Integrating Historical Materials into Teaching, "Incubating" Scientific Spirit

Taking "The Industrial Revolution That Affects the World" as an Example

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ABSTRACT

History is an empirical humanities and social science that emphasizes logical reasoning and rigorous argumentation. The exploration of history is based on historical materials, and through the analysis of historical materials, materials that conform to historical facts are used as evidence to form a correct and objective understanding of history. This helps cultivate students' rational thinking and scientific spirit of daring to explore.

Keywords: *Empirical evidence of historical materials, Integration of historical materials, Scientific spirit.*

1. INTRODUCTION

General Secretary Xi Jinping pointed out that "we should do a good job in scientific education addition in the 'double reduction' of education". The basic education stage is a decisive stage for incubating students' scientific spirit and innovative qualities. Further strengthening science education in primary and secondary schools has both practical urgency and foresight.[1] Based on years of practical exploration and in-depth thinking in interdisciplinary theme learning of high school history, guided by the "History Curriculum Standards (2017 edition, revised in 2020)" and taking "The Industrial Revolution that Influenced the World" as an example, the author explores the inherent connections between history and other disciplines, breaks down the barriers of traditional subject teaching, and aims to construct a comprehensive and integrated interdisciplinary learning implementation plan, in order to better cultivate students' core literacy in empirical historical materials, as well as their scientific spirit of rational thinking and courage to explore.

1. http://www.moe.gov.cn/jyb_xwfb/s5148/202306/t20230619_1064850.html

2. SETTING DOUBTS TO PROVOKE INTEREST, AND CARRYING OUT EXPLORATION IN A SCIENTIFIC WAY

Teachers select a picture of the Crystal Palace built in Britain in 1851 for the Great Exhibition (CIIE), and explain the story of the British "Crystal Palace" International Industrial Fair (Great Exhibition). The Expo announced to the world that Britain had entered the industrial age, as the world's first and strongest industrial country.[2] The Great Exhibition shocked the world with the achievements of the British Industrial Revolution. It had raised people's further questioning: Why did

2. Qian Chengdan, Xu Jieming, History of England [M]. Shanghai Academy of Social Sciences Press, December 2012, p221. In 1851, Britain held the world's first International Industrial Exposition in Hyde Park, central London. To showcase the achievements of the Industrial Revolution, a "Crystal Palace" was specially built, over 560 meters long and over 20m high, all constructed with fiberglass frames, covering an area of over 37,000 m2 and costing 80,000 pounds (an astronomical figure at the time). As the expo is held in the "Crystal Palace" exhibition hall, it is called the "Crystal Palace" International Industrial Expo. The expo displays products from over 7000 British manufacturers and approximately the same number of exhibits from foreign merchants. Almost all British merchants display industrial products, while foreign merchants display almost all agricultural or handmade products.

the 1851 Great Exhibition shock the world with the achievements of the British Industrial Revolution?(“Figure 1”)

Figure 1 The Crystal Palace built by Britain in 1851 for the Great Exhibition.

3. INTEGRATION OF HISTORICAL MATERIALS AND INTERACTION BETWEEN TEACHERS AND STUDENTS

Why did the Industrial Revolution first occur in England?

What were the conditions for the rise of the Industrial Revolution in Britain?

Teachers present historical material 1: Britain became a nation-state very early on, and many economic and political characteristics of feudalism disappeared. Capitalist organizations are rapidly spreading with minimal resistance. Economic development is also unusually fast; It is obvious that most of these changes are progressive. Therefore, it is beyond doubt that the Industrial Revolution first occurred in England.

— (U.S.) Wrigley, Continuity, Chance and Change: The Characteristics of Industrial Revolution in England[3]

Teachers present historical material 2: The constitutional monarchy established after the bourgeois revolution (Glorious Revolution of 1688) actively implemented policies that were conducive to the development of the capitalist economy, encouraged the development of domestic and foreign trade, and reduced import taxes on raw materials; By implementing the Monopoly Law, protecting patent rights, and incentivizing innovation, political prerequisites were provided for the arrival of the Industrial Revolution.

