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Research on Building the Research-Based Teaching Model Based on Core Competencies in Colleges and Universities

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Abstract: Cultivation of students' core competencies is a significant measure to carry out the basic task of fostering virtue through education, and building the research-based teaching model is a successful practice of cultivating students' core competencies in developed countries. Research-based teaching takes students' "learning" as the fundamental purpose and teachers' high-quality "teaching" as the basic guarantee. Its most important goal is to cultivate students' core competencies to meet the needs of social development in the 21st century. Through analyzing the core competencies of students, the connation of research-based teaching, and the internal logic of both, this paper has, from macro and micro levels, proposed the building and exploration of the research-based teaching model based on core competencies in colleges and universities. On the macro level, the research-based teaching model is built through establishing a solid ideological foundation, strengthening top-level design and planning, optimizing and adjusting teaching resources, and formulating incentive measures and system guarantee, so as to provide a macro teaching environment for the implementation of research-based teaching. On the micro level, the research-based teaching model is built through teachers' elaborate pre-class design, in-class distribution guidance, and after-class analysis, summary and deep learning. and further concluded that, in order to get concrete outcome in research-based teaching, what is difficult and crucial is guiding teachers to be passionate about, devoted to and research teaching and concentrate on education.

Keywords: Core Competencies, Research-Based Teaching, Internal Logic, Model Building

1. Introduction

Cultivation of students' core competencies is a significant measure to carry out the basic task of fostering virtue through education. In the current era and educational context, the answer to "what kind of people we should cultivate" reflects the direction and trend of education reform and development, and is also an urgent need for improving China's international competitiveness in education. Traditional Chinese education lays emphasis on lecturing and imparting knowledge, and ignores the cultivation of students' abilities of independent learning and exploration, communication, and cooperation. Most of the talented people cultivated are quite at odds with the core competency cultivating objective, and this is exactly the weak point of current education in China, showing an

obvious contradiction with the strong demand of the increasingly fierce international competition for innovative talent in the 21st century. In this regard, developed countries have successfully practiced the cultivation of students' core competencies by promoting research-based teaching and building research-based classroom teaching model, which are also the inevitable options of Chinese colleges and universities to boost teaching quality and cultivate high-level innovative talent. In the process of reforming teaching models and talent cultivation, colleges and universities need to reshape their perspectives on knowledge, learning, and teaching. They need to break free from the "knowledge-centric" mindset that restricts students' self-awareness and seek the optimal model for implementing research-based teaching. [1] The research on building the research-based teaching model based on core competencies in colleges and

universities helps university administrators to reconsider the importance and role of research-based teaching. This assists university teachers in developing a research-based teaching perspective, which will enable them to effectively carry out research-based teaching activities both inside and outside the classroom. Furthermore, it can help students to develop a positive learning attitude and promote the development of their innovative abilities.

2. Connotations of Core Competencies and Research-Based Teaching

Research on students' core competencies started late in China. In 2014, the Ministry of Education (MOE) introduced the Opinions on Comprehensively Deepening Curriculum Reform and Carrying Out the Basic Task of Fostering Virtue through Education, pointing out that "the MOE will organize research and propose the core competency system for the development of students at each learning phase, and clarify the essential qualities and key abilities that students should have to meet the needs of lifelong development and social development" [2]. In 2016, through the MOE's commissioning of Beijing Normal University (BNU) and the joint research of nearly one hundred experts from domestic colleges and universities, the Core Competencies and Values for Chinese Students' Development was issued. According to this official document, core competencies are centered around cultivating "well-rounded persons", interpreted in three aspects: cultural base, independent development, and social participation, and comprehensively manifested in six competencies: humanistic knowledge, scientific spirit, learning how to learn, healthy living, responsibility, and practice and innovation [3], which are specifically refined into eighteen basic points such as national identity; also, it defines students' core competencies as "essential qualities and key abilities that students should have to meet the needs of lifelong development and social development". As the synthesis of students' knowledge, ability, emotion, attitude, quality and other needs, core competencies focus on students' understanding in the process of cultivation, and unify the process orientation and results orientation. Meanwhile, core competencies are also stable, open-ended and developmental, and characterized by advancing with the times, sustainable development and dynamic change, serving as a primary guarantee for cultivating and developing individuals' adaptability and propelling all-round social development. In 2016, World Innovation Summit for Education (WISE) and China Education Innovation Institute of BNU jointly issued the Education for the Future: Global Experience of Developing 21st Century Skills and Competencies report. According to this report, the seven competencies most valued by all economies and international organizations are: communication and collaboration, creativity and problem solving, information literacy, self-awareness and self-management, critical thinking, learning how to learn and lifelong learning, and civic responsibility and social participation [4].

