

New Thinking, New Mode, and New Path of University Classroom Instruction Design

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Abstract: Classroom teaching reform has attracted much attention in China's higher education. "Eliminating the frivolous class" has become an essential topic in constructing undergraduate education in China. This study explores a new method of classroom teaching reform, which forms a "new thinking" of "Three-in-one" by setting classroom teaching time, transforming classroom teaching space and reconstructing the content of classroom teaching activities; the "deep learning method" is introduced to propose five steps of QTDDF to carry out classroom teaching activities. At the same time, embed the "transformable skills" concerned by enterprises to form the constituent elements of building a "new model" of classroom teaching; With continuous practice and repeated training, a "generation model" of college classroom teaching reform with the characteristics of "classroom revolution" is finally formed. The practice has proved that the designed classroom teaching can significantly improve students' attention, concentration, interest, participation, knowledge contribution, learning acquisition, goal achievement, and achievement display. The research results are expected to provide theoretical and practical support for the return of "classroom revolution" to whole-person education and promote the sustainable development of teaching and learning to construct a "top-quality class".

1. Introduction

University classroom teaching reform is the microcosmic thinking ^[1] in university teaching reform, and it is a thinking mode of teaching reform from the angle of teachers and students. Classroom teaching is the most direct, core, and effective place from which students benefit. However, the university classroom generally exists the shortboard, the bottleneck, and the soft rib ^[2], the concrete manifestation is: Lacks the teacher and the student exchange and the interaction.

- (1) Pays attention to the student individuation development insufficiently.
- (2) "seedling" the classroom space is not advantageous to the student exchange discussion.
- (3) Teaching content cannot fully manifest the teaching humanities spirit.
- (4) Information overload, the student knowledge internalization slow.
- (5) Lesson time reduces, the classroom instruction and attends to the class pressure
- (6) After the class, cannot display the student independent study enthusiasm fully.

Based on the above analysis, this study explores a college classroom instruction design method, to provide theoretical and practical support for eliminating the "water class"^[3]. This study holds that a complete classroom teaching design should include a " "Three-in-one" " of new design thinking, namely, classroom teaching "time" design, classroom teaching "space" design, and classroom teaching "content" design. In the process of classroom teaching, the "deep learning" method is introduced, and the five-step method of QTDDF is used to carry out classroom teaching activities. Through the new path of "situational knowledge construction", the whole college classroom teaching can be reconstructed from the change of learning environment to the change of roles of

teachers and students, to the design of teaching content, and then to the change of teaching organization form.

2. Theoretical Basis

From the perspective of brain science and cognitive psychology, human brain learning is produced through the interaction between the human brain and the environment ^[4]. This idea makes the "learning environment" one of the key elements for learners to enhance their learning effectiveness. According to this idea, effective teaching involves promoting effective learning by creating or introducing students to a specific environment based on clear learning goals and criteria. At the same time, this thought also represents the influence of brain science and psychological research on the study of the learning environment. As early as 1910, John Dewey criticized modern school education for being divorced from life and practice and proposed the idea of "learning by doing". Under the influence of Marxist philosophy, Vygotsky puts forward that learning is related to learners' social and cultural environment. Learners learn in a specific social and cultural environment, and the knowledge constructed must have its social and cultural characteristics. It was not until 1960 when the cognitive revolution broke out that western scholars began to combine the construction of knowledge with the cognitive context. Students are confined to the walls of the school, and there is a basic assumption that knowledge can be learned outside of real situations. However, human cognition is carried out in the environment, and the "de-contextualized" education goes against the natural cognitive law of human beings. Therefore, Ravi believes that "de-contextualization" is a major drawback of modern schools and modern education. Then, the "contextualization" of knowledge means returning to man's natural cognition.

Students' learning process in class is their cognitive process, and their cognitive model determines the learning efficiency and teaching efficiency to a great extent. Therefore, classroom teaching design should first be based on students' cognitive model. Lard found that the brain first constructs cognitive patterns that correspond to the outside world and then uses them to reason. It can be said that the classroom teaching process is to assist students in the brain to build a specific professional cognitive model process. Learning is the process of the self-constructing cognitive model in students' minds, and teaching is the process of the self-constructing cognitive model assisted by teachers. This idea has become an important basis for the transformation from teacher-centered to student-centered in modern classroom teaching.

