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"Anti-Self-Learning Design": Positioning Cognitive Biases in Textbooks and Their Correction ——An Empirical Investigation Based on the New PEP Edition of Junior High School Physics

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Abstract: In light of the current societal controversy surrounding the suitability of textbooks for self-study, this chapter takes the new edition of the junior high school physics textbook published by the People's Education Press (PEP) as a case study. A nationwide questionnaire survey was conducted to gather feedback on the use of this textbook. It was found that over half of the teachers and students agreed that the textbook exhibits an "anti-self-learning design." This perception was particularly pronounced among junior high school physics teachers. However, through a textual analysis of the organization and content of the physics textbook, the researchers found no evidence of any intentional factors designed to hinder self-study. On the contrary, the textbook is rich in guiding contextual elements, with various physics learning methods and thinking approaches introduced in the opening sections and throughout the chapters. Based on these findings, this chapter systematically proposes universal suggestions on how to correct cognitive biases regarding the textbook's positioning and effectively utilize the current textbook.

Keywords: Anti-Self-Learning; Physics Textbooks; Students; Teachers

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1. Problem Statement

The "Compulsory Education Physics Curriculum Standards (2022 Edition)" explicitly emphasize that the organization of textbook content should facilitate students' autonomous learning [1]. However, in recent years, "anti-self-learning" has emerged as a high-frequency term in various media outlets. Numerous textbooks, including those for junior high school physics, have been widely criticized for being perceived as incompletely compiled and unsystematic. Furthermore, current academic and educational circles have paid insufficient attention to this phenomenon. Existing research is largely confined to subjective interpretations of various textbook texts [2]. Empirical investigations have been largely neglected, and the authentic experiences of textbook users are seldom considered.

Do textbooks possess a so-called "anti-self-learning design"? Clarifying this issue is of great significance for defining the core positioning of textbooks under the context of the new curriculum standards and for enhancing the confidence of teachers and students in effectively utilizing the new editions. Accordingly, this study focuses on the 2024 PEP edition of the junior high

school physics textbook. It begins by collecting user feedback data through a questionnaire survey. Building on this, a textual analysis of the new edition textbook is conducted to uncover the root of the problem—that is, whether the issue lies within the textbook itself or stems from users' cognitive biases. The aim is to provide effective references for optimizing both the compilation and the utilization of current physics textbooks.

2. Research Design

2.1 Research Subjects

Against the backdrop of online discussions regarding the issue of "anti-self-learning" textbooks, this chapter focuses its research subjects on the 2024 PEP edition of the junior high school physics textbooks—specifically the eighth-grade first-semester volume and the ninth-grade complete volume (with attention limited to the first-semester portion)—as well as the associated users, including students and teachers. Since the new PEP junior high school physics textbooks were implemented in the autumn semester of 2024, many regions had adopted the new ninth-grade textbook by 2025. Therefore, focusing on the 2024 PEP junior high school physics textbooks as the primary research object is particularly timely.

2.2 Research Methods

A mixed research method combining questionnaire surveys and textbook textual analysis is employed. Through the questionnaire survey, we aim to gain an in-depth understanding of users' attitudes and perceptions toward the new junior high school physics textbooks. Finally, a comparison will be made between the textual analysis of the new textbooks and the sample data obtained from the questionnaires. This will involve analyzing the factors within the new textbooks that facilitate self-study, serving as a basis for correcting cognitive biases regarding textbook positioning and proposing strategies for effectively utilizing the new textbooks.

2.3 Research Tools

For the questionnaire survey, the Wenjuanxing platform will be utilized. This platform offers advantages for large-scale online surveys and possesses functions such as cross-analysis, data filtering, and cleaning. The questionnaires to be distributed are self-developed by the researchers, titled "Questionnaire Survey on the Anti-Self-Learning Issue in Junior High School Physics Textbooks." They are divided into teacher versions and student versions, both including open-ended questions for free responses as well as some test questions designed to screen research subjects and valid samples. Specifically, regarding the question "Do current physics textbooks exhibit an anti-self-learning design?" An identical question is duplicated here, but the order of options from "Strongly Agree" to "Strongly Disagree" is reversed. However, when responses are inconsistent, they are not immediately excluded; instead, the combined proportion of options for both questions is calculated as the final evaluation criterion.

