increase the pressure and time of the learner, and if it is too small, the corresponding effect will not be achieved. As an intermediary of communication between teachers and learners in the online learning environment, the online video learning resources of civil engineering and construction education in

higher vocational education are important nodes to break through the bottleneck of informatization teaching.

The current design and application of video learning resources can not meet this demand. Video learning resources are mainly used in face-to-face teaching environment, and teachers are used as the “intermediary” between students and video learning resources. Under this teaching mode, video is an application object or tool in teaching activities. With the construction of online open courses, online learners will directly face the video learning resources. Teachers have retired from the intermediary position to the auxiliary position, and carry out teaching activities indirectly through video learning resources [4]. Without the teacher’s on-site guidance and intervention, students can still complete the whole learning process only through online video, and teachers can also complete all teaching tasks through online video.

Online video learning resources for civil engineering and architectural education in higher vocational education have become an extension of teachers in the online teaching environment, and gradually replace teachers’ face-to-face guidance and intervention functions for students. In the face of this situation, the actual demand for online video learning resources of civil engineering education in higher vocational education will also change. Not only must we undertake the mission of explaining online video learning content of civil engineering education in higher vocational education, but also need to consider the understanding process of students. The design quality of online video learning for civil architecture education will directly affect the final understanding effect [5]. Therefore, the current video learning resources should not only be a single, static video concept in the general sense, nor a simple, linear content organization, but should be a three-dimensional design generated according to learners’ understanding rules. Multi-dimensional learning resources include the necessary links in the learning process such as learning content presentation, learning activity design, and learner interaction. Therefore, the design of video learning resources that integrates students’ understanding process is the goal pursued by the development of information education.

Under the guidance of traditional theories, we still regard “learning resources” and “learning process” as two independent research areas. In the past, the design of learning resources is less related to learning process. In teaching practice, video is also an auxiliary tool used by teachers in the teaching process. Therefore, the role of video in the past classroom teaching is very limited [6]. However, today’s online video learning resources of civil and Architectural Education in higher vocational colleges are endowed with broader connotation and value by the times, and the online video learning of Higher Vocational civil engineering education and the learning process of students have become an integral whole [7]. However, the design perspective of online video learning designers of civil engineering and architecture education in higher vocational colleges has not changed in time and conform to the trend. They do not realize the teaching value of video learning resources. They still keep unchanged and adapt to changes. They regard video as a traditional sound transmission tool and fail to redesign it in combination with teaching process.

Some online learning videos are just copies of face-to-face classroom teaching, and do not really consider the difference between online and offline learning environments. The content is still based on traditional lecture-based teaching, which is difficult to fully

integrate with the learning process of online learners [8]. Most of these online videos of civil engineering and construction education in higher vocational colleges are still formal videos, that is, they simply record live classroom situations and upload them to the website. However, there are very few “content videos” resources to assist students and promote learning, and the quality of teaching videos is uneven. The content design of many video learning resources has problems such as focusing on teaching results, focusing on the learning process, knowledge transfer, and students’ understanding. They only care about mechanical methods instead of teaching process design. They only focus on the expansion of the number of videos and ignore the improvement of video quality.

The design and development of online video learning resources for civil and Architectural Education in higher vocational colleges has always been the historical mission of educational technology discipline. Throughout the research status of video resource design and tracing the root of this work, there is a lack of a set of reasonable design theoretical guidance, and the research on the understanding of video learning resources is even less [9]. As a result, a lot of resource construction work is like a blind man feeling an elephant. Only by constantly exploring and experimenting in practice can we see the whole picture of resource design theory. The lack of online video learning design theory in Higher Vocational civil engineering education will lead to the disorder and weakness of practical work. The contradiction between the teaching value of video learning resources and the current application situation urgently needs the guidance of new ideas and new ideas of resource design theory.

### **3 Optimization of Online Video Learning Design Method for Civil and Architectural Education**

#### **3.1 Design of Educational Online Video Learning Resources**

The design of online video resources for civil engineering and construction education in higher vocational education should emphasize the role of video learning resources in connecting teachers and students in the learning process, and combining streaming media technology to provide online learners with more easy-to-understand video learning resources. The structure of higher vocational civil engineering education and teaching usually consists of three elements: teachers, students and teaching resources.