Deep learning is a higher-order product of a new phase in the development of cognitive models, based on work done by Marton and Saljo in the 1960s ^[5]. They argue that there are two approaches to text-oriented reading: trying to understand the text and trying to memorize it. The former is called the "deep learning method"^[6], and the latter is called the "shallow learning method". This theory corresponds to Bloom's six levels of human cognitive development, namely, higher-order thinking (analysis, evaluation, and creation) in memorization, understanding, application, analysis, evaluation, and creation. The Sloman study found that adults focus for about 20 minutes ^[7]. Therefore, the classroom teaching is designed to reflect the time segment, so that the cerebral cortex by different stimulation and in a state of excitement, helps guide students into deep learning. McKenzie, an expert on teaching methods in universities, points out that it is an effective teaching method to organize classroom discussion, cooperate on tasks or projects and let students teach and learn from each other. These ways, not only can help students establish a good cognitive model, but also can effectively design teaching time to achieve good teaching results.

3. “Three-in-one”: New Thinking of Classroom Teaching Design

Based on the above theoretical basis, this study proposes new thinking, a new model, and a new path to classroom instruction design.

Classroom instruction design is constructed by the new thinking mode of ““Three-in-one””, that is, a complete Classroom instruction design should focus on the content design of Classroom instruction activities, with Classroom instruction time design and Classroom instruction space

design as the auxiliary and condition guarantee, as shown in Figure 1.

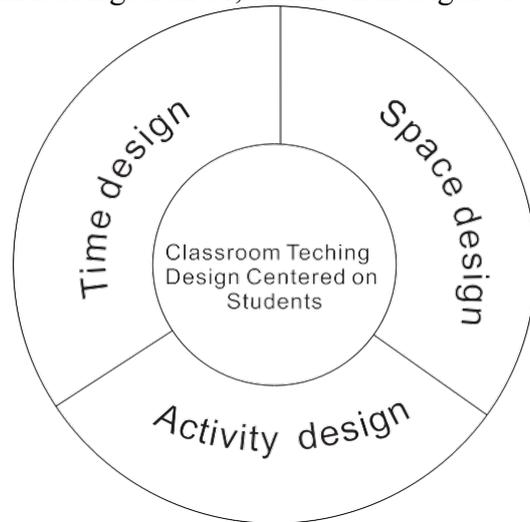


Figure 1 “Three-in-one” design composition.

In terms of classroom teaching time design, follow the findings of brain science and psychology in learning science: an adult sitting in the classroom can endure the longest period time is 90 minutes, a teaching activity from the content of lectures to students' participation and then to review, the longest time does not exceed 20 minutes, an adult continuous attention to listen to a period time does not exceed 8 minutes, play a video of the most effective time does not exceed 3 minutes. The results of the study above have become an important basis for the design of classroom teaching content.

