

Research on the Goal of Doctoral Education in China Based on the Development History of Doctoral Education in the West

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Abstract—China's doctoral education model has experienced from the education model of studying the UK, US and German to the model of copying the Soviet Union's doctoral education. Till now, China's doctoral education scale has surpassed the United States to become the world's top doctoral education country. However, the discussion on the goal of doctoral education across the world has never stopped. This paper reviews the history of western doctoral education in the middle ages and modern times, and concludes that the goal of doctoral education is to train future researchers, hoping to make some theoretical contributions to the perfection of China's doctoral education system and the implementation of doctoral education goals in the future.

Keywords—doctoral education; educational history; educational goal

I. INTRODUCTION

China's doctoral education model has experienced from the education model of studying the UK, US and German to the model of copying the Soviet Union's doctoral education. Till now, China's doctoral education scale has surpassed the United States to become the world's top doctoral education country. However, the discussion on the goal of doctoral education among both Chinese and overseas scholars has never stopped. Therefore, based on the perspective of the development history of education, this paper discusses the goals of doctoral education in China on the basis of reviewing the western doctoral education in different stages, so as to make some theoretical contributions to the improvement of the doctoral education system and the implementation of the goals in the future.

II. MEDIEVAL DOCTORAL EDUCATION AIMED AT CULTIVATING TEACHERS

Higher education originates in the fifth century B.C., near the temples of Athens, at universities with high fees. And the title of doctor didn't really appear until the middle ages. In the middle ages, when the appellation or title of doctor was attached to a surname, it meant that the person holding the doctorate had a perfect command of the subject he was studying. This represented him to be able to be engaged in

the education of this discipline, and have all the other qualifications necessary to engage in governance work. From this point of view, the general attitude towards the title at the end of the middle ages was to give it real social dignity and make it more accessible to the privileged classes and aristocracy. As a result, doctors who taught were often called "regent" doctors, namely regens or atcu regens. The participle soon became a noun (a regent), and is still used by the university of Cambridge in the awarding of doctorates.

PhDs have been around since the 12th century. Until the twelfth century a doctor was a common descriptive term, not a formal title. If a person ran a school (whether he was appointed to or was the founder, or with the permission of the authorities and the bishops' agents), he would call himself a master or a doctor. Of course, according to the data, this title could be used in most cases by anyone who has studied for a certain period of time and those who leave school with a formal or informal certificate from the teacher indicating academic performance. By the 12th century, the title had been widely used by members of the episcopal order, the Roman courts, and some of the king's offices.

After the emergence of universities in the Middle Ages, the process of obtaining doctorates became a procedure that universities claimed was unique to them, indicated their status, and were described in detail. The process also included the awarding of a master's degree, and its evaluation consists of three steps.

In the first stage, with the consent of the candidate's teachers, that the candidate was considered to have reached a level that was high enough, he could apply to the university authorities and the president, especially the dean. The dean, usually accompanied by a master's panel, checked to see if the candidate had completed the required number of years of study and the exercises, readings and debates required before getting bachelor's degree.

The second stage, the actual exam, which was often described in the literature as "closed" and "rigorous", was also administered by the dean and with the participation of the master's panel. Generally speaking, the examination was mainly a debate about a particular problem or "argument" that the candidate agrees with, which was decided by

drawing lots the night before or on the morning. If a candidate passed the first two exams, he was considered to have "graduated". The paradox was that the qualifications conferred by the dean proved his academic achievements, but did not qualify him to teach at the university. In view of this, applicants must take the third examination.

