

Exploration and Research on Textbook Quality Evaluation Index System Based on Engineering Major in Higher Education

Xiaoyang Yue*, Yanqiong Wu

Shanghai Jiao Tong University, Shanghai 200240, China

*Corresponding author: Xiaoyang Yue, xiaoyangyue@sjtu.edu.cn

Copyright: © 2024 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The report of the Chinese 20th National Congress put forward “strengthening the construction and management of textbooks” for the first time, which indicates the importance of textbook construction and highlights the vital position of textbooks in the overall development of the country. From the perspective of textbook quality, and based on the research and analysis of the policy requirements and current evaluation indicators of higher education textbooks, this paper establishes the textbook quality evaluation index system composed of basic indicators and evaluation indicators. This system is based on the principles of science, comprehensiveness, operability, and target-oriented approach. It provides a relatively scientific, objective, and fair reference system for the management and evaluation of textbooks.

Keywords: Textbooks; Evaluation index system; Higher education; Engineering major

Online publication: March 24, 2024

1. Introduction

Textbooks are the basic carrier of teaching and the main studying materials. As an important part of the educational evaluation index, China has been studying the evaluation of textbooks for more than 30 years. In the beginning, it mainly aimed to study and reform the evaluation index system of textbooks in the basic education stage. Then, it gradually changed to study the evaluation index system of textbooks for vocational education, higher education, and other stages. However, the evaluation index system of textbooks for engineering majors in higher education has yet to be established and perfected at present. Based on reviewing and summarizing the development process of the evaluation index system of textbooks for higher education in China, this paper constructs the evaluation index system of textbooks suitable for engineering majors in higher education. This paper also presents the characteristics and development trends of engineering majors in higher education and draws on the existing mature textbook evaluation index system. It is helpful to improve the quality of textbooks and promote the development and reform of education.

2. Development of higher education textbook evaluation index system

Since 1978, the state has paid increasing attention to the research and evaluation management of the construction of college textbooks. In 1984, the National Conference on Textbooks Evaluation and Communication in Colleges and Universities was held at Soochow University, which was the first large-scale conference on textbooks in colleges and universities in China. Representatives of more than 40 colleges and universities all over the country participated in the conference. The conference discussed the working methods of textbook evaluation and research and unanimously agreed that through the theoretical research of teaching methods in colleges and universities, the goal of improving the standards of textbooks in colleges and universities can be achieved ^[1]. In 1985, the Ministry of Education actively supported and encouraged universities and researchers to research the construction and management of college textbooks. In 1987, the state decided to carry out the National Excellent Textbooks Evaluation activity, which was the first public and systematic evaluation of college textbooks. The quality of textbooks was initially evaluated by the college teachers who used the textbooks by filling in the “National Excellent Textbooks Quality Evaluation Form,” and then the textbooks with higher scores were selected. Finally, the national excellent textbooks were evaluated by the award committees ^[2]. In 1992, the National Research Association for the Construction of Higher Education Textbooks was established. Since then, the construction and management of higher education textbooks entered a new stage. While reviewing and summarizing the historical experience of textbook construction and management, the researchers combined social development and needs to learn the successful construction experience of textbooks, and put forward that college textbook construction is the main body of textbook management.

In 2001, the Ministry of Education clearly put forward the need to “vigorously advocate the compilation, introduction, and use of advanced textbooks,” proposed to establish a scientific system for the compilation, evaluation, and selection of college textbooks, and encouraged qualified colleges and universities to compile high-level textbooks and handouts. It aimed to prevent low-level repetition in the compilation of textbooks and put an end to poor-quality textbooks entering classrooms ^[3]. The selection of textbooks focused on content quality, teaching applicability, editing quality, printing quality, and so on. With the deepening of teaching reform, the evaluation index system of textbooks is also developing and improving. In 2007, the Ministry of Education emphasized further strengthening the construction of textbooks and the organic combination of paper textbooks, electronic textbooks, and network textbooks. The evaluation indexes of textbooks included timeliness and reader feedback and began to pay attention to the practicality of textbooks, like emphasizing the connection between textbooks and real-life ^[4]. After entering the new era, the development of higher education has put forward higher requirements for the construction of textbooks. To better meet this demand, the Ministry of Education has continuously optimized and improved the content of the textbook evaluation index. In 2019, the Ministry of Education proposed that “colleges and universities should improve the quality control and evaluation mechanism of textbooks, and strengthen the inspection and supervision of own textbooks.” The evaluation index also increases the advanced nature, innovation, and individuation of textbooks. At the same time, more experts and scholars in the field are introduced to participate in the evaluation, and the collective decision-making opinions of experts serve an important reference role ^[5]. In general, the development of the evaluation index system of higher education textbooks in China is a process of continuous optimization and improvement.