— Edited by Yu Weimin, Volume 4 of "High School History"[4]

Teachers lead students to identify one of the conditions for the rise of the Industrial Revolution in Britain as a political premise: domestic development advantages and the stability of the domestic political situation after the Glorious Revolution in Britain, with the government actively encouraging economic development.

Teachers present historical material 3: In the mid-18th century, the agricultural revolution in England began to advance with great fanfare. With the growth of population, implementing large-scale operation of grain production has become more profitable. As a result, small and medium-sized landlords began to call on the government and parliament to support the lord's enclosure of land, and the parliament formed a series of enclosure laws in the form of legislation. The enclosure movement promoted changes in land ownership and management models, and the scale of capitalist farms continued to expand... The Agricultural Revolution made significant contributions to the

3. (U.S.) Wrigley, Continuity, Chance and Change: The Characteristics of Industrial Revolution in England [M]. Zhejiang University Press, June 2013, p66.

4. Edited by Yu Weimin, "High School History" Volume 4, East China Normal University Press, November 2008 edition, p38.

Industrial Revolution, as Jones pointed out: "In 18th century England, industrialization and economic development would not have been possible without agricultural change and agricultural output growth.

— Liu Jinyuan "Agricultural Revolution and Social Transformation in 18th-century Britain"[5]

Teachers lead students to identify the second condition for the rise of the Industrial Revolution in Britain, which is economic condition 1: the rapid development of agricultural capitalism and the enclosure movement in Britain provided abundant agricultural products, free labor, and domestic markets for industrial development.

Teachers present historical material 4: Ernest Mandel estimated that from 1500 to 1800, the total value of gold coins plundered by European colonies was 1 billion pounds, of which only between 1750 and 1800, Britain plundered 100 million to 150 million pounds of gold coins from India. The inflow of this batch of capital, if not the entire capital of the New Industrial Revolution in Britain, at least promoted Britain's investment in the revolution, especially in steam engines and textile technology.

— (Canada) Gunder Frank, ReOrient: Global Economy in the Asian Age[6]

Teachers present historical material 5: During the period from 1698 to 1775, both imported and exported goods in Britain increased by between 500% and 600%. In 1698, about 15% of Britain's maritime trade was conducted with its colonies, but by 1775, this number had risen to 33%.

— Leften Stavros Stavrianos, A Global History: From Prehistory to the 21st Century[7]

Teachers lead students to identify the economic conditions for the rise of the Industrial Revolution in Britain: Through colonial expansion, Britain promoted the primitive accumulation of capital, obtained a large amount of cheap raw materials, and vast overseas markets.

Teachers present historical material 6: Prior to the Industrial Revolution in Britain, it had already established a dominant position in the manufacturing and production sectors of Western Europe. And the handicraft workshops in Britain were the most advanced and developed capitalist enterprises in 18th century Europe. Therefore, it is not surprising that Britain took the lead in the transition from workshop handicrafts to large-scale machine industry. Firstly, the highly developed handicraft industry in the UK has achieved precise division of labor in the production process, creating conditions for the use of machines Secondly, in the handicraft workshops in the UK, there is a concentration of skilled workers and experienced skilled craftsmen who are the main force of technological innovation and revolution in production practice Finally, on the eve of the Industrial Revolution in Britain, the advanced form of handicraft workshops - centralized handicraft workshops - had already reached a large scale.

— Wang Side, chiefly ed., General History of the World (2nd version)[8]

Teachers lead students to identify the economic conditions that led to the rise of the Industrial Revolution in England: the high level of development of handicraft workshops in England, detailed division of labor, increasingly specialized production tools, and skilled workers' production techniques provided conditions for technological reform and machine invention.

Teachers present historical material 7: Entrepreneurial talents are impressively concentrated in the UK. This can be illustrated to some extent by the outstanding contributions made by non-conformists such as the Dabi family engaged in the iron industry, the Cook Worthy who made porcelain, the Bright father and son who ran cotton mills and participated in political activities, as well as Dalton and Eddington who devoted themselves to science. Breaking conventions and emphasizing personal responsibility have led to a large number of experimentalists and inventors among non-conformists, whose frugality has enabled them to reinvest profits in industry instead of squandering them for a luxurious lifestyle.