2.4 Research Procedure

A simple random sampling method will be adopted, with nationwide distribution. After data collection, samples will be excluded where the grade level being studied or taught does not match the textbook used for that grade (e.g., selecting "Eighth Grade Second Semester" or "Ninth Grade First Semester" for the question "Which textbook are you currently using?"), or where the selected grade level does not match the textbook (e.g., selecting "Eighth Grade First Semester" for "Current grade level studying or teaching" but choosing "Ninth Grade First Semester" for "Which textbook are you currently using?"). A quantitative analysis will then be conducted to understand the general situation regarding those who believe the textbook exhibits an anti-self-learning design. Finally, a textual analysis of the new PEP junior high school physics textbooks for eighth-grade first semester and ninth-grade first semester will be performed. The findings from this analysis will be compared and discussed against the survey results to reveal potential cognitive biases in textbook positioning and offer suggestions for correction.

3. Survey Results and Findings

3.1 Overview of Sample Distribution

From November 6 to November 15, 2025, 500 student questionnaires and 300 teacher questionnaires were collected respectively. After excluding invalid samples, 348 and 229 valid questionnaires remained, respectively. Subsequently, a

Python script was used to extract IP address information from the samples, and the compiled national sample distribution data is presented in Table 1. Due to space limitations, only the top ten provinces with the highest sample distribution are displayed here. This indicates that the PEP junior high school physics textbooks are widely used across various regions. Except for the notably higher sample distribution from Guangdong Province in the student questionnaires, the overall distribution is roughly balanced. The relevant analysis can, to a certain extent, represent the basic situation in these ten provinces, but it cannot yet represent remote areas such as Tibet. Related conclusions should therefore be treated with caution.

Table 1 Top Ten Provinces with the Largest Sample Sizes in Student and Teacher Questionnaires

Student's Test Paper	Guangdong	Sichuan	Zhejiang	Hunan	Jiangsu	Shanghai	Fujian	Henan	Jiangxi	Beijing
	43	25	23	22	21	19	18	18	15	15
Teacher's Edition	Guangdong	Sichuan	Henan	Hunan	Hubei	Fujian	Guangxi	Shandong	Guizhou	Zhejiang
	26	23	17	15	12	11	11	10	10	9

3.2 Data Processing and Analysis

3.2.1 Student Questionnaire Results

In the student questionnaires, when asked about the existence of an "anti-self-learning design," those who strongly agreed and agreed accounted for 12.6% and 31% respectively, meaning that 43.6% believed that an anti-self-learning design exists. Those who strongly disagreed and disagreed represented 4.9% and 21.3% respectively, indicating that 26.2% held the opposite view. Meanwhile, 30.2% responded as "uncertain." Regarding the textbooks being used, 40.5% were studying the eighth-grade first-semester volume, and 59.4% were studying the ninth-grade first-semester volume. The relevant data are compiled and presented in Table 2.

Table 2 Student Agreement on the Existence of an "Anti-Self-Learning Design" in Textbooks

Textbook	Strongly agree	Agree	Not clear	Disagree	Strongly disagree	N
Grade 8 and Semester 1	15.2%	29.1%	29.1%	19.1%	7.4%	141
Grade 9 and Semester 1	10.9%	32.4%	30.9%	22.7%	3.1%	207

As shown in Table 2, among students currently using the eighth-grade first-semester physics textbook, 44.3% believed that this textbook exhibited an "anti-self-learning design." Of these, 15.2% expressed "strong agreement" and 29.1% expressed "agreement." Meanwhile, 26.5% believed that an anti-self-learning design did not exist, which was significantly lower than the former proportion. Similarly, among students currently using the ninth-grade first-semester physics textbook, 43.3% acknowledged the existence of the "anti-self-learning design" issue. Those holding opposing views accounted for 25.8%, also significantly lower than the former proportion. This indicates that students who believe the current junior high school physics textbooks still possess an "anti-self-learning design" constitute the majority.