Under the streaming media technology, teachers can transfer teaching ideas to students through teaching resources such as teaching materials, coursewares and test paper assignments. Teachers can also skip these teaching resources and directly talk with students to promote knowledge understanding in face-to-face communication. At present, the mediating role of teaching resources in the whole process of understanding is gradually weakened, and seems to be a “dispensable” existence. The design goal of online video learning course of Higher Vocational civil engineering education focuses on “online video watching of Higher Vocational civil engineering education” and “online video interpretation of Higher Vocational civil engineering education”, which guides students from learning, learning to learning, and achieving a good state [10–12]. Among them, the learning in the online video of Higher Vocational civil engineering education is not simple, but purposeful.

Online video learning for civil engineering and construction education in higher vocational colleges requires the support of certain basic knowledge of visual culture, and on this basis, the ability to learn and do well can be improved. In other words, the knowledge goal is the foundation and the key goal. The learner’s understanding of the basic knowledge of the online video learning theory of civil engineering education in higher vocational education is the key basis for further study and interpretation. Based on this, optimize the design of the online video teaching resource management function of higher vocational civil engineering education, as shown in the Fig. 1.

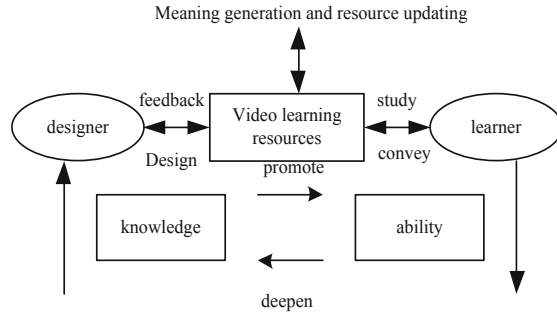


Fig. 1. Online video teaching resource management module

Different from traditional face-to-face teaching, the hermeneutical relationship between “designer-video learning resource-learner” in the online learning environment is more clear.

Through the design and development of online video learning resources for higher vocational civil and architectural education to achieve the teaching process, the intermediary role of online video resources of Higher Vocational civil and architectural education has been highlighted unprecedentedly. In online learning, video learning resources are used for indirect dialogue. Learners can feed back their understanding views to designers through resources, and designers can also send feedback to students through resources, so as to promote the communication and sharing of views between teachers and students under the media effect of video learning resources, and stimulate the fusion and collision of vision of both sides. Generally speaking, enriching the online video learning resources of civil engineering education in Higher Vocational Colleges and meeting the personalized needs of learners is only a way to improve the learning effect, not the ultimate goal. The ultimate goal of network video course resource design of civil architecture education in higher vocational colleges is to promote the improvement of knowledge and ability. Through the form of video to promote learners’ knowledge understanding, and on this basis to promote the improvement of ability, which in turn promotes the further deepening of knowledge.

### 3.2 Educational Online Video Learning Model Design

Teaching method is the general name of the methods and means used by teachers and students in the teaching process in order to achieve the common teaching goal and complete the common online video learning task of civil engineering education. According to Professor Li Bingde’s classification and summary of the teaching methods commonly used in the teaching activities of primary and secondary schools in China, online video learning of civil and architectural education can be divided into teaching class, question and answer class, inspiration class, discussion class, demonstration class, practice class, experiment class, performance class, autonomous learning class, cooperative learning class and inquiry learning class. From the interactive roles of teachers, students, teaching materials and environment, the online video learning of civil and architectural education can be summarized as prompt teaching method, problem-solving teaching method and independent teaching method. In the process of online video learning of civil engineering and architecture education, teachers mainly adopt prompt teaching methods, which mainly include four forms: demonstration, presentation, display and oral narration. The connotation and application scope of these four forms of teaching methods are different, as shown in the Table 1.

**Table 1.** Educational online video learning teaching methods

Teaching method	Connotation description	Example analysis
Demonstration	Demonstration is a teaching method that teachers provide students with certain activities, actions and attitudes for students to follow	Teachers demonstrate how to use principles, how to analyze problems, how to grasp the test, how to explain the relationship, how to extract articles, how to use textbooks, etc. for students, the above are all demonstration teaching
Oral account	Oral teaching is a teaching method that prompts the course content through language	Oral form includes report, speech, explanation, narration, etc. The act of telling refers to the presentation of oral language by teachers to students. Explain knowledge and make students understand the behavior of knowledge
Present	An intuitive teaching method, which can vividly and intuitively present some contents that are difficult to grasp only by language description and students’ imagination with the help of various static teaching methods	Use such as wall charts, models, specimens, drawings, etc.