The third stage was generally described as "open" testing. The exam was held usually shortly after the qualification for the grant of a quasi-master's degree was obtained. The general term used here was "Inceptio" or "inauguration". This kind of public examination was actually not difficult, and there was little possibility of failure. In fact, it was only a ceremony, usually held in the church, including prayer, professional speech and the granting of a special symbol for the candidate master, namely the a biretta, gloves and books. Then the candidates would give a trial lecture. The performance of his first act as a teacher was usually a debate with students on a topic of his own choice. In some ways this was merely a demonstration of the competence demonstrated by previous examinations and by the granting of a quasi-master's degree. But the ceremony was of multiple meanings, not only indicating that the candidate was suitable for teaching, but also marking his grand entrance into the doctoral community, known and recognized by his peers. Even if the dean were present at such a ceremony, he would not, in the strict sense of the word, exercise any privilege in the granting of a doctorate, which was the exclusive activity of the university. The university also declared through this activity that this was a very important aspect of the university's independence, that is, the university had the freedom to recruit whoever it wanted.¹

Broadly speaking, these were statutory requirements. In terms of the jargon of the day, it generally referred to the master's degree when speaking of literature and law, and the doctor's degree when speaking of theology and medicine. By the fourteenth and fifteenth centuries, anyone who obtained qualifications for a quasi-master's degree could become a master and a doctor. For example, in some liberal arts colleges or seminaries, these two titles almost go hand in hand. Although a doctorate brings considerable prestige to the owner, interestingly, many master's degree holders did not apply for a doctorate, as the title was not only much more expensive than an ordinary degree, but also did not lead to further intellectual development. So a PhD is only necessary for those who wanted to stay in school and teach.

III. WESTERN MODERN DOCTORAL EDUCATION AIMED AT CULTIVATING ACADEMIC LEADERS

The founding of the University of Berlin (known as Humboldt-Universität zu Berlin today) in 1809 marked the birth of a modern university. Modern universities take scientific research as their main function, regard increasing human knowledge and training scientific workers as their main tasks, and advocate "academic freedom" and "unity of teaching and research". In the University of Berlin, the

school of philosophy replaced the previous theological seminary in the university, becoming the center of the university and the birthplace of scientific research, and it was the place, for the first time in the development of the university, the doctor of philosophy was awarded by the school of philosophy. The establishment of doctor of philosophy marks the beginning of modern doctoral education. The training of doctor of philosophy takes "successor of science" as its goal. Students carry out scientific research under the guidance of tutors and participate in discussion classes presided by tutors. The achievement of creative scientific research and the completion of the dissertation are the necessary preconditions for obtaining the doctoral degree.

Under the influence of Germany, Britain, the United States, France and other countries introduced scientific research and research-based doctoral training mode to their universities successively in the second half of the 19th century and the early 20th century. For example, in 1870, after the establishment of the Royal Commission for the Development of Science, Technology and Teaching, the UK advocated the establishment of doctoral degrees in universities, and proposed that "such doctoral degrees should not be granted according to academic performance but according to students' creative ability". Subsequently, the university of London took the lead in setting up to establish a doctorate in science; the university of Cambridge and the University of Oxford also established doctor of science degrees in 1882 and 1890 respectively, and doctor of philosophy degrees in 1917 and 1919 respectively. In the five years after 1918, Britain awarded almost 800 PhDs.² In most universities and disciplines, this degree is an absolute requirement for teaching in higher education and for research in all areas of academic research, and is the main qualification for entry into the academic profession. Americans were impressed by the achievements of German universities. Influenced by Germany, Americans reformed universities. In 1860, Yale University took the lead in establishing the doctor of philosophy. In 1876, Hopkins University established the world's first graduate school with the mission of cultivating doctoral students. In its Higher Education Law of 1896, France required universities to carry out scientific research, and added scientific research content and regulations on dissertation in the cultivation of doctoral students in medicine, law, science and literature.

The United States has learned from the experience of Germany in the cultivation of doctors of philosophy, but it did not copy completely, but combined its own reality, and gradually formed the doctoral education model and training objectives with American characteristics.³ For the purpose of doctoral education, it breaks the tradition of pure academic research in Germany, combines basic theory with

² Hu Sineng. The purpose and thinking of doctoral education in the 21st century [J]. Research in Higher Education of Engineering, 2008(4) (in Chinese)

³ Chen Xuefei. Tradition and innovation: discussion on the evolution trend of the cultivation mode of French, British, German and American doctoral students [J]. Research on Education Tsinghua University, 2000(4): 19-20.