3.2.2 Teacher Questionnaire Results

Regarding the question of whether the textbook exhibits an "anti-self-learning design," teachers who strongly agreed and agreed accounted for 9.8% and 45.5% respectively, meaning that 55.3% believed an anti-self-learning design exists—a proportion significantly higher than the 43.6% among students. Those who strongly disagreed and disagreed represented 2.8% and 27.1% respectively, indicating that 29.9% held the opposite view, slightly higher than the 26.2% among students, though the difference was not substantial. Another 15.7% responded as "uncertain," accounting for approximately half of the 30.2% among students. Regarding the textbooks being taught, 68.5% were using the eighth-grade first-semester volume, and 31.5% were using the ninth-grade first-semester volume. The relevant data are compiled and presented in Table 3.

Table 3 Teacher Agreement on the Existence of an "Anti-Self-Learning Design" in Textbooks

Textbook	Strongly agree	Agree	Not clear	Disagree	Strongly disagree	N
Grade 8 and Semester 1	9.6%	44.6%	14.3%	28.0%	3.5%	157
Grade 9 and Semester 1	10.4%	44.4%	18.8%	25.0%	1.4%	72

Comparing the data in Table 3 with Table 2 above, it was found that among teachers currently teaching the eighth-grade first-semester and ninth-grade first-semester textbooks, those who believed the textbooks exhibited an anti-self-learning design accounted for 54.2% and 54.8% respectively—both significantly higher than the student proportions of 44.3% and 43.3%. Those holding opposing views accounted for 31.5% and 26.4% respectively, which were also higher than the student proportions of 26.5% and 25.8%. This indicates considerable controversy among teachers on this issue. Furthermore, given that teachers' depth of research into textbooks generally far exceeds that of students, the proportions of teachers who responded as "uncertain" for the two textbooks—14.3% and 18.8% respectively—were much lower than the student proportions of 29.1% and 30.9%. In summary, not only was the proportion of teachers who believed the textbooks possessed an anti-self-learning design higher than those holding opposing views, but it was also higher compared to students.

4. Textbook Analysis and Reflections

The aforementioned survey reveals that a significant majority of teachers and students, compared to those holding opposing views, believe that junior high school physics textbooks possess an anti-self-learning design, with the proportion of teachers holding this view being notably higher than that of students. When differentiating by the textbook currently being studied or taught—eighth-grade first-semester volume versus ninth-grade first-semester volume—the overall numerical differences in responses ranging from "strongly agree" to "strongly disagree" were not substantial. This suggests that the situation for the second-semester volumes of junior high school physics textbooks across grades is likely similar. Whether textbooks truly exhibit an "anti-self-learning design" requires further analysis in conjunction with the textbook texts themselves.

4.1 The Suitability of Textbooks for Self-Learning

As both textbooks under review are from the new PEP edition and their compilation styles are largely similar, there is no need for separate explanations regarding relevant issues. In the opening section of the eighth-grade first-semester physics textbook, the editors include a "To Students" column, advocating for learning physics through inquiry and proposing strategies for "how to learn physics well." In terms of the language style across chapters, the text is imbued with a guiding context, facilitating students' autonomous construction of a physics knowledge system. Each chapter begins with a "Chapter Introduction Page Design" that serves a scaffolding function, aimed at developing students' core competencies [3]. The introductory content at the start of each section often employs contextualized scenarios, featuring a rich and diverse array of vivid, real-life materials that help students accumulate perceptual knowledge, paving the way for the formation of rational, abstract thinking.

Physics, as a discipline driven by experimentation, includes experiments in many chapters. Without experimentation, numerous abstract concepts are difficult for students to grasp. For instance, when learning about the concept of density, if students merely memorize the formula, they will struggle to understand why, for the same volume, the mass difference between iron and wood is so significant. Delving into the neuroscientific level, students' multi-sensory participation—such as the visual act of reading instrument readings, the tactile experience of operating balances and graduated cylinders, and the operation of logical thinking itself—activates the visual cortex, motor cortex, and prefrontal cortex [4]. This strengthens synaptic connections, enabling the abstract concept of density to be encoded from short-term memory into long-term memory, thereby completing the construction of one's own knowledge system. Therefore, the various signs indicate that the textbook invests considerable effort in guiding students towards self-learning, yet it is still labeled with the "anti-self-learning design" mantle. To a large extent, the problem lies within the teaching and learning conceptions of the teachers and students themselves.

