

Examination and Enlightenment: Exploring the Scientific Value of Late Qing Encyclopedias

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Abstract. At the end of the Qing Dynasty, the imperial examination system added examination subjects related to western science, and scholars were required to study Western learning, which made the compilation and printing of encyclopedias at the end of the Qing Dynasty prosperous. After the abolition of the imperial examination system, the encyclopedia gradually declined due to the disappearance of the value of the examination, and some new intellectuals even gave a negative evaluation because of its close relationship with the imperial examination. Although the "shelf life" of encyclopaedia in the late Qing Dynasty was relatively short, it was a special form and way for scholars in the late Qing Dynasty to accept western learning while catering to the trend of imperial examinations. Its scientific value should not be overlooked.

Keywords: Imperial examination reform, encyclopedia, Scientific value

1. Introduction

Compilations of Western learning in the late Qing Dynasty were quite popular among scholars during the period of imperial examination reform, because the abundant Western scientific knowledge contained in them could help scholars cope with the examinations after the reform. Different from traditional Chinese leishu (category books) which compiled articles by category, compilations of Western learning reorganized and wrote the collected new scientific knowledge in the form of entries. German sinologist Milena Doleželová-Velingerová and others found that compilations of Western learning were prevalent in the late Qing Dynasty, but their "shelf life" was very short [1]. These books disappeared from public view for nearly a century. This disappearance not only hindered Chinese readers' acceptance of modern Western science and culture, but also distorted the real picture of the formation of modern China [2]. Academic research on compilations of Western learning has mainly explored their origin, types, stylistic rules, content characteristics, and the scientific nature of the entries [3-5]. Encyclopedias brought new perspectives to readers [6] and promoted "practical scientific knowledge" [7]. As carriers of Western learning, late Qing encyclopedias were closely related to the reform of the imperial examination system. Iwo Amelung argued that the emergence of late Qing encyclopedias was a response to the reform of the imperial examination system [8]. Zhang Qing held that "it was precisely the reform of the imperial

examination that enabled the real breakthrough in the introduction of Western learning in the late Qing Dynasty" [9].

The life cycle of late Qing encyclopedias was relatively short, flourishing only briefly during the imperial examination reform. This phenomenon has long attracted academic attention, but discussions on its underlying causes are still insufficient. This paper attempts to analyze the rise and fall of late Qing encyclopedias against the background of the imperial examination reform, and discuss their scientific value and historical significance.

2. Western learning entering the imperial examination and the popularity of encyclopedias in the Late Qing Dynasty

Both the Hundred Days' Reform (1898) and the New Policies of the Late Qing Dynasty (1901) put forward measures related to the reform of the imperial examination system. To reverse the predicament of internal and external troubles, the Qing court added Western learning questions to the imperial examination to "promote practical learning and encourage versatile talents" [10]. Its main measure was to add content related to Western science to "Ce xue" (policy studies), which focused on examining encyclopedic knowledge [11]. In addition, examinations such as the annual examination, subject examination, palace examination, and court examination also intentionally highlighted content related to Western science such as "essays on politics and arts of various countries" [12]. During the Guangxu reign, the special examination on statecraft was also summoned twice, in 1898 and 1903 [13].

2.1. Scientific examination questions in the imperial examination

The examination questions set by Wang Tongyu, the academic administrator of Hubei Province, for the provincial examination of the imperial examination in 1898 reflected the trend of the Qing court advocating Western learning. The question "On the Principle of Gezhi as the Innate Universal Principle" showed that the question-setter intended for candidates to understand Western science including physics. Questions such as "The Power of the Wooden Ox and Floating Horse", "Hydraulic Erosion", and the analysis of the similarities and differences between gravity and air pressure required candidates to have a certain understanding and research on mechanics; "Explanation of the Speed of Electricity" required candidates to understand relevant knowledge of electricity; "Substances Absorb More Heat and Dissipate It Slowly" involved knowledge of specific heat capacity; and "Three States of Matter: Solid, Liquid and Gas" involved the transformation process between the three states of matter [14]. Such questions involving "acoustics, optics, electricity and thermology" could no longer be coped with by candidates merely knowing a few new Western learning terms; the questions touched on various aspects of physics knowledge, and candidates needed to study in depth to answer them reasonably.