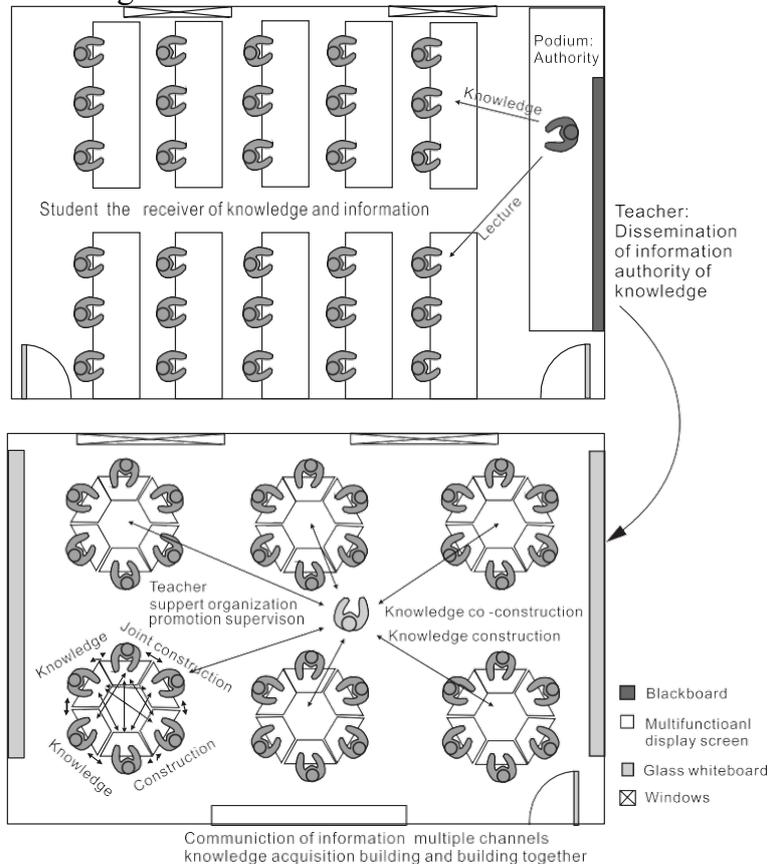


Figure 2 Spatial pattern and knowledge construction process of grouped classroom

The classroom teaching space design refers to the classroom physical space layout, including a blackboard lectern, desks, and chairs between the relationship. The traditional spatial layout conveys a message: the teacher is the authority of knowledge, the center of

teaching, and the publisher of information. With the development and deepening of the "classroom revolution", teaching no longer pays attention to the process of knowledge transmission but emphasizes the design of teaching content with students as the center. The classroom is transformed into a space where teachers guide students to construct contextual knowledge and build it together. Therefore, the spatial layout of the classroom needs to meet the needs of students' independent inquiry, cooperation/collaboration, and participation/sharing learning model. The proposed model and path of classroom teaching reform are based on grouping space structure, as shown in Figure 2.

4. Deep Learning Transferable Skills: A New Model for Classroom Teaching

4.1. Integration of Deep Learning Methods into Classroom Teaching

With the popularization of online and offline hybrid teaching modes of "Internet Plus Education", "access to knowledge", rich learning resources, "fragmented" learning time, "personalized" teaching form, and "borderless" learning modes are subverting traditional education. This normal educational development model provides the basis for the integration of the "deep learning method" into classroom teaching design.

Deep learning is considered as the corresponding three levels of analysis, evaluation, and creation in the Bloom model, while memorization, understanding, and application in the model are considered low-level thinking activities and belong to shallow learning. Based on this theory and the model of "Internet plus Education", the knowledge content, discussion, and communication of shallow learning can be put online and put in front of classroom teaching. Deep learning itself emphasizes "knowledge transfer", "knowledge internalization", "learning interaction" and "learning experience". Therefore, classroom instruction design is oriented by students' "learning to learn", "growth and development" and "solving complex engineering" problems, based on "project-based", "task-driven", "problem-oriented" and "case-analysis", to promote the implementation of various elements in classroom teaching.

To test, internalize and expand the knowledge points, we should use the incentive mechanism to arouse students' curiosity and competitiveness, stimulate students' intrinsic learning motivation, enhance their curiosity, interest, and participation in class, and enhance their sense of achievement.

Classroom interaction in the form of groups is an important means to create a "deep learning" classroom teaching design. The five steps of Question, Thinking, Discussion, Display, and Feedback are intertwined and complement each other. Questioning can highlight the thinking mode, thinking can promote the development of teachers and students, discussion can guide students to learn, the presentation can promote students' diversified development, and feedback can stimulate students' innovative consciousness.

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4.2. Teaching Design Embedding Transferable Skills

Transferable skills, as the name suggests, are skills that can be transferred from one job/field to another. University education pays more attention to the construction of the knowledge system, while employers pay more attention to the cultivation of ability structure. Therefore, it is necessary to make up the "last mile" between the value chain of talent cultivation in universities and the value chain of talent utilization in employers. Transferable skills can make it easier for students to apply what they have learned after graduation and create value for enterprises.