3. Research status of higher education textbook evaluation index system

Based on the database of CNKI, a total of 1,662 research papers on textbook evaluation were searched with the theme of “textbook evaluation,” among which only 170 literature on higher education textbook evaluation were screened. At the same time, based on the database of Wanfang data, a total of 45,776 research papers on

textbook evaluation were searched with “textbook evaluation” as the theme, and only 285 of them were about higher education textbook evaluation. In a survey of all literatures, most of them focus on textbooks in the basic education stage. The researches on the higher education stage are classified according to disciplines, mainly focusing on foreign languages, sports, music, journalism, agriculture, management, and other disciplines. Lastly, with “engineering major” and “textbook evaluation” as the main topics, more than 30 literatures were selected according to the relevance of the articles and the number of citations.

After analysis, some researchers summarized and put forward some evaluation index systems of teaching materials. For example, the higher education textbook evaluation index system research project has proposed an evaluation index system for the quality of text teaching materials, including three first-level indicators: content quality, editing quality, and printing quality. The content quality sets four second-level indicators, including teaching level, scientific level, ideological level, and graphics level. Editing quality sets four second-level indicators, including processing level, design level, drawing level, and proofreading level. Printing quality sets two second-level indicators, including printing level and binding level. A total of different 23 tertiary indexes are set under the secondary index [6]. Su *et al.* put forward a set of textbook evaluation index systems that is generally applicable to different majors of higher education, including four first-level indexes of science, teaching, ideological level, characteristics and quality of compilation and printing, and 15 second-level indexes of advanced nature, systematism, applicability, and inspiration [7]. Li proposed an index system suitable for evaluating the quality of digital textbooks under the background of informatization, including three first-level indexes: teaching indexes include four second-level indexes and ten third-level indexes; software indexes include three second-level indexes and seven third-level indexes; media indexes include three secondary indexes and eight tertiary indexes [8].

Through comprehensive study and analysis, the current research on the textbook evaluation index system in colleges and universities in China pays more attention to the evaluation of textbook ideological level, content quality, teaching applicability, editing quality, etc. The characteristics and shortcomings of the current evaluation index system are summarized in **Table 1**.

Table 1. Summary and analysis of the textbook evaluation index system of existing higher education

Evaluation aspects	Evaluation dimensions/indicators	Summary and analysis	
		Index characteristics	Index deficiency
Ideological level of textbooks	Correct ideological views Conforming to dialectical materialism Promoting national culture	It pays attention to the political and policy content of textbooks, and strengthens the ideological value of textbooks.	There is a lack of evaluation of intellectual property rights, disguised implantation of commercial content, and other aspects that violate public order and good customs.
Content quality of textbooks	Teaching adaptability, scientific, advanced, systematic, theoretical, accurate, cohesive, etc.	It is mainly the evaluation of the scientific content of textbooks and whether it adapts to teaching needs.	Engineering majors pay attention to practice. It lacks evaluation of the textbooks' practicability.
Editing quality of textbooks	Complete structure, language, graphic symbols, design level, proofreading level, printing level, binding level, and so on	It focuses on the evaluation of textbook layout design, text and chart proofreading, and printing quality.	There is a lack of evaluation of formula expression and graphic aesthetics in engineering textbooks.
Other	Price, reader evaluation, cultural inheritance, system structure, supporting teaching resources, and so on	Introducing other characteristic indicators can reflect the quality level of teaching materials more comprehensively, and increase the complexity and difficulty of the evaluation system.	There is a lack of innovative indicators, such as the innovation of publishing form, the innovation of textbook inheritance and promotion.

4. Characteristics and analysis of engineering majors in higher education

In today's technology-driven society, with the rapid development of science and technology, engineering majors in higher education play an increasingly important role in promoting social development and enhancing national power. With the increasing demand for high technology in the development of society, the connotation and extension of the engineering major are constantly evolving.