¹ A.E.Bernstein. 'Magisterium and License: Corporate Autonomy against Papal Authority in the Medieval University of Paris', *Viator*, 9(1978), p291-307

applied research, and organically combines knowledge discovery, knowledge dissemination and knowledge application. In addition to the doctor of philosophy, Harvard University of the United States took the lead in 1922 to open a new type of doctor's degree for the professional field — doctor of education professional degree. This is an application-oriented degree, which mainly focuses on ensuring the systematic and solid professional theoretical knowledge and the ability to engage in some professional work of students through high-level professional training. The emergence of professional doctors meets the demand for high-level talents in all fields of society. Since the 20th century, especially after the Second World War, in order to respond to the needs of society and make doctoral education more adapt to the actual needs, American professional doctor's degree has been further developed. Because the doctoral education in the United States is adapted to the extensive demand for teachers in institutions of higher learning, and high-level professionals for national basic research and other fields of society, the doctoral education in the United States has developed rapidly, and has become a successful example for many countries such as Britain, France and Germany to learn from and imitate.

In the UK, although Oxford and Cambridge still aim at cultivating research-oriented doctors, new universities and city universities focus on cultivating interdisciplinary doctors, while technical universities and multi-disciplinary technical universities focus on cultivating application-oriented doctors, thus diversifying the goals of doctoral education in British universities.⁴ In 1954 and 1958, France established the "doctoral diploma of the third stage of universities" in science and arts respectively, with the purpose of promoting students to carry out in-depth research and learn research in a certain subject. In 1973, the "PhD-engineer diploma" and "national doctoral diploma" were established. The Higher Education Law of 1984 reformed the doctor training system of universities, and the new doctor training target changed from the previous single research-oriented doctor training to the training of both research-oriented doctor and compound doctor and doctor engaged in applied research. At the same time, Germany also abandoned the training goal of pure research and established interdisciplinary graduate schools by imitating American universities, focusing on the cultivation of individual research ability as well as the improvement of team spirit and ability.

Since the 1990s, the globalization trend of economy and technology has been developing continuously and the international competition has become increasingly fierce. The knowledge is being updated faster and faster and the division of disciplines is becoming more and more detailed. As more and more senior professional talents are needed in various industries, it is also one of the goals of doctor education to cultivate compound and applied talents.

In the 1990s, as the exchanges and cooperation among European countries in the political, economic and social

fields became closer and closer, the integration of European higher education was urgently required to promote the exchange of talents among member states and facilitate mutual recognition of credits and academic qualifications. The German government actively participated in and advocated the integration of European higher education. In order to meet the upcoming reform, in August 1998, Germany revised the "Framework for Higher Education Act", allowing the retention of the traditional degree system, and at the same time, the trial implementation of the international common bachelor's degree system and master's degree system. In June 1999, Germany and 28 other European countries signed the Bologna Declaration in Bologna, Italy, announcing the completion of the Europaischer Hochschulraum (European higher education area) by 2010, and the establishment of the higher education degree system at the undergraduate and master levels.⁵ In September 2003, Germany held a meeting with the signatory countries in Berlin to introduce the doctoral education into the "bologna process", and established the three-level degree system of Bachelor (3 to 4 years), Master (1 to 2 years) and doctor (3 years).

Objectively speaking, the bologna process has promoted the modernization and internationalization of the German doctoral degree. After the reform, the German doctoral system is in line with the international system, which shortens the time for students to obtain the degree. The setting of course modules and the unified credit transfer system also improve the transparency of professional learning, which is conducive to the mutual recognition and comparison among different majors in colleges and universities. In particular, the management of doctoral education and teaching has been strengthened. The setting of a graduate school and the strengthening of interdisciplinary education enable doctoral students enter into teamwork from independent scientific research and cultivate their good scientific literacy and innovative spirit, and prepare them for their future career or scientific research.

What is the purpose of doctoral education in the 21st century? From the end of the 20th century to the beginning of the 21st century, the United States conducted in-depth investigation and research on this issue.