Research-based teaching has integrated the ideological essence of multiple psychological and educational theories, such as the theories of cognitive structure, multiple intelligence, constructivism learning, subjective education and lifelong education. Originating from Dewey's educational thought of "Learning by Doing", research-based teaching stressed that "instead of starting from knowledge, the most effective education starts from meeting students' needs for development; instead of through imparting knowledge, the most effective teaching is conducted through students' activities to achieve experiential learning; students should not be limited to the classroom for conducting activities, but should be put in the real society" [5]. Dewey believed that the evolvement from problem posing to problem solving fell into five steps: association, problem definition, hypothesis, reasoning and hypothesis verification. Later, educational theories got further enriched and developed, such as the "Discovery Learning" of Bruner, "Inquiry-based Learning" of Schwab, and "Inquiry-based & Reflective Teaching" of Massiales and Cox, providing a theoretical basis for guiding the research-based teaching reform. For the concept of research-based teaching, domestic and foreign scholars of educational circles have not reached a consensus yet. However, as an effective teaching approach to guide students to explore actively and cultivate their ability of innovative practice, research-based teaching has become a hotspot of the current higher education reform in China, and has been vigorously advocated by the MOE. The author opines that, research-based teaching is a teaching model based on research-based teaching design, in which the teachers, as teaching organizers, guiders, collaborators and evaluators, consciously inspire and guide students to apply research-based thinking and inquiry-based learning to understand, discover, experience and create, thus to gradually acquire knowledge, train skills, foster abilities and develop their own personalities during the inquiry.

3. Internal Logic of Research-Based Teaching and Core Competency Cultivating

Research-based teaching focuses on cultivating the consciousness of problems, the spirit of scientific exploration and the creativity of students. It highly values students' active construction of knowledge, pays attention to students' emotional experience during learning and their critical spirit and innovation ability enhancement, and emphasizes on their participation and interaction in teaching activities. Compared to the traditional spoon-feeding teaching, research-based teaching is highly consistent with the core competency cultivating objective for students, with a strict internal logic existing during its overall implementation:

3.1. Developmental Knowledge

In traditional teaching theory, curriculum is regarded as the normative teaching content, and curriculum implementation refers to teachers' copying of static

curriculum, namely the one-way imparting of certain knowledge. Surely, certain knowledge cannot be avoided in college classes, but simply teaching certain knowledge cannot accomplish the cultivation of students' core competencies. The learning content should be rich, challenging, open-ended and developmental. In addition to the learning of basic knowledge and fundamental theories, research-based teaching has uncertain teaching and learning contents, which may focus on the major theoretical problems to be solved in a discipline or curriculum, or the solving of problems closely related to students' present or future life. In order to achieve the goal of problem solving, research-based teaching can mobilize and integrate multidisciplinary knowledge to guide students to give play to their initiative, continuously broaden their original knowledge, and seek and add new knowledge; and it can also motivate and stimulate students to be passionate about exploration, allowing them to experience and develop in the process, which is beneficial to cultivating their creativity and problem solving ability, information literacy and critical thinking.

3.2. Exploratory Process

In the traditional spoon-feeding teaching, students only learn knowledge itself without experiencing the process of "knowledge rediscovery" such as exploring, questioning, criticizing and reflecting, and are unable to internalize knowledge in mind and externalize it in practice. Research-based teaching stresses the principal position of students, making students the subject of activities such as thinking, exploring, criticizing, questioning, practicing and discussing. In the process of teaching, through the setting of meaningful and purposeful problem situations, students are allowed to continuously discover problems, collect information, and analyze, research and solve problems, so as to learn the knowledge related to the problems into which they explore, and develop problem-solving skills and independent learning ability. This process witnesses the improvement of students' information literacy, their construction of knowledge based on problem solving activities, and their questioning, criticizing, then internalization of knowledge into personal experience.