In terms of course setting, engineering major is based on practical science and emphasizes the combination of theory and practice. The course content covers basic theories such as mathematics, physics, chemistry, and biology, as well as practical parts such as engineering design, manufacturing, and testing ^[9].

In terms of teaching characteristics, one of the teaching characteristics of engineering majors is practicality. The practical teaching parts such as experiments and course projects are an important part of the curriculum. The practical parts emphasize student participation and creation, deepen students' understanding of theoretical knowledge, and provide students with practical opportunities and employment prospects ^[10].

In terms of scientific research level, engineering majors generally have a strong atmosphere of scientific research. Universities set up large-area laboratories to create a good scientific research environment and encourage students to participate in scientific research projects to improve their innovative ability and problem-solving skills. At the same time, students' teamwork spirit and leadership are cultivated to help them develop comprehensively ^[9,11].

In terms of talent training, the cultivation of talents in engineering majors focuses on practical skills and innovative spirit. In the process of training, students' critical thinking, imagination, and creativity are cultivated to adapt to the ever-changing scientific and technological environment. It also emphasizes students' comprehensive qualities, such as communication and coordination, teamwork, leadership, etc., to help students succeed in their future career development ^[12].

Based on the above research, it is concluded that the engineering major of higher education has the characteristics of emphasizing theoretical basis, strong interdisciplinary, outstanding practicality, and focusing on the improvement of comprehensive quality, etc. Further research and analysis of the characteristics of engineering textbooks in higher education and inspiration for the construction of textbook evaluation systems are summarized in **Figure 1**.

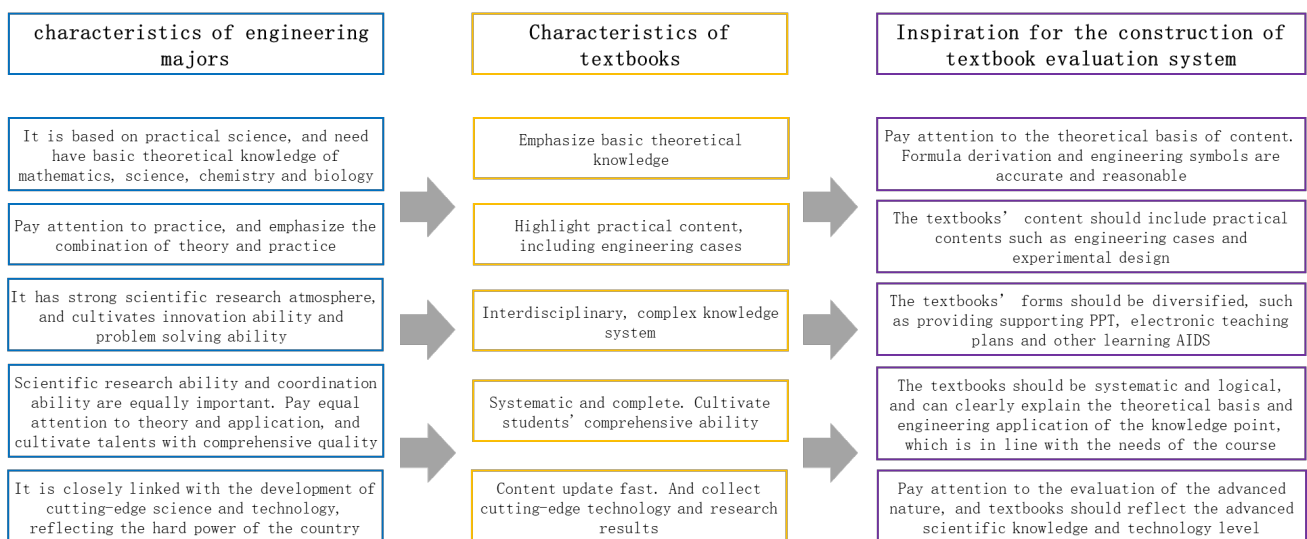


Figure 1. The characteristics of higher education engineering majors and the inspiration for the construction of engineering textbook evaluation system

5. Textbook quality evaluation index system for higher education engineering majors

By sorting out the policy requirements, researching and analyzing the existing higher education textbook evaluation index system, extracting the indicators of common concern in the previous textbook evaluation index system, and combining the characteristics of engineering majors as well as the inspiration for textbook evaluation, this paper constructs a textbook evaluation index system which is more suitable for higher education engineering majors. It consists of two parts: the basic index and the evaluation index. The basic index is the item that must be satisfied, and the evaluation index can evaluate the quality level of teaching materials according to the actual content of teaching materials. The basic index includes three first-level indicators: ideological, policy, and socialist core value, and the evaluation index includes four first-level indicators: teaching content level, expression standard level, editing and printing level, and innovation level. The detailed index system is shown in **Figure 2**.