In 2000, the university of Washington published an ambitious innovation plan, "Rethinking PhDs — what we focus on", funded by the Perot charitable foundation and completed by Jody d. Nyquist and Betting j. Woodford.⁶ The purpose of this report is to answer the question: "how can we redesign PhDs to meet the needs of 21st century society?" The report pointed to the current situation in doctoral education: the rapid development of undergraduate education has led to the need for teaching assistants for graduate students, which in turn has led to more people

⁵ Jiang Peihong, Zhang Chaoran. Review on the reform of degree system in German universities [J]. Academic Degrees Graduate Education, 2007(5).

⁶ Hu Sineng. The purpose and thinking of doctoral education in the 21st century [J]. Research in Higher Education of Engineering, 2008(4) (in Chinese)

⁴ Wang Xuqin, Zhu Hong. The enrollment model of British doctoral students and its referential significance [J]. Heilongjiang Researches on Higher Education, 2013, 31(10): 53-55.

pursuing PhDs than are needed in academia; society's desire for scientific advancement, including substantial investments in laboratories, has led to a great demand for scientific research assistants, and as a result has led to a surplus of scientists in certain fields; the responsibility for improving higher education led to the Carnegie Classification of Institutions of Higher Education and the ranking of American research council, and the pursuit of research privileges and funding has led to an increase in the national PhD program. This situation gives rise to different views on doctoral education. Although doctoral education is generally regarded as a preparation for high-quality research, there are widespread questions about the adequacy of doctoral training for research purposes only. It is generally accepted that doctoral education does not prepare students for other responsibilities and careers. Particularly within higher education, some argue that an overemphasis on academic research leads to inadequate preparation of doctoral students for their future responsibilities as teachers, such as teaching, school evaluation, collective and individual curriculum planning, and school and community service. Business argues that PhD education lacks the collaborative thinking and intellectual activities and tasks necessary for today's work, and that student papers and research interests are often disconnected from other knowledge and real problems. Students, on the other hand, find the process of getting a PhD unpleasant, even intolerable, and some of the best and brightest students are leaving for other reasons. These differing views exist among doctoral students, doctoral supervisors, institutions that provide direct or indirect funding for doctoral programs, and organizations or institutions that employ doctoral graduates.

For the purpose of doctoral education, the report points out the differences between research institutions and the business community. Doctoral supervisors and research institutes consider a PhD to be an academic degree and should prepare students academically, while the business community believes that a PhD should have a wide range of professional knowledge and prepare students for a variety of career options. This divergence is just a general tendency, and in fact, even within the same institution, opposite views can be held. For example, the provost of a university believes that doctoral education should include a variety of professional skills and skills required by the business and government sectors, while the provost of another university believes that the interests of other sectors have nothing to do with the doctor of philosophy.

Despite the differences, there is some agreement on the reform of doctoral education. That includes shortening the time it takes to earn a degree, studying the nature of doctoral education, developing the multifaceted talents of PhD recipients, enabling PhD students to master more new technologies, preparing doctoral students for a variety of professional options, enhancing their understanding of the global economy and environment and strengthening interdisciplinary training in doctoral education.

In 2001 the Carnegie Initiative on the Doctorate (CID) conducted a study. The study focused on six disciplines: chemistry, education, English, history, mathematics and