*(continued)*

**Table 1.** (continued)

Teaching method	Connotation description	Example analysis
Exhibition	Exhibition is a method of teaching by presenting the process and process of things and phenomena intuitively and dynamically	Demonstrate experiments, watch software operation, listen to literature or music tapes, reproduce the process and process of things and phenomena, and visit the scene, so that students can actually observe Wang's live phenomenon in progress: the display is different from presentation, the display is dynamic, it is the observation of movement, it requires students to focus on observation

The above online video learning methods of civil engineering education are mainly based on classroom teaching, and the classification is detailed. Generally, the online video learning resources of civil engineering education are prone to overlap due to excessive details. Therefore, according to the teaching method of teaching micro video, the teaching micro video can be divided into oral teaching micro video and operation demonstration online video learning.

### 3.3 Realization of Online Video Learning in Civil Engineering Education

The main process of online video learning design for civil engineering education in higher vocational education is: selecting courses → selecting knowledge points → writing teaching plans, making courseware, writing exercises → course production → course release → interactive reflection and perfection. There are many factors that need to be considered in the selection of its construction method, including course preparation, publishing platform, production format and duration, teaching method, interactive method and frequency, etc. The key to the effect of online video learning in civil engineering education is the teacher's teaching content, teaching design and teaching level. Develop from the perspective of the learner. Teachers then select and decompose course knowledge points according to the goals, and write lesson plans, courseware and scripts.

The expression content of online video learning resources of civil engineering and architecture education needs to have the enlightening effect of the text. It not only enables learners to correctly understand the designer's intention, but also stimulates learners' thinking, so as to provide a broader discussion space for all online participants and open up more meaningful fields. From the perspective of hermeneutic understanding, a new form of resource design to promote understanding is formed, and an understanding oriented online video learning resource design framework for civil architecture education is constructed, as shown in the Fig. 2.

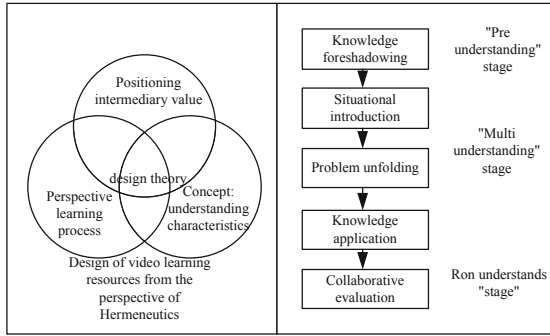


Fig. 2. Educational online video learning resource design framework

The design framework puts forward three stages of the content design of online video learning resources for civil and Architectural Education: pre understanding, multi understanding and integrated understanding. At the same time, the learning content is divided into five parts: knowledge foreshadowing, situation introduction, problem deployment, knowledge application and collaborative mutual evaluation.

Explain the application path of the design framework through a specific teaching case, and according to the later questionnaire feedback and interview investigation, it is shown that the case video can promote students' understanding. Teaching understanding focuses on the teaching process, and each link in the teaching process can be described through diagrams.

By analyzing the structure of knowledge points, we can test the learners' mastery of "required knowledge". Through the concept discrimination, the students will have a simple review of the concept of friction and review the old to learn the new. Students with wrong answers will give detailed explanation of wrong answers and review the definition and knowledge points of friction concept. Like the teaching design of other types of teaching resources, the online video learning of civil engineering education also needs to effectively design the online video learning objectives, learning content, learning process, teaching strategies, media selection, etc. around the characteristics of learners, such as knowledge level, learning style, learning ability, etc.

According to the characteristics of online video learning in civil and architectural education, based on working memory theory, cognitive load theory, multimedia learning cognitive theory, constructivism, and learning objective classification theory, some principles are proposed for the instructional design of micro-class videos in order to give Learners provide a good learning experience. When choosing the teaching content of the online video learning of civil engineering and construction education, avoid multiple teaching contents in the online video of civil engineering and construction education, and design the teaching content as a unit of knowledge points.

When designing and producing the online video of civil and architectural education, it is the most important link to determine the learning objectives. First of all, the teaching content of online video of civil engineering education is based on knowledge points, and the teaching objectives should be layered according to the teaching content, and the corresponding teaching objectives should be designed according to the specific

teaching content. Secondly, the level of teaching objectives should be adapted to the level differences among learners. When determining the teaching objectives of online video of civil and architectural education, we can refer to Bloom’s classification method of teaching objectives to establish the cognitive  $D_s$ , motor skills  $D_p$  and emotional learning objectives  $D_e$  that match the teaching content and learners.

$$\rho = (D_s, D_p, D_e) \tag{1}$$

The constructivist view of learning believes that the learning process is a process in which students actively construct knowledge. Learners select, process and process external information based on their own learning experience and existing knowledge structure. Students construct knowledge meaningfully through adaptation and assimilation in a specific learning situation. Therefore, when designing the specific teaching process in the civil and architectural education online video, we should combine the teaching content and the actual situation of the learner, and strive to create a learning situation to promote the learner’s processing, memory and transfer of knowledge.