3.3. Expansible Space

Compared to the traditional class-centered teaching, "research-based teaching can, through rational teaching design, unify the pre-class, in-class and after-class teaching links, and integrate teaching spaces such as classroom, seminar room, library, laboratory or even research field, thus redefining the college classroom and developing the concept of classroom from a narrow to a broad sense" [6]. Teaching activities always keep close contact with the vivid external world. To expand teaching activities from a single classroom space to a broader three-dimensional space, such as rural field, community street, industrial/mining enterprise, practical training and innovation and entrepreneurship incubation platform, can help to broaden students' horizons and thinking space, and train and enhance their sense of civic

responsibility and social participation with their broad horizons during the analysis and solution of practical problems.

3.4. Teacher-Student Interaction

In traditional teaching, students tend to see themselves as passive recipients who are in awe of the teachers' authority and afraid of making blunders or voicing their own opinions. Such a teaching model ignores the development of students' critical thinking and innovation ability. In contrast, during research-based teaching, Teachers have undergone a shift of role from lecturers and authority to communicators and collaborators, and from "soloists" to "accompanists" [7]. teachers change from the one-way knowledge imparter to multiple roles, including the teaching designer, organizer, edifier, guider, motivator and promoter, and have in-depth dialogue and communication with students on a democratic and equal footing, thus stimulating students' subjective consciousness, initiative and creativity during the construction of knowledge, and achieving the teacher-student joint construction of teaching content and enjoyment of a pleasant "teaching life" in communication and cooperation.

3.5. Diverse Methods

Compared to the traditional teaching, research-based teaching has uncertainty in its form of expression, which makes its fundamental goal no longer enriching or enhancing students' fixed knowledge, but enhancing students' knowledge-based consciousness of questions towards the open world, their spirit of bold exploration and creative research ability. Since it is carried out in a dynamic, open and democratic atmosphere, research-based teaching needs no fixed teaching form, or, a single fixed teaching form is totally unfeasible. Instead, it is necessary to flexibly select the teaching form in accordance with the teaching situation, such as the heuristic, case-based, participatory or inquiry-based teaching. Focusing on questions and exploring freely under the guidance of teachers, students can not only acquire knowledge, but also develop question consciousness and research habit, and have their research and innovation abilities enhanced.

3.6. Multi-Evaluation

Traditional evaluation of students' learning outcomes is mainly reflected in their usual performance and exam performance, which can help to know about their mastery of knowledge and development of abilities, yet hardly show their abilities to apply knowledge to solve complex problems in a dynamic and real social context. In contrast, research-based teaching leads students into an open world of problems, and evaluates students' research consciousness and abilities of practicing, innovation, collaboration, communication, expression and presentation, as well as their abilities to master and make practical use of the knowledge based on the problem exploration, by virtue of group collaborative research, special training, scientific research project practice, innovative design and other evaluation means. Led by the

multi-evaluation, students can have their self-awareness and self-management enhanced gradually.

4. Exploration of Building the Research-Based Teaching Model Based on Core Competencies

Apart from being a teaching concept, research-based teaching is more of a teaching model and action. Instead of a simple reform in teaching methods, research-based teaching is a structural reform involving multiple dimensions, including the education and teaching concept, talent cultivation objective, curriculum setting, optimized resource allocation, teaching content, teaching approach, teaching organization form, teaching environment, teacher-student relationship and teaching evaluation. Therefore, it requires the whole-process participation of all teaching administrators, teachers and students. To be specific, the research-based teaching model can be built from macro and micro levels.

4.1. Macro-Level Building of the Research-Based Teaching Model

On the macro level, the research-based teaching model is built through establishing a solid ideological foundation, strengthening top-level design and planning, optimizing and adjusting teaching resources, and formulating incentive measures and system guarantee, so as to provide a macro teaching environment for the implementation of research-based teaching.

1) Extensive discussions over college students' core competency cultivating objective and research-based teaching in colleges and universities should be organized, to establish a solid ideological foundation for research-based teaching. Student-centered education does not undermine the authority of teachers; rather, it puts forward higher requirements for the principal role of teachers, requiring them to change from lecturers to enlighteners and guiders [8]. The prerequisites for the building of research-based teaching model include: breaking through the ideological barrier of the traditional spoon-feeding teaching, and changing the education and teaching concepts of teaching administrators and front-line teachers, to make them aware of the necessity of their role changing from the knowledge imparter to the learning guider, from the classroom teaching dominator to the collaborator interacting with students.