As the core part of the talent training program, which part of the transferable skills should be selected in classroom teaching? After careful analysis and research on the transferable skills of

foreign universities, such as Cambridge, MIT, etc., combined with a detailed survey of real enterprises, this study explores the transferable skills that are realized in classroom teaching and suitable for domestic enterprises, including communication skills, interpersonal skills, research and planning skills, creative thinking skills, organizational, management and leadership skills, and job survival skills, as shown in Table 1.

Table 1 Transferable Skills.

Transferable Skills	Definition	Specific skills
Communication skills	The expression, dissemination, and interpretation of knowledge and ideas.	Speak effectively, write succinctly, independently or provide appropriate feedback when requested, facilitate group discussions, persuade others, describe feelings.
Research and planning skills	Abstract requirements, give solutions and have knowledge search capabilities.	Ask questions, solve problems, collect information, set goals, analyze information, develop assessment methods.
Interpersonal skills	Interpersonal skills.	Build rapport with others, appropriately convey emotions, motivate others, share with others, accurately perceive the situation, respect, counsel services.
Creative thinking skill	Skills related to building critical thinking or thinking flexibility.	Display cognitive flexibility, curiosity, imagination, abstract connections, conceptualized situations, make calculated predictions, and reason.
Organizational, management and leadership skills	Supervises and mentor's individual and team competencies in accomplishing tasks and goals.	Initiate new ideas, deal with details, coordinate and plan tasks, promote change, manage conflicts, manage time, guide assistance.
Job survival skills	Daily, detailed skills that contribute to effective production and job satisfaction.	Make and implement decisions, implement policies or rules, be on time, achieve short- and long-term goals, help others, take responsibility, set deadlines and execute them.

In the five steps of QTDDF, the above transferable skills can be integrated into group learning activities organically in the stages of discussion, presentation, and feedback. Group collaboration can enhance the ability to work with others; group communication can enhance communication skills; group discussions can demonstrate organizational, managerial, and leadership skills; group debates can build critical thinking; and group competition can comprehensively and comprehensively enhance these six transferable skills.

To improve the students' comprehensive quality and the ability to solve complex engineering problems, narrowing the gap between the training of talents and the needs of market enterprises, is one of the effective ways to solve the "last kilometer" problem.

5. Co-construction of Situational Knowledge: A New Approach to Classroom Teaching Design

Constructivism holds that knowledge is contextualized [8]. Based on the new thinking and mode of classroom teaching design, this study proposes a new way to reconstruct the traditional classroom teaching process. The design takes the group as the carrier and uses the situational knowledge activity with "gender once" (innovative, high-level, and challenging) as the means to immerse students in the creative learning environment, carry out "cognitive collision" through activities, realize knowledge transfer and internalization, enhance students' learning experience,

cultivate students' abilities in such aspects as "high-level thinking mode", "complex cognition", "creative questioning" and "critical reflection", and simultaneously respond to the call of "let the class come to life and let students move" in the "classroom revolution"^[9].

Creating a situational learning environment based on the above goals has become one of the key links in the design of classroom teaching activities. The learning environment shall pay attention to authenticity, which is embodied in the following four aspects :Physical reality, that is, real physical scenes, such as enterprises and factories ;True content, that is, the content is closely related to life and professional needs ;True process, that is, the learning process is consistent with the actual life process, such as students' participation in research projects; and True results, that is, after learning, students' harvest is diversified, that is, they know their majors, solve problems, cultivate their abilities and obtain happiness ^[10]. Therefore, the learning generated in the real environment is centered on specific problems, closely related to the situation, and the acquired knowledge and ability are comprehensive and integrated.

After summarizing the characteristics of contemporary knowledge transformation, Shi ^[11] proposes that teachers should transform from the authority of knowledge to the organizer of knowledge and the transmitter of knowledge to the promoter of learning. The design of classroom teaching activities based on teacher-student and student-student situational knowledge fully reflects the change in teacher-student roles.