2.2. Scientific examination questions in the imperial examination

Newspapers in the late Qing Dynasty reported the situation of "few candidates taking the exam" in the imperial examination halls after the reform. Guangdong Province "had a long-standing emphasis on imperial examination fame". Taking Nanyi and Panyu as examples, after the imperial examination reform, more than 2,000 candidates registered to collect examination papers in each place, a decrease of half in Nanyi and more than 1,000 in Panyu compared with five years earlier [15]. Jicheng News also reported the decrease in the number of candidates in Nanhai County in

1901: "In previous years, no fewer than 4,000 candidates took the exam in Nanhai County alone, but this time the total number for the two counties was only over 1,000." [16] The decrease in the number of candidates due to the imperial examination reform was not limited to the southern region. In 1902, the Shuntian provincial examination was held in Henan instead, with 5,800-odd scholars taking the exam, the smallest number "ever recorded" [17]. In 1903, thousands of candidates in Shandong Province abandoned the examination. In previous provincial examinations in Shandong, the number of candidates exceeded 10,000, with about 13,000 candidates attending the 1873 and 1875 examinations (the largest number), but "only 9,900-odd candidates took the first session of this year's examination" [18]. Complete Collection of Global Political and Art Studies, published in 1902, mentioned in its preface the situation where scholars were unable to adapt to the imperial examination reform for a time: "In remote rural areas with limited knowledge, without a comprehensive collection of books for reference, how can scholars understand and study [Western learning] conveniently?" [19]

Candidates for the imperial examination in the late Qing Dynasty could bring examination-related materials into the examination hall; the so-called regulations of "searching and inspection" and "no paper allowed to be carried" for provincial and metropolitan examinations were merely empty words. Candidates could bring books, bedding, clothes and daily necessities into the hall, "weighing about 70 to 80 jin in total" [20]. A large number of candidates "all had numerous luggage, pasted with the words 'provincial examination' everywhere, and each person probably had to carry about 100 jin of books" [21,22]. "Since the edict on the reform of the examination hall was issued, the number of recent essays on policies published by bookstores was almost countless" [23]. Scholars taking the exam scrambled to follow the trend to gain imperial examination fame. After discovering the business opportunity, booksellers successively published many encyclopedias specially for the imperial examination, most of which included words such as "current affairs", "art studies", "Western learning", and "new learning" in their titles, intending to indicate that the content of the books was closely related to the scientific questions in the reformed imperial examination. Books such as Classified Compilation of Current Affairs, Compilation of Art Studies, Textual Research on Current Affairs, and Textual Research on Western Art Studies covered multiple fields such as mathematics, chemistry, electricity, mechanics, steam power, acoustics, and optics.

Due to the demand of scholars taking the exam, encyclopedias became popular in the market, so much so that "the amount of paper used increased dozens of times" [24-26]. Textual Research on Current Affairs compiled by the owner of Dianshizhai "caused the price of paper in Luoyang to rise within a few months of its completion" [27]. The encyclopedia business was profitable, leading to the prevalence of piracy in the market. "Unscrupulous merchants" "secretly reprinted published encyclopedias, changed their titles, reduced the font size, and sold them cheaply to make profits" [28]. Due to the reform of the imperial examination, studying new learning was the trend among scholars at that time. Compiling and translating encyclopedias meant for merchants to meet scholars' urgent demand for the examination and obtain huge profits. "The large-scale influx of commercial capital into the new book industry itself reflected the most imminent and real trend of the times" [29].