4.2 Attribution of Cognitive Bias

The above analysis indicates that junior high school physics textbooks do not possess an anti-self-learning design, nor do they exhibit characteristics unsuitable for self-study. Teachers holding this contrary view constitute the majority. Furthermore, as junior high school students are in a golden period for learning physics, their physical and mental maturity is still developing, their tendency to follow teachers' lead is stronger than that of high school students, and their worldviews are significantly influenced by their teachers. Therefore, the discussion here specifically addresses the attribution of teachers' cognitive bias, aiming to grasp the principal contradiction and resolve the key issues.

Against the backdrop of the "double reduction" policy, to ensure reduced burden and improved quality, textbook content

organization increasingly focuses on a few key concepts. Particularly in light of the requirements for textbook compilation based on the new curriculum standards, cultivating students' self-learning abilities requires more teacher guidance than ever before. How should teachers teach using the textbook? How should students learn using the textbook? These are major issues urgently needing resolution for many frontline teachers. Based on responses to open-ended questions in the teacher questionnaires, a common expectation among current junior high school physics teachers is that textbooks should provide as much substantial and directly usable knowledge as possible. Teachers holding this view are often veterans of the era emphasizing basic knowledge and basic skills. Their understanding of the teacher's role remains somewhat rooted in the past impression of an instructor focused on knowledge transmission. Consequently, at least subconsciously, they perceive the lack of the breadth and depth found in traditional textbooks as prime evidence that current textbooks are unsuitable for student self-study, or even contain an "anti-self-learning design." Moreover, such teachers often have seniority and significant influence over younger teachers, potentially passing on this bias to them and subsequently to students, thereby fostering a teaching atmosphere similar to the "textbook uselessness" notion sometimes seen in higher education.

Consider an alternative perspective: could the textbooks indeed possess an "anti-self-learning design"? In the author's view, what textbooks should guard against is not self-learning in its true sense. If, from the very beginning, all content to be taught were simply listed out for students to memorize mechanically for high scores, then this so-called "self-learning" would have lost its original meaning. Because the acquisition of knowledge, once divorced from inquiry and reflection, cannot be transformed into ability, and subsequently into competency. The renowned American psychologist David Ausubel proposed the theory of "meaningful learning," emphasizing that the learning of systematic knowledge from school textbooks is primarily meaningful learning. The meaning can be acquired through reception, discovery, or guided discovery, but it cannot be rote learning that is incomprehensible [5]. Therefore, learning that lacks active thinking and exploration does not equate to self-learning. Especially for teachers, what textbook compilation should truly guard against is the practice of simply teaching by rote following the book.

5. Countermeasures and Suggestions

Due to a lack of understanding regarding the guiding elements within textbooks, many individuals come to believe that textbooks possess an "anti-self-learning design," thereby losing trust in them. Given the detrimental effects of this perception as discussed above, it is important to take measures to correct this bias among teachers and students, particularly among teachers.

5.1 Changing Teachers' Perceptions

5.1.1 Individual Level: Clarifying the Textbook's Role

Guided by constructivist theory, it is essential to recognize the dynamic, open nature of knowledge and its characteristic of being autonomously constructed. This is especially important for individual teachers. Whether a textbook is suitable for self-study depends not primarily on whether it can directly impart a large quantity of knowledge, but on whether it can, as a guiding resource, equip students with learning methods while also conveying core concepts. After all, the principle that teaching one to fish is better than giving him fish holds true. If students can achieve self-directed knowledge construction based on the methods provided by the textbook, through independently gathering materials and engaging in various inquiry activities, then the textbook's inherent value for self-learning can still be fully realized.