neuroscience, and lasted five years (2001-2005).⁷ In 2006, the Carnegie report on doctoral education, "Rethinking the future of doctoral education: preparing academic leaders" was published. The goal of doctoral education in the 21st century is to develop "academic leaders," the report said. What is an academic leader? The academic leader is a scholar who has formed the habit of thinking and the ability to do three kinds of things (namely, to innovate, to preserve knowledge and to transform and apply knowledge). It states that a PhD, especially a PhD in philosophy, is essentially a research degree, proving a person's ability to engage in research and academic work. Those who are good at knowledge innovation can evaluate, criticize and defend knowledge propositions, and academic leaders can put forward and form these important questions. Academic leaders should be able to understand the history and basic ideas of the discipline. As disciplines are developing, academic leaders are responsible for maintaining the development, stability and vitality of the discipline. A PhD should understand the basics of the subject — what to keep and what to leave out. Moreover, academic leaders should understand how to make disciplines conform to the knowledge environment, respect and understand the questions and paradigms of other disciplines, and know how to answer the important questions of their own disciplines. Transforming applied knowledge means effectively and clearly describing knowledge and valuing communication, including writing, teaching and application. Subject experts are required to teach regardless of their background. Whether in classroom teaching, nonprofit or government organizations, industry or policy, academic leaders must be able to transmit information and their valuable knowledge and skills. To apply knowledge in different situations, academic leaders must know the scope of application of the knowledge. This ability to communicate needs to be developed during the doctoral education period. Academic leaders must be able to communicate orally or in writing with technical or lay personnel. Knowledge application also requires academic leaders to understand and value how to communicate across traditional disciplinary boundaries.

Although the report is mainly aimed at academic doctoral (Ph.D.), it can be basically determined that for any discipline, being engaged in the field of research (basic research or applied research) is the main work, also is the main standard to get a degree, or the cultivation of the doctoral education aim is to cultivate scientific research workers of the future.

IV. CONCLUSION

The purpose of doctoral education is the general goal of doctoral education. Influenced by political, economic, scientific and social development, it is not easy to determine such a goal scientifically.

First of all, the definition of educational concept and goal is itself a problem. Burton Clark pointed out: According to Humboldt's system, education first refers to the training of reason. Therefore the corresponding concepts of German and

⁷ Chris M. Golde, George E. Walker. Envisioning the Future of Doctoral Education [M]. Shanghai Jiao Tong University Press, 2015.

Anglo-American traditions are different, and concepts of the latter are more oriented to the development of individuals rather than disciplines. A redefinition of the concept of education would clarify the need for appropriate guidance and supervision in the advanced training of future scientists and scholars. A redefinition of the concept of education could also pave the way for a more appropriate response to the needs and expectations of students and future employers. Traditionally, according to the principle of the unification of teaching and research in the University of Berlin, doctoral education aims at cultivating research-oriented talents for academic purposes. However, with the progress of society and science and technology, the scale, structure and function of postgraduate education have changed greatly, and the job market of doctoral students has inevitably changed. "With the increasing complexity of academic systems in the 20th century, it is impossible to help us really understand the situation by explaining in clear terms the purpose of 'higher education' (or even just 'university'). In theory, the purpose of doctoral education can be simply understood from the academic and professional direction, but in practice, the goal of doctoral education has individual goal, social (national) goal, academic development goal and practical application and career development goal.

Doctoral education is divided into academic doctorate (doctor of philosophy) and professional doctorate, but people's understanding is not the same. "There is no general consensus on the balance between the goals of knowledge progress and training, and the attainment of the two goals between originality and the acquisition of general techniques of discipline and scientific research." Some argue that the nature of the PhD is in question. It is appropriate for PhD program to provide broad scientific training rather than to give students the opportunity to do a very specialized research. There is a contradiction in the goal of a PhD, namely, the contradiction between maintaining the scientific objectives of the doctorate and its function of supporting originality and increasing knowledge, and the need to enhance talent and promote technical requirements in some fields. Some argue that the role of the doctor of philosophy should not be to provide advanced training and the enrichment of new knowledge later on as a postdoctoral fellow should be allowed for. For example in some natural sciences, such as physics and chemistry, many people continue their research work as postdocs. Others argue that any doctoral dissertation must include an original and identifiable contribution to the field of study.