2) A modern teaching management system and a flexible teaching operation mechanism that can contribute to promoting research-based teaching and developing students' innovation ability should be built. The credit system, elective system, tutorial system, second classroom, innovation training and scientific research subject selection system should be improved to endow college students with more broad space for self-

selection and self-improvement, and motivate their initiative to learn independently and strive to excel themselves, fully embodying the individualized and humanistic education concept.

3) A professional training program combining the core competency cultivating and research-based teaching concepts into the whole process of talent training should be re-developed. This requires to integrate curriculum resources, optimize curriculum system and practical teaching system, and change the standardized "cookie-cutter" training tendency of talent, thus transforming the model from training traditional knowledge-based, closed and single-disciplinary talent to training modern competency-based, open and inter-disciplinary innovative talent.

4) Teaching resources should be optimized to promote research-based teaching. To that end, it is necessary to actively create an environment rich in teaching resources, such as the intelligent multimedia classroom, open laboratory, electronic resource bank, campus network for global knowledge sharing, training platform, diverse practice base, and innovation incubation platform. Development of teaching resources that are applicable and extensive is an important supporting tool and guarantee for teachers to carry out research-based teaching towards students.

5) A three-level (basic, comprehensive and innovative) experimental curriculum system should be built. The proportion of comprehensive, design-based and research-based experiments should be increased, to make experiments more applicable, challenging and research-based. And the objectives, schemes and processes of various experiments should be refined. For example, guidance should be provided for students in experimental group establishment, literature consultation according to experiment content and requirements, independent formulation of an experimental scheme, selection of applicable experimental instruments and equipment, as well as operating method and process, allowing them to hypothesize before experimenting, obtain experimental results, carry out analysis and discussion, and write an experimental report.

6) The practical teaching system should be reconstructed to change the tendency of in-class theory imparting outweighing practical education in traditional teaching, explore and design new flexible in- and out-class, in- and out-campus practical teaching models combining time and space, such as skill training, specialty practice and social investigation. Through building the practical teaching syllabus, expanding the practical teaching base, and carrying out in- and out-campus practical teaching activities, the combination of classroom teaching (in-class) and practical teaching (out-class) makes students truly reconstruct and internalize knowledge in their experience.

7) A platform for college students' research and

innovation activities should be established. A series of curriculum of innovative practice will be offered to meet the needs of innovation activities of different durations, stages and scales, and a reasonable extra credit mechanism for outstanding innovation, scientific research and practice will be set. Great importance will be attached to the organization, training, development of works and implementation of science and technology contests, to set the stage for excellent undergraduates to get exposed to subject frontiers, participate in scientific researches and carry out innovative projects as soon as possible.

8) Teachers are an indispensable factor in carrying out the teaching reform. Given this, an evaluation and incentive mechanism fitting the research-based teaching should be established. Research-based teaching has raised higher requirements for teachers' psychology, ability and competency, demanding them to invest more time and efforts than required by traditional teaching, and also to have the teaching wisdom and be passionate about and faithful in teaching. Colleges and universities should emphatically improve teachers' teaching ability and competency, and perfect the incentive mechanism based on research-based teaching, which is the system guarantee to solve teachers' worries and encourage them to be devoted to research-based teaching.

9) The student evaluation standard system should be upgraded. The evaluation system should not only focus on evaluating students' mastery of knowledge, but also extend to the development of their learning habits and innovation consciousness and ability; instead of being limited to the specific knowledge that students have learned, it should extend to the desire and passion of students to make further exploration and creation; instead of merely focusing on students' exam performance, it should evaluate students' problem-solving ability, creativity and teamwork spirit. [9] A whole-process evaluation should be implemented by combining process evaluation and summative evaluation, classroom teaching and out-class independent learning, and quantifiable (e.g. knowledge and ability) evaluation and fuzzy (e.g. attitude, emotion and value) evaluation. The evaluation should have its roles fully played, including the identifying, guiding, motivating, diagnosing, adjusting and strengthening roles, in order to guide students to change from pursuing high exam scores to seeking all-round development and improvement of personal abilities.

4.2. Micro-Level Building of the Research-Based Teaching Model

Education is not a simple matter; it is complex and sacred, and teachers are the sacred performers or interpreters of this complex process. Ultimately, the success of the curriculum and teaching depends on the teachers. [10] To be specific to the teaching link, no matter the theoretical teaching in class, experimental teaching, practical teaching or research-based subject teaching, all need to go through teachers' elaborate pre-class design, in-class distribution guidance, and after-class analysis, summary and deep learning.