The general form of the design of classroom teaching activities is the focus of this study, emphasizing its diversity, the diversity of students will have a "comprehensive effect", as shown in Figure 3.

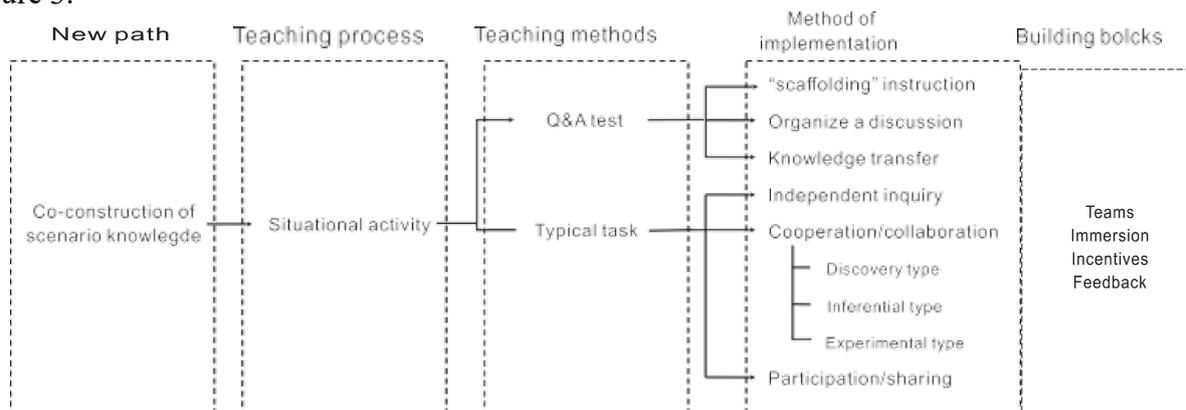


Figure 3 General form of classroom teaching activity design under new path.

Under the new thought and the new pattern support, the creation of situational activities mainly completes the Q\&A test and the typical task link. In the aspect of "test of answering questions", teachers should create contextual knowledge activities to give students "scaffolding" instruction ^[12], in which the teacher is the organizer and the student is the main body. The whole process is dynamic development, teachers are personalized learning service providers, and students are users of this service. By providing the platform of knowledge construction, knowledge discussion, and knowledge transfer for service users, service providers make teachers, students, and students complete knowledge co-construction.

In the aspect of "typical task", students complete self-exploration according to contextual knowledge activities to realize knowledge construction, cooperate/collaborate with their peers, and participate/share with teachers and peers to complete knowledge construction. The teaching process follows the new model of QTDDF's five steps, each activity a closed loop, a class a closed loop, a course a closed loop. Teachers create situations through "asking" and "leading", and students form their own achievements through individual learning or group learning. Teachers provide in-depth feedback on the evaluation, supplementation, and revision of students' achievements. Once again guide students to think in order to complete the internalization of knowledge, knowledge transfer to achieve the goal of the classroom into students to build knowledge and co-building learning "experience field" ^[13]. The reconstruction of the whole classroom teaching activities has several key

elements such as team, immersion, motivation, and feedback, which can promote students' active participation.

Classroom activities promote dialogue, no feedback is difficult to form a dialogue. Efficient and appropriate feedback is the guarantee of teaching quality, and reasonable and pertinent evaluation is the "catalyst" to promote students' participation in learning. Under this new thinking, new mode, and a new path, the feedback, and evaluation of college classroom instruction design are quite different from traditional instruction. Traditional teaching pays attention to students' mastery of knowledge, so summative evaluation is often used. What this study proposes is the development of learners' innovative and intelligent accomplishment, which focuses on the process of students' knowledge construction and co-construction, and the active participation and interaction of students in the classroom. An excellent classroom teaching evaluation system can help students affirm learning awareness, clarify learning direction, stimulate learning enthusiasm, guide learning ideas, urge the learning process, and improve learning efficiency. At the same time, it can promote the quality of teaching and learning, tap the potential of students' multiple developments, and provide basic support for whole-person education.