—Leften Stavros Stavrianos, A Global History: From Prehistory to the 21st Century[9]

5. Liu Jinyuan, Agricultural Revolution and Social Transformation in 18th-century Britain [J]. Agricultural History of China, 2014, 33(01): 76-84.

6. Gunder Frank, ReORIENT: Global Economy in the Asian Age [M]. Central Compilation & Translation Press, August 2013, p278.

7. Leften Stavros Stavrianos, A Global History: From Prehistory to the 21st Century [M]. Shanghai Academy of Social Sciences Press, September 2004, p277.

8. Wang Side, chiefly ed., General History of the World (2nd version) [M]. East China Normal University Press, December 2019.

Teachers lead students to identify the third condition for the rise of the Industrial Revolution in Britain, which is production technology: In the mid-17th century, Britain had become one of the scientific and technological centers in Europe, and many scientists were concerned about society's demand for technology and enthusiastic about improving production technology. The advancement of production technology laid the foundation for the Industrial Revolution.

Teachers present historical material 8: Known data indicates that in the 18th century, domestic commerce in England grew significantly, while overseas commercial activities increased even more, promoting a sharp increase in local industrial production output: industrial production for the domestic market increased from base 100 to 150, and industrial production for export increased sharply from base 100 to 550. The combination of domestic and foreign forces in one direction has propelled the Industrial Revolution It is estimated that between 1760 and 1769, the average annual amount of domestic trade in the UK was between £40 million and £60 million, with an average annual profit of £4-6 million, which was quite considerable.

— Wang Side, chiefly ed., General History of the World (2nd version)[10]

Teachers lead students to identify the fourth condition for the rise of the Industrial Revolution in Britain, both domestic and international markets: With the expansion of domestic and international markets and the growth of demand, handmade products can no longer meet the needs, and improving productivity has become a top priority.

4. INTEGRATION OF DISCIPLINES, AND INSPIRING THINKING

4.1 Phase 1: The Steam Age - The First Industrial Revolution (1860s to 1840s)

Firstly, teachers inspire students: Why did machines first appear in the emerging cotton textile industry and not in the traditional national industry of wool textile in Britain? Please use relevant subject knowledge to think and answer.

Teachers present historical material 9:

- Compete with India requires to offer affordable and high-quality products through mass production.
- Adapting to the preferences and needs of the majority of British residents at that time.
- Low investment, simple technology, fast capital turnover, and high profits.
- Lancashire County has a mild and humid climate, and cotton yarn is not easily broken, making it suitable for the development of cotton textile industry.
- The cotton textile industry is an emerging sector that is relatively less constrained by guilds and government regulations, making it relatively easy to develop.

— Kong Fangang, Several Issues on the Industrial Revolution in Britain[11]

Guided by the teachers, the students suddenly realized that the UK has a temperate maritime climate, with mild and rainy weather throughout the year. Cotton fabric is comfortable to wear, easy to sweat, and cost-effective. If the produced cotton fabric meets the market demand and is suitable for the road, it will generate high profits. (The terrain and climate characteristics explained by the geography discipline and the market economy content explained by the political discipline have achieved interdisciplinary integration with the first industrial revolution content explained by the history discipline.)

Secondly, teachers sort out and display the mechanized production process of cotton textile industry.(“Figure 2”)

9. Leften Stavros Stavrianos, A Global History: From Prehistory to the 21st Century [M]. Shanghai Academy of Social Sciences Press, September 2004, pp283-284.

10. Wang Side, chiefly ed., General History of the World (2nd version) [M]. East China Normal University Press, December 2019.