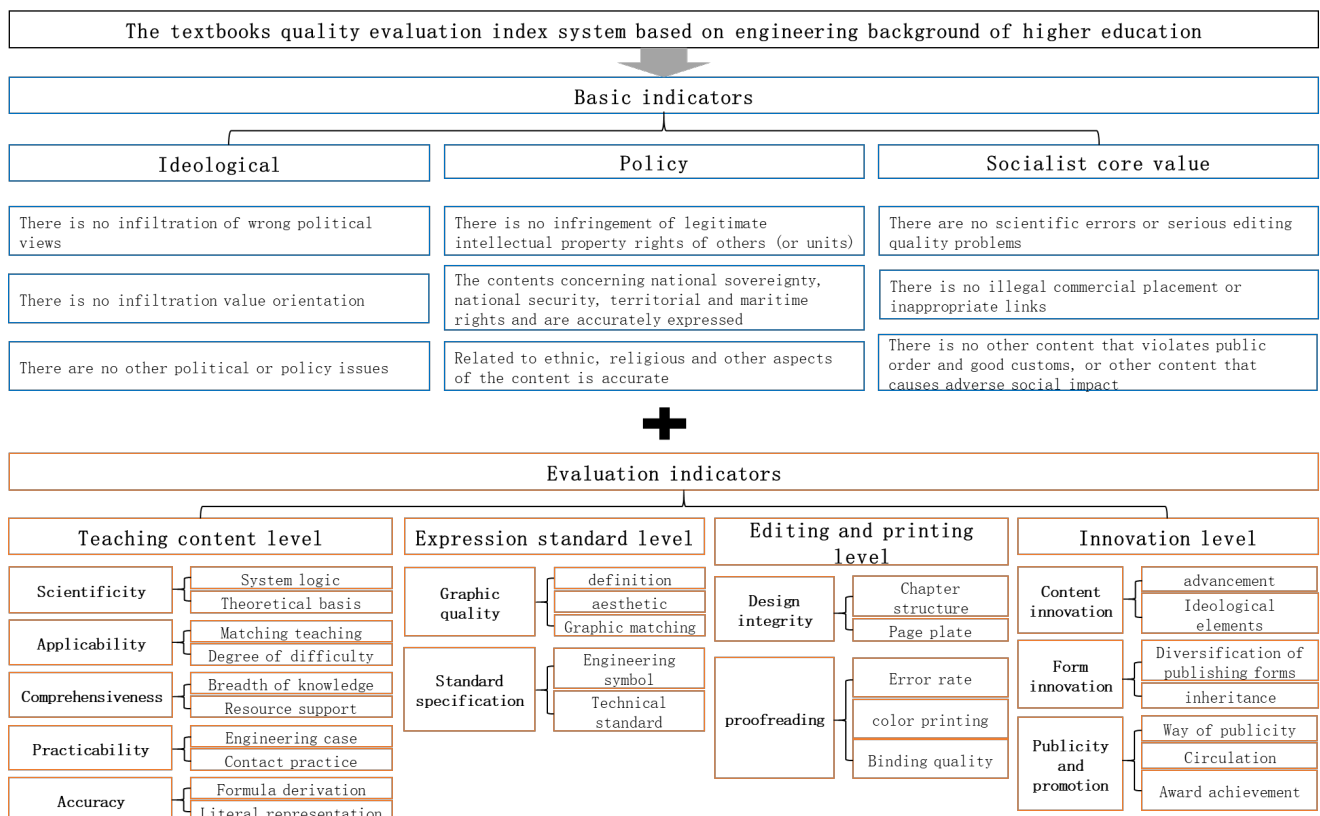


Figure 2. Textbook quality evaluation index system of higher education engineering majors