### 4 Analysis of Experimental Results

In order to explore the construction mode of online video learning course for civil and architectural education, this paper designs questions from the above six factors and conducts a questionnaire survey. 132 valid answers are collected, of which 37.88% are reading and 62.12% are graduated. After the completion of autonomous learning based on micro class video, the experimental group and the control group were tested for learning effect. The average score of the experimental group was 97.24, while that of the control group was 83.6. The average score of the experimental group was higher than that of the control group. In order to verify whether the average score difference between the two groups is significant, that is, whether the learning effect of the experimental group is significantly better than that of the control group, this study conducted two independent sample t tests on the test scores of the two groups of students (Table 2).

**Table 2.** Sample test results

Test results		Suppose the variances are equal	Suppose the variance is not equal
Levete test of variance equation	F	2.908	0.096
	Sig		
Test of mean value equation	T	6.184	6.184
	Dt	38	33
	Sig	0.00	0.00
	Mean difference Standard	13.750	13.750

(continued)

**Table 2.** (continued)

Test results		Suppose the variances are equal	Suppose the variance is not equal
	Error value	2.223	2.223
	Lower limit	9.248	9.248
	Upper limit	18.251	18.750

The results in the table are divided into two parts. The first part is Levene's variance homogeneity test to judge whether the overall variance of the two groups is homogeneous, where  $f = 2.908$ ,  $P = 0.096$ , the significance level  $\alpha$  is 0.05, and the probability  $p$  value is greater than 0.05, so the variance is homogeneous, that is, there is no significant difference between the two groups; the  $t$  test of homogeneity of variance is selected, where  $t = 6.184$ ,  $P = 0$ ,  $P < 0.05$ , reaching a very significant level of 0%, so there is a significant difference between the experimental group and the control group, that is, the test scores of the experimental group are significantly higher than those of the control group.

Further investigate and record the experience of civil engineering students on online video teaching, and conduct statistics to obtain the following information:

Among the interactive (multiple choice) options, "online exercises" accounted for 62.88%, and "Learning Forum" accounted for 48.48%. In the preference of interaction frequency (single choice question), 46.21% chose "interaction of each class"; 32.58% chose "interaction of each chapter". In addition, online learning forum is set up for learners to discuss with each other, solve questions and answer doubts. Teachers can answer questions online in the forum at a fixed time every week. In the multi topic "for civil engineering courses, which courses do you need to make into online (Network) courses for learning?" Among them, BIM modeling, engineering CAD, reinforcement calculation, measurement and pricing ranked the top four, with more than 50% of the choices, and BIM modeling was as high as 77.27%. From this analysis, learners have a strong demand for professional courses with strong practical operation, but a low demand for theoretical courses (such as engineering laws and regulations) (28.79%).

In the multiple-choice questions in the form of video learning and production, 90 people chose "PPT + screen recording"; 68 people chose "Physical Demonstration"; 58 people chose "Classroom Recording"; and "Studio Recording" only had 14 choices. From this analysis, when students majoring in civil engineering choose online courses, they do not pursue gorgeous visual effects, but prefer the simple and simple form of "PPT + screen recording" that is commonly used. The civil engineering course is highly professional, and it is necessary to integrate practice and apply what you have learned. The combination of "in-kind demonstration" when teachers teach will be more popular with learners, and the teaching effect will be better.

## 5 Conclusion

In order to improve the learners' learning effect and subjective satisfaction, we should follow certain teaching design principles and picture design principles in the design and production of online video learning for civil and architectural education. It should be noted that the overall optimization of the teaching design and picture design of the online video of civil and architectural education needs the cooperation of teachers and professional producers. Further promote the in-depth integration of information technology and higher education, and provide high-quality learning resources for students. Because this paper does not consider the efficiency of online video learning when studying the online video learning of civil architecture education in higher vocational colleges, in the future research, it can improve the online video learning effect of civil architecture education in Higher Vocational Colleges in the shortest learning time.

## 6 Fund Projects

No. 203683, Project Name: Research and Application of Teaching System and Method of Construction Engineering Management Specialty Based on BIM Technology.

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