3. Negative evaluations after the decline of Late Qing encyclopedias

In 1905, the imperial examination system was completely abolished, and the encyclopedias that were once regarded as "treasures" by scholars taking the exam soon declined because their examination-oriented value disappeared. Compiled and published hastily to meet scholars' urgent need for the examination, encyclopedias pursued quantity and comprehensiveness in data collection

and sorting, but the screening of the compiled knowledge was not meticulous. New intellectuals were mostly critical of encyclopedias.

Liang Qichao once commented on the compilation errors of encyclopedias: "However, as the trend [of learning Western learning] just started, compiling and translating Western books suffered from the lack of good editions. For example, books such as *Series on Prosperity and Strength* and *Textual Research on Current Affairs* were voluminous but poorly selected and compiled, which was a regret for aspiring scholars." [30] As a result, readers "could hardly find one out of ten books that were practically relevant" [31].

However, some new intellectuals' negative evaluations of encyclopedias mainly targeted their strong correlation with the imperial examination. For example, some students studying in Japan believed that many encyclopedias popular in the book market at that time were of poor quality: "Books such as *Complete Collection*, *Comprehensive Compilation*, *Collected Works*, and *Textual Research* were specially made for profit and convenient for the examination, being a jumble of excerpts, fragmented and incomplete" [32]. Criticism of the strong correlation between late Qing encyclopedias and the imperial examination became even harsher during the Republic of China period. Shu Xincheng commented in *A History of Modern Chinese Education* that "few people in the world could understand science by reading them", and held that late Qing encyclopedias were nothing but "products of profiteers who changed their appearance into books such as *Series on Prosperity and Strength*, *Textual Research on Western Learning*, *Textual Research on Current Affairs*, and *Complete Collection of Western Learning* for scholars to use in the examination hall, with sales of tens of millions of copies" [33]. A textbook during the Republic of China referred to encyclopedias such as *Textual Research on Current Affairs* as "compiled by book merchants to make profits during the imperial examination period in the late Qing Dynasty" [34]. In the view of new intellectuals who mastered Western science, encyclopedias had little significance for cultivating talents proficient in Western learning [35].

Late Qing encyclopedias only flourished in the late period of the imperial examination system. After the abolition of the imperial examination, new-style schools developed rapidly and adopted specialized science textbooks. At this time, late Qing encyclopedias could hardly meet the needs of new-style schools and were not recognized by new intellectuals. The textbooks emerging in the late Qing and early Republic of China periods strengthened the standardization and unification of disciplinary terms and promoted the establishment of scientific methods [36]. For example, *Latest High School Textbook on Dynamic Electricity* in the "Latest Textbook Series" published by Commercial Press systematically expounded basic electrical theories such as Ohm's Law, Joule's Law, and the Law of Electromagnetic Induction, accompanied by formulas and a large number of examples [37].

Encyclopedias were only popular briefly in the late Qing book market and were subject to much criticism, but reflections on encyclopedias should by no means stop here. From the late Qing to the May Fourth Movement in the Republic of China, the radical ideology of intellectuals became increasingly intense, characterized by overall anti-traditionalism and Westernization [38]. Criticisms of the imperial examination system and the examination-oriented books auxiliary to it also carried the radical color of this period, with certain temporality and limitations. Throughout history, the imperial examination for selecting officials played a role in selecting talents and encouraging scholars to study, so some scholars believed that the imperial examination system should at least be regarded as a neutral term [39]. New intellectuals almost universally criticized the imperial examination system and the examination-oriented books related to it, failing to fully recognize the positive role of adding Western learning to the imperial examination in encouraging scholars to learn

Western science, and the value of encyclopedias was naturally ignored. In the late Qing Dynasty, China's science and technology were backward and national strength was weak. New intellectuals derived cultural anxiety from social crises, thus blaming the imperial examination system and showing sharp criticism of encyclopedias. This was reasonable against the specific historical background at that time, but it was also a "simplistic approach" [40]. From the perspective of the present, it is necessary to eliminate the "negative tendency" in the evaluation of the imperial examination [41] and objectively view the shortcomings of late Qing encyclopedias. Although late Qing encyclopedias had problems such as compilation errors and omissions and mostly had the characteristics of traditional leishu, they were also an important "bridge" for introducing Western scientific knowledge in the late Qing Dynasty [42].