In the evaluation concept, the evaluation of classroom process management is greater than the final examination score; in the evaluation principle, there is the result, effect, and result; in the evaluation content, there is knowledge transferability and transferable skill training evaluation in addition to the content of professional knowledge construction and knowledge co-construction to be completed; in the evaluation method, there is diversity and interactive evaluation. The evaluation system has the characteristics of "two integration" (dynamic, personalized, community). Through the construction of situational knowledge, after the collision of teacher-student cognition and student-student cognition, a community of thinking products is formed. At the same time, the stimulation, subjectivity, and authenticity of the evaluation system also help students to reflect and summarize to achieve the goal of leading a thinking transition.

Based on the above discussion, this study proposes an evaluation system framework suitable for classroom instruction design, as shown in Figure 4. There are three dimensions in this system, which are the degree of students' accomplishment of classroom tasks, the degree of students' accomplishment of transferable skills, and the degree of students' accomplishment of contextual knowledge construction and co-construction. Each dimension embodies the basis and knowledge of learning content, the interaction, and diversity of learning methods, and the innovation of learning ability and learning environment. Among them, in the context of knowledge co-building, mainly carrying out tasks, cooperation, projects, inquiry, and other forms of interactive activities, is the top priority of the classroom teaching reform.



Figure 4 The Framework of the Classroom Teaching Activity Evaluation System.

6. Discussion

This study attempts to explore new thinking, a new model, and a new path of classroom instruction design from the perspectives of brain science, cognitive psychology, learning science, pedagogy, and pedagogy.

First, from the perspective of new thinking in classroom teaching design, the two prerequisites and foundations of classroom teaching content design are to subdivide classroom teaching time into subsections and to transform classroom physical space into a space pattern suitable for groups discussion. The thinking of "Three-in-one" in college classroom teaching reform reflects the change from the traditional classroom "full classroom" to the modern classroom "cognitive collision", from the traditional teacher "one-size-fits-all" to the modern teacher "scaffolding guidance", from traditional classroom "seedling" to modern classroom "interactive space", from traditional "quiet" to modern "brainstorming" classroom atmosphere, from traditional "teaching perspective" to modern "learning perspective". This thinking also becomes the foundation of this research and becomes the new essential factor to change the university classroom instruction design construction.

Second, as far as the new model of classroom teaching design is concerned, there have been some studies that show that the deep learning method is helpful for students to "help them realize themselves", enlighten "high-level thinking", form "critical reflection", put forward "creative questioning", strengthen "independent discussion", cultivate "cooperation/assistance preference", and enhance the advantages of problem-solving ability [14]. In this study, the "Deep Learning Method" is introduced into the design of classroom teaching activities, and the QTDDF five-step teaching method is put forward. The introduction of this model to enhance students' ability to practice lifelong learning is an important part of this study and becomes the core object of college classroom teaching reform.

Third, as far as the new path of classroom teaching is concerned, there are two changes in the new path of "situational knowledge construction". From the perspective of teachers, the role of teachers in classroom teaching has been changed from "teaching" to "guiding", from "teaching skills" to "stimulating learning motivation", from "paying attention to curriculum content" to "paying attention to the individual development of students", from "simple explanation" to "heuristic explanation", from "one space, two worlds" to "emotional integration". Co-construction of situational knowledge can help students change from passive acceptance to active learning, from one-way knowledge input to multi-channel knowledge acquisition, from boring learning experiences to self-study, self-inspiration, self-exploration, and self-education. The practice of this path emphasizes the students' autonomy in learning, the revision of knowledge structure, and the activation of learning desire, and expresses the deepest demand for education reform and the goal of "classroom revolution".