11. Kong Fangang, Several Issues on the Industrial Revolution in Britain [J]. History Teaching, 1998(08): pp3-5.

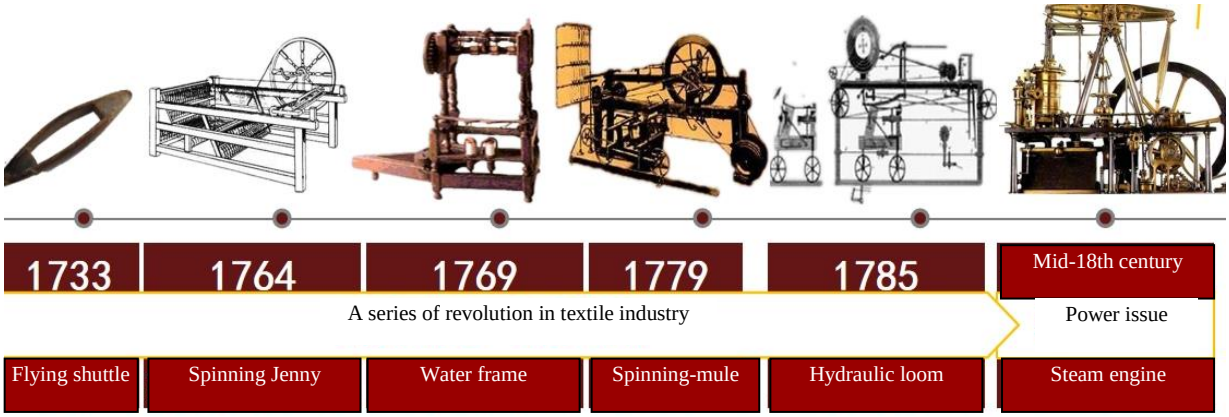

Figure 2 Development and evolution of cotton textile machines up to the mid-18th century.

Guided by the teachers, the students realized that under the influence of multiple factors such as the times, science, demand, power, and Watt's subjective efforts, Watt's improved steam engine emerged. The Watt steam engine is a product of the times that boldly explores and practices based on scientific theories such as classical mechanics created by the scientific giant Newton, Boyle's gas law, and Blake's latent heat theory. (The interdisciplinary integration of mechanics, gas laws, latent heat theory in physics and the first industrial revolution explained in history has been achieved.)

4.2 Phase 2: The Second Industrial Revolution in the Electrical Age (Late 19th century to early 20th century)

Sign: With the widespread development and application of power technology, electricity has become a new power source to supplement and replace steam, and humanity has entered the "electrical age". (“Figure 3”)

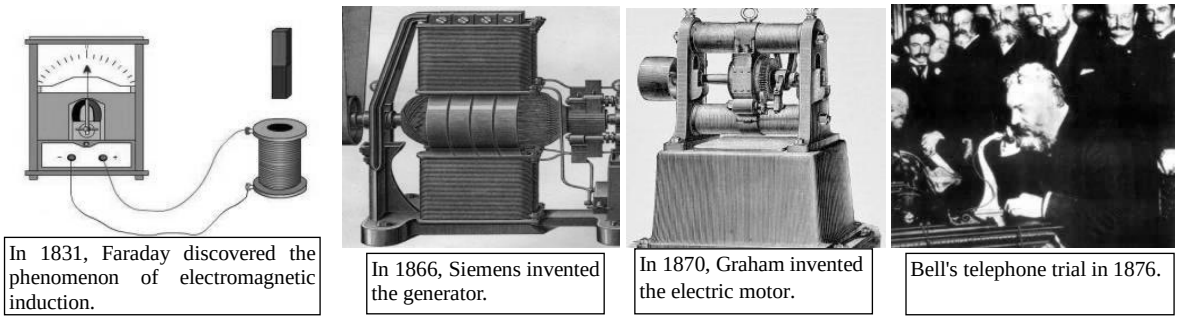

Figure 3 Wide development and application of power technology.

The creation and application of internal combustion engines have brought more convenient power, giving rise to new types of rapid transportation such as automobiles and airplanes, becoming the most far-reaching achievement of the Second Industrial Revolution.(“Figure 4”)

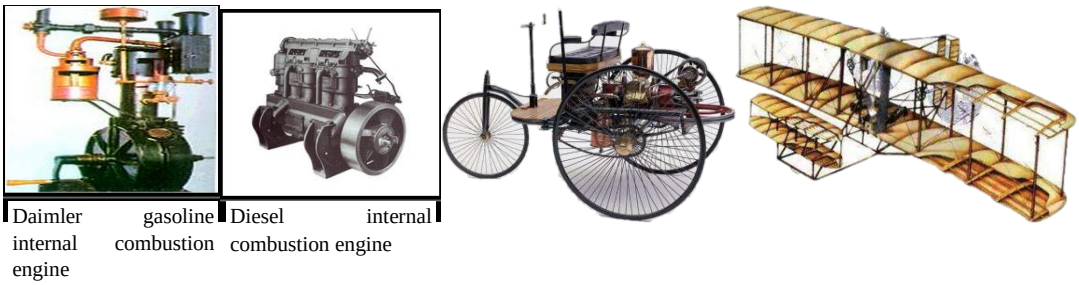

Figure 4 Creation and application of internal combustion engines.