Secondly, the purpose of doctoral education is also closely related to students' motivation. There are three possible motivations for students to pursue a doctorate. Some may not have a great interest in academic work, but they prefer college life and continue to pursue advanced degrees after graduation. Some other students, for utilitarian purposes, see advanced degrees primarily as a means to improve job opportunities. The third kinds of students who are more interested in research work have a certain foundation in the research field they choose, and take the exploration of this field as the purpose itself. Students with different motivations have different goals, pursuits and attitudes

towards learning. Students in the first category are more likely to drop out of school when they find their PhD is facing greater difficulties early in their studies. Of course, such students can be inhibited in the enrollment and the number of such students is relatively small. Students in the second category are motivated by instrumental motives and are generally prepared to stick with the entire course, but are easily lured away if other interesting job opportunities crop up along the way. The third group of students seems best suited to surviving the rigors of learning and is the backbone and focus of teaching and research. The motivation of these students is internal rather than external. Their main consideration and lasting motivation for pursuing a doctorate comes from their interest in research and deep affection for the subject, rather than career concerns or future financial reward prospects.

Finally, the future career of the PhD students is also a factor in determining the goals of graduate education. Generally speaking, people who are studying for a doctor's degree hope to have an academic job, but not all of them can get it. The reality is that a lot of people are in positions at various universities; many of those who leave academia find their way into government, or work in various management and professional organizations. A considerable number of them end up working in the general business community. But their PhDs in these professions don't provide them with more advantages than those with masters in economics or bachelor's or professional masters in economics. One of the main purposes of the PhD is to train a future generation of scholars, but the number of positions is limited, which is confusing. The purpose of doctoral education is the general goal of doctoral education. In view of this, some people believe that academic requirements should be lowered for employment purposes. But will lowering academic requirements and making employment a goal increase the employment rate for PhDs? In fact, it is impossible to improve the quality of doctoral education, nor to achieve the purpose of improving students' employment. The report "Reinventing graduate education for scientists and engineers" in the United States, points out that "the proposal to reconstruct the current PhD program, based on a reasonable employment forecast, can directly control graduate student enrollment. But the problem with such scheme is the reliability of employment forecasts and the practical difficulties in its implementation. Another approach is to invent a new degree — a 'different PhD', perhaps, requiring fewer advanced research experiences — to prepare students for non-research careers. But employers tell us that they pay attention to the original research requirements, which are the mark of a PhD, so there is little need for such mixed degree". Therefore, the employment of doctoral students is not a very appropriate factor to determine the goals of doctoral education. The cultural value of doctoral education and the role of intellectual training cannot be negated whether it can bring employment opportunities or not.

Since the 21st century, with the rapid development of social economy and science and technology, doctoral education itself has also been rapidly developed. The society

puts forward a variety of requirements for the doctoral education, and the doctoral education itself also shows differentiation and goal diversification. However, throughout history, doctoral education in China and abroad requires that a doctor "should have the ability to engage in scientific research independently and the ability to achieve creative results in science or technology." This indicates that the purpose of doctoral education should be to maintain the quality and standards of doctoral education, and at the same time to equip students with corresponding subject knowledge basis, innovation ability and transformation and application ability, so as to cultivate "future scientific research workers" and even "academic leaders".

Therefore, according to the educational purpose of doctoral students obtained previously, the crux of the first question (the scope of assessment is not clear) raised in the introduction can be seen, namely, how to judge who is suitable for doctoral students among students who are under the same level of knowledge?

The following discussion is made to solve the above question. From the perspective of language and literature, the key words here is "who is suitable", among which the unknown variable is "who", that is, the attribute of "person". Human beings are the community of internalized attributes and externalized attributes. Today, the most comprehensive expression of a person's personality is the study of personality traits in psychology. So the key to the graduate student index system of science of natural science is to determine whether the personality traits of doctoral candidates are suitable for doctoral students. Then what kind of people is suitable for it? The educational purpose of doctoral candidates mentioned above has clearly answered the question that doctoral candidates who have the potential to become "scientific research workers" or even "academic leaders" are suitable for pursuing doctoral degrees. Therefore this paper, from the perspective of the natural scientists, makes research on the personality traits of them in order to find the significant long-term and universal way of thoughts and emotions of these scientists. These will be used to guide the enrollment work of "checking-system" doctoral candidate, select those have more potential to become "scientific research worker" and "academic leader" into the ranks of PhD students, and make them better adapt to the following academic training.

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