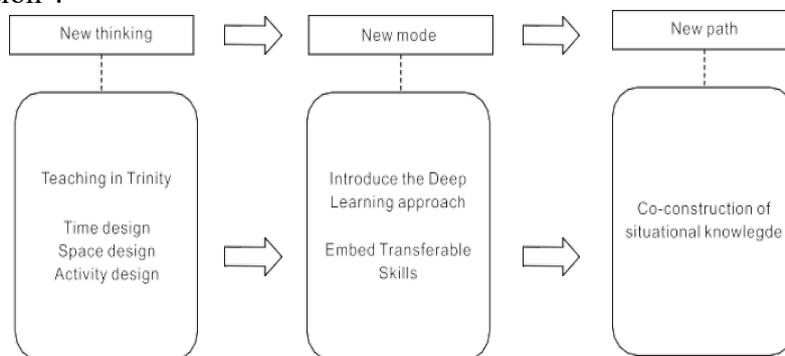


Figure 5 Generation mode of college classroom teaching reform.

Based on the above conclusions, this study attempts to summarize a generative model of college classroom teaching reform with the distinctive characteristics of "classroom revolution", as shown in Figure 5. Figure 5 shows that the college classroom teaching reform is based on the thinking mode of the "Three-in-one" of time, space and content". The reform model is embedded in the

existing "deep learning method". The "arrows" among the three indicate a logical orientation based on causality. At the same time, it should be emphasized that with the deepening and improvement of the classroom teaching reform, the thinking, model, and path in the teaching reform will be updated, iterated, or spiraled upward, and the generation model diagram will be richer mo.

7. Conclusion

The famous educator John Dewey once said, "If we teach our students yesterday, we will ruin their tomorrow." This sentence confirms the basic spirit of the classroom instruction design proposed in this study. The mass of knowledge, the accelerating growth of information, and the updating and iteration of data make it impossible for any teacher to teach students all the knowledge and the latest knowledge. Therefore, how to let the students "learn to learn" is the focus of contemporary classroom teaching.

Through the course designed by classroom instruction, students' attention, learning interest, learning participation, knowledge contribution, learning achievement, goal attainment, and achievement display has been improved. As the observer of the learning effect and the controller of the learning process, teachers find that students' learning behaviors change significantly at all levels and aspects. The enthusiasm and participation of the students in class, especially the students who are not obvious in the traditional class, will participate in all the links of classroom teaching. At the same time, students in communication, interpersonal communication, creative thinking, time management, and other aspects of comprehensive training and improvement. Students gradually learn to think from different aspects and dimensions, and their high-level thinking ability is well promoted.

After the implementation of new thinking, a new mode, and a new path, the teaching classroom produces the following four effects. First, the classroom instruction design has aroused students' study enthusiasm enormously. Co-construction of situational knowledge begins with the problem of representation. With the enhancement of students' ability, the student interest and participation in learning are enhanced by combining knowledge, skills, and interest in the situation itself. Students can have a more positive emotional experience through group voting, evaluation, and encouragement. Students' internal learning motivation is released. Secondly, classroom instruction design provides a good space for students' personalized learning. Teachers are liberated from the central position of teaching knowledge, which makes it possible for teachers to provide individualized tutoring for students. Students' personality develops. Third, the classroom instruction design is helpful to the student and may change the skill training. All activities are closely related to transferable skills, including precise expression, group discussion, persuasion, problem-solving, information analysis, motivating, sharing, abstract connections, time management, and helping others. The quality of students has been improved. Finally, classroom teaching design provides students with a variety of activities, not only requiring students to have their independent thinking but also requiring students to constantly collide between ideas.

Based on the new idea of "Three-in-one" in classroom teaching reform, this study provides a complete solution to eliminate the "water class" through the new path of "situational knowledge construction". Based on the project, task-driven, problem-oriented, and case analysis, the program creates real situations, carefully chooses and designs various activities and application scenarios, and reconstructs classroom instruction design thinking, concepts, contents, methods, and evaluations, so that teachers and students can work together to complete the construction of professional knowledge. The process fully embodies the core view of modern university education with student-centered learning, student-centered development, and student-centered learning effect [15]. As a result, this kind of classroom teaching design can release students' inner learning motivation, develop their personality, improve their quality and cultivate their innovative thinking mode. The theoretical basis and practice of this study have some practical value, to provide a reference for classroom teaching design activities, promoting "classroom revolution" and eliminating "water class".

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