Under the background of the rapid development of science and technology and the maturity of education informatization, the construction and evaluation of textbooks in China are faced with many challenges. The characteristics of textbooks in different disciplines vary, and there are great differences between their research progress and existing achievements. Based on full investigation and study of relevant policies and existing higher education textbook evaluation index system, combined with the characteristics of engineering majors, this paper further analyzed and summarized its inspiration for textbook evaluation, and established a targeted textbook evaluation index system suitable for higher education engineering majors to fill in the shortcomings of current research. It provides a theoretical reference for textbook construction and management under the background of engineering majors in colleges and universities and a relatively scientific, objective, and fair reference system for textbook evaluation for textbook administrators and publishing houses. In the future, we will take this as the research basis, adopt the method of questionnaire survey and hierarchical analysis to conduct a quantitative analysis of this index system, and lastly promote the practical application of this index system.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Zheng X, 1985, The National Conference on Textbook Evaluation and Textbook Communication in Higher Education Was Held in Suzhou. *Jiangsu Higher Education*, 1985(01): 45.
- [2] The Ministry of Education, 1987, Trial Regulations on Awarding Excellent Teaching Materials in Colleges and Universities. *China University Teaching*, 1987(03): 2–3.
- [3] The Ministry of Education, 2001, Some Opinions on Strengthening Undergraduate Teaching in Colleges and Universities and Improving Teaching Quality, viewed August 23, 2023, <https://baike.baidu.com/item/%E5%85%B3%E4%BA%8E%E5%8A%A0%E5%BC%BA%E9%AB%98%E7%AD%89%E5%AD%A6%E6%A0%A1%E6%9C%AC%E7%A7%91%E6%95%99%E5%AD%A6%E5%B7%A5%E4%BD%9C%E6%8F%90%E9%AB%98%E6%95%99%E5%AD%A6%E8%B4%A8%E9%87%8F%E7%9A%84%E8%8B%A5%E5%B9%B2%E6%84%8F%E8%A7%81>
- [4] The Ministry of Education, 2007, Some Opinions of the Ministry of Education on Further Deepening Undergraduate Teaching Reform and Comprehensively Improving Teaching Quality, viewed August 24, 2023, http://www.moe.gov.cn/srcsite/A08/s7056/200702/t20070217_79865.html
- [5] The Ministry of Education, 2019, Notice of the Ministry of Education on the Issuance of the “Measures for the Administration of Teaching Materials for Primary and Secondary Schools,” the “Measures for the Administration of Teaching Materials for Vocational Colleges” and the “Measures for the Administration of Teaching Materials for Ordinary Colleges and Universities,” viewed August 24, 2023, http://www.moe.gov.cn/srcsite/A26/moe_714/202001/t20200107_414578.html
- [6] The Higher Education Textbooks Evaluation Index System Research Project, 2002, Research and Exploration of Teaching Material Quality Evaluation Index System. *China University Teaching*, 2002(12): 19–22.
- [7] Su L, Liu H, Liu J, et al., 2004, Research on the Index System of Higher Education Textbook Quality Evaluation. *Heilongjiang Researches on Higher Education*, 2004(12): 58–59.
- [8] Li Y, 2018, A Brief Analysis on the Construction of Quality Evaluation Index System of Digital Textbook Construction in Colleges and Universities Under the Background of Informatization. *Journal of Higher Education*, 2018(16): 44–46.
- [9] Lin J, 2020, The Curriculum System Reform and Courses Construction of New Engineering Majors. *Research in Higher Education of Engineering*, 2020(01): 1–24.
- [10] Zhi X, Luo X, Zhang Q, 2015, Thinking on the Construction of Engineering Specialty Connotation Under the Guidance of Professional Certification Standards. *Journal of Northwestern Polytechnical University (Social Sciences)*, 35(02): 103–106 + 116.
- [11] Yin Y, 2021, Research on the Optimization of Engineering Curriculum System in High Level Universities Under the Background of “Emerging Engineering Education,” dissertation, Northeast Petroleum University.
- [12] Wang H, Ding J, Xu K, 2021, The Connotation of the Construction of First-Class Engineering Specialty and the Construction of Curriculum System. *Heilongjiang Education (Research and Evaluation of Higher Education)*, 2021(08): 20–23.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.