Before class, teachers should take the research-based teaching design scheme as a breakthrough, clarify the course teaching objectives, study students' existing knowledge level, need, experience and interest, analyze and refine the main line of curriculum research topic. Also, they should select proper problems to build specific situation and path of research-based teaching, and design and plan the problems or subjects of college research-based teaching from the major pending theoretical or brand new problems in course teaching objectives, disciplines or courses, the problems related to students' present or future life, and the practical problems faced in specialized technological fields. The organization mode of each research-based teaching module should be specifically set, including teachers' lecturing, students' criticizing, presentation and peer evaluation links. Proper training forms should be selected, such as example, case, special research, final project, and book report. The research-based teaching module should be designed in detail, including the posing of problems, basic requirements for students, reference materials offered to students, suggestions on problem solving steps, feedbacks from students, teachers' comments and students' peer evaluation, time node arrangement for organization and implementation, and training performance evaluation. In conclusion, teachers must provide a platform for students to carry out research-based teaching activities through a large number of investigations, research and detailed curriculum design. Only in this way can students participate in the research-based teaching, internalize their learning experience, and meet the teaching goal and requirement.

In class, teachers should put into practice one by one the detailed design schemes they prepare before class, create a teaching situation and atmosphere similar to scientific research, put forward problems or hypotheses, and continuously organize and guide students to actively explore, learn and practice. Besides, teachers should also make, or guide students to make summaries, mainly including the explanation of problems solved, main conclusions drawn, basic understanding formed, and problems that can be further discussed. Through independent discovery, research and solving of problems and summarization, students can finally achieve the course teaching objectives of knowledge accumulation, ability fostering and competency enhancement. According to the course nature and different needs of the teaching content in each class, the teaching methods based on discussion, situation, collaboration, problem, case as well as the flipped classroom should be flexibly put into practice for implementing research- or discussion-based teaching. A diversity of teaching organization forms should be adopted, such as independent learning, group collaborative learning, "large-class lecturing and small-class discussion", discussion- and debate-based learning, flipped classroom, and essay writing.

After class, teachers should timely analyze, summarize and

give feedbacks on classroom teaching achievements, and should, based on key contents imparted in class, tap into potential research subjects combined with the practical life. The subjects should be both challenging and close to students' practical life, and can stimulate their desire to explore and interest to experience. The combination of the first and second classrooms should be emphasized, so should be that of science and humanities education. For example, proper outward bound training, seminar, practice or science and technology contests should be organized, to allow student to consult literatures in the form of group, enter the community or industrial/mining enterprise to conduct investigations, carry out discipline competitions, and write scientific research papers. Students can improve their information collection and processing abilities through repeatedly consulting literatures, develop their oral expression and interpersonal abilities through group collaborative learning, train their writing skills and summarizing abilities through writing experimental reports and scientific research papers, and improve their comprehensive quality through discipline competitions, especially their gain of the senses of value and achievement.

5. Conclusion

Through analyzing the core competencies of students, the connation of research-based teaching, and the internal logic of both, this paper has, from macro and micro levels, proposed the building and exploration of the research-based teaching model based on core competencies in colleges and universities. On the macro level, the research-based teaching model is built through establishing a solid ideological foundation, strengthening top-level design and planning, optimizing and adjusting teaching resources, and formulating incentive measures and system guarantee, so as to provide a macro teaching environment for the implementation of research-based teaching. On the micro level, the research-based teaching model is built through teachers' elaborate pre-class design, in-class distribution guidance, and after-class analysis, summary and deep learning. Research-based teaching takes students' "learning" as the fundamental purpose and teachers' high-quality "teaching" as the basic guarantee. [11] Its most important goal is to cultivate students' core competencies to meet the needs of social development in the 21st century. The emphasis on students' principal position means that students should be the subject of exploration, practice, discussion, criticizing, questioning and thinking activities, and the process of students changing from being "passive" to "active" requires the organization and guidance of teachers. Since teachers' teaching competence have a direct impact on students' motivation, process and quality of learning, what is difficult and crucial to research-based teaching is guiding teachers to be passionate about, devoted to and research teaching and concentrate on education. Currently, teachers as the teaching subject are the key to implementing the research-based teaching model.

Acknowledgements

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Biography

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