4. Scientific value and historical significance of Late Qing encyclopedias

Late Qing encyclopedias had a strong color of coping with the imperial examination, and were the result of Chinese people's attempt to integrate Western learning into local context using traditional Chinese learning at that time. Although these encyclopedias had the entry-based characteristics of traditional leishu, their content gradually "shifted from Chinese learning to Western learning", and even in fields not covered by traditional interpretations, they broke away from the foundation and scope of traditional interpretations and directly turned to new Western learning knowledge [43]. Encyclopedias compiled in the form of entries, although splitting the logical relationship between the original scientific knowledge in knowledge presentation, this "simplification" also made it easier for scholars without a scientific foundation to read and understand. Concise scientific entries enabled scholars to quickly form a vague understanding of science in their minds.

Books introducing Western learning that appeared at the same time as encyclopedias also included translated Western works and compilations of statecraft essays. Translated Western works focused on expounding scientific knowledge in a certain field and were highly professional [44]. Compilations of statecraft essays collected full texts of articles related to Western learning and were voluminous [45]. In comparison, encyclopedias had "a wide range of knowledge" and "strong scientific nature". For example, Textual Research on Modern Global Art Studies was compiled based on "newly published books on manufacturing", "newly translated manufacturing illustrations and new methods of surveying, mapping and calculation from various countries", striving to "cover both animals and plants, and include substantive content on mechanics and acoustics", [46] presenting relatively advanced scientific knowledge of the time to readers.

Late Qing encyclopedias catered to the trend of advocating Western learning in the imperial examination reform and had a profound impact on the gentry group at that time. And this was the key to whether Western culture could integrate into Chinese society [47]. Because the gentry group occupied an important position among all social strata, was the carrier and spokesperson of Chinese culture, and assumed the responsibility of educating the people. Once the gentry entered officialdom, they could serve the monarch above and benefit the people below, playing a linking role. The reform of the imperial examination to introduce Western learning promoted the gentry class in the late Qing Dynasty to contact and understand Western science, and encyclopedias just met the gentry's demand for new Western learning knowledge and enriched their "knowledge repository" [48]. Influenced by new Western learning knowledge, "scientific gentry" emerged from within the gentry class in the late Qing Dynasty, who took practicing modern Western science and technology as their career [49] or "materialized" scientific knowledge [50]. Scientific gentry had a background in traditional Chinese learning, but they took the initiative to study Western scientific

knowledge with the help of scientific materials such as encyclopedias, which was a valuable step in China's modernization process.

5. Conclusion

The life cycle of late Qing encyclopedias was short, and their rise and fall were closely related to the reform of the imperial examination system in the late Qing Dynasty. It is undeniable that encyclopedias themselves had some compilation problems, which were related to the editors' insufficient understanding of scientific knowledge at that time. Superficial scientific cognition and even many errors were inevitable temporal limitations of late Qing encyclopedias. However, it is indisputable that the imperial examination reform advocated Western learning, and the emerging late Qing encyclopedias presented a large amount of new scientific knowledge to the Chinese people. As examination-oriented anthologies, encyclopedias were not only a bridge for introducing new knowledge, but also a key to inspiring intellectuals at that time to think about the integration of Chinese and Western academic learning. Reflecting on the historical significance of late Qing encyclopedias today, we should not only see their function of consolidating the old rule and maintaining the imperial examination order, but also recognize the new enlightenment they brought to the Chinese people at that time; we should see their historical limitations, and also understand their transitional and inclusive nature in introducing Western science under the traditional framework.

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