It is to promote the rise of oil extraction industry, chemical industry, and technological transformation of old industrial sectors (such as steel industry and steelmaking).(“Figure 5”)

Figure 5 A glimpse of the petroleum, chemical, and steel industries.

Guided by the teachers, the students had an epiphany: the concepts of electricity and the working principles of internal combustion engines in physics, as well as petroleum refining in chemistry, were integrated with the second industrial revolution explained in history.

5. REVISITING CLASSICS, AND SCIENTIFIC REPRESENTATION

Teachers present historical material 10: The productive forces created by the bourgeoisie in its less than one hundred year ruling class are greater and even greater than the total sum of all productive forces created in all past eras.

— (Germany) Marx, Engels, Manifesto of the Communist Party[12]

Teachers present historical material 11: The bourgeoisie, due to the rapid improvement of all means of production and the extremely convenient transportation, has brought all ethnic groups, even the most barbaric ones, into civilization. The low price of its products is the heavy artillery it uses to destroy all the Great Wall and conquer the most tenacious xenophobia of barbarians. It forces all nations to adopt the bourgeois mode of production one by one if they do not want to perish. It forces them to promote so-called civilization within themselves, that is, to become capitalists. In a word, it creates a world for itself according to its own appearance.

— (Germany) Marx, Engels, Manifesto of the Communist Party[13]

Teachers lead students to understand the impact of the Industrial Revolution: The Industrial Revolution greatly increased productivity, changed the face of the world, and made connections between different parts of the world increasingly close. The major capitalist countries, relying on the strong economic and military power provided by the Industrial Revolution, continued to expand massively around the world. At the end of the 19th century and the beginning of the 20th century, capitalism entered the monopoly stage, and the capitalist world economic system was finally formed. (“Table 1”)

12. Marx, Engels, Manifesto of the Communist Party: Collected Works of Marx and Engels, Volume 2 [M]. People's Publishing House, 2009 edition, p36.

13. Marx, Engels, Manifesto of the Communist Party: Collected Works of Marx and Engels, Volume 2 [M]. People's Publishing House, 2009 edition, pp35-36.

Table 1. The capitalist world economic system in the late 19th and early 20th centuries

The formation of a capitalist world economic system centered around Europe and America				
Age of Discovery	Spain Portugal's Rise	Start blending together	The embryonic form of the world market is emerging	Asian, African, and Latin American countries or regions gradually become colonies or semi colonies while being caught up in the world market
Colonial expansion	Britain establishes world colonial hegemony	Colonial plunder	The global market is gradually expanding	
The First Industrial Revolution	Britain becomes the world's factory	Military aggression Product output	The world market has initially formed	
The Second Industrial Revolution	The rise of countries such as the United States and Germany	Dividing the world Export of capital	The ultimate formation of the world market	

6. CONCLUSION

History is a highly comprehensive discipline. Selecting “The Industrial Revolution That Affects the World” for explanation can help guide students to acquire scientific historical methods derived from history during the exploration process. While cultivating students' core literacy in historical evidence, it also emphasizes “incubating” their rational thinking, rigorous argumentation methods, and scientific spirit.

Meanwhile, every discipline has its own history of disciplinary development. Selecting “The Industrial Revolution That Affects the World”, while achieving the integration of historical classic materials in teaching, also pays attention to the cultivation and integration of interdisciplinary content and core competencies under the common theme of science education in different disciplines, which helps students broaden their horizons, cultivate humanistic heritage, and comprehensively improve their scientific literacy.

It is necessary to launch high-quality resources, strengthen brand activities, promote discipline construction, conduct scientific research, improve students' scientific literacy, "incubate" scientific spirit, cultivate a group of young people with the potential to be scientists and willing to dedicate themselves to scientific research, and cultivate socialist builders and successors. The author will always move forward courageously.

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