5.1.2 School Level: Strengthening Guidance in Awareness

Daily teaching and research work often focuses on how to transmit physics knowledge to students. However, insufficient attention is frequently paid to how to transmit the methods of acquiring knowledge to students. Therefore, in guiding teachers on how to use the textbook, it is necessary to insist on placing equal emphasis on teaching knowledge and teaching methods through the textbook, allowing both to synergistically promote the development of students' competencies. For example, at the end of the first three chapters of the new eighth-grade first-semester physics textbook, knowledge framework summaries are provided. Although subsequent chapters no longer include such content, teachers can guide students to learn from this method of summarization to organize the knowledge of chapters they study later, thereby enhancing the effectiveness of self-study.

5.1.3 Societal Level: Remedying the Public Opinion Environment

It is undeniable that the narrative of an "anti-self-learning design" may originate from a minority of online influencers [6]. Many of these individuals work in the education and training industry and may maliciously malign school textbooks to promote supplementary materials characterized by clear knowledge frameworks and comprehensive problem-solving models. They call upon teachers and students to shift their attention from textbooks to such products in pursuit of higher scores and admission rates. Given this possibility, it is necessary to coordinate with multiple relevant departments to strengthen the governance of online public opinion using digital technologies such as artificial intelligence and big data. Particular attention should be paid to preventing the exploitation of the "anti-self-learning design" gimmick to create educational anxiety, thereby stimulating irrational educational consumption and excessive competition. Teachers should be guided to view and utilize current textbooks rationally, and to strengthen the exploration and elucidation of the guiding elements contained within them.

5.2 Clarifying Principles of Use

5.2.1 Building upon Key Editions, Organically Integrating Multiple Versions

In the context of junior high school physics, although the PEP edition is currently the most widely used, this does not imply that thoroughly mastering only the PEP edition can meet all self-learning needs. Conversely, neither should the PEP edition materials be deemed deficient or rejected based on the notion of an "anti-self-learning design." To accommodate the usage needs of as many regions as possible, the editors have made considerable efforts in the organization of textbook content, and the universality of the PEP edition has been proven in practice. To enhance the effectiveness of textbook self-study, organically integrating the strengths of multiple versions is very important. Taking interdisciplinary practice as an example, the purpose of designing such content in the new junior high school physics textbooks is to stimulate students' initiative in self-learning by teaching them through "doing." Some scholars, using "States of Matter and Their Changes" as a case study, found that the PEP edition requires using slides, videos, and other forms to promote communication; the Beijing Normal University edition requires presenting the effects of seawater desalination devices through formats like blackboard newspapers and handwritten reports; the Jiangsu Science and Technology Press edition requires sharing plans for making cold drinks and delicacies in the form of short essays [7]. It is essential to emphasize the organic integration of such resources to enhance the overall educational efficacy of interdisciplinary practice. Additionally, teachers should encourage students to actively utilize multiple versions of physics textbooks to enrich and perfect their autonomous knowledge construction and improve the efficiency of self-study.

5.2.2 Utilizing Online Resources Effectively, Without Detaching from the Textbook

Using the core concepts of the textbook as a framework, various digital resources should be employed to enrich the textbook's knowledge content system. However, this must not lead to detachment from the textbook; otherwise, the knowledge structure formed by over-reliance on online learning resources often lacks the depth of core competencies required by the curriculum standards. Moreover, the knowledge acquired becomes more fragmented, lacking systematic integration and organic synthesis. For instance, educators active on various self-media platforms mostly publish content related to test-taking techniques. While such content is highly targeted, its one-sidedness is also evident. It often lacks elements such as scientific spirit, inquiry ability, and social responsibility required by the new curriculum standards and textbooks.

5.3 Reforming Evaluation Methods

5.3.1 Stabilizing the Difficulty Range to Prevent Deviation from an Appropriate Middle Course

Behind the controversy surrounding the textbook's "anti-self-learning design" essentially lies the issue of users' sense of learning attainment. The methods used in examination design significantly influence this. If the difficulty of examination content aligns with the design of the textbook content, students' effective use of the textbook generally correlates positively with achieving desirable results. Consequently, students will study the textbook more diligently, and teachers will engage more deeply with it. The perception of an "anti-self-learning design" would then naturally dissipate from the minds of teachers and students.

However, if "appropriate alignment" evolves into "mechanical replication," teachers will be reduced to mere executors of the curriculum, and students will become completely subservient to the textbook. Innovation would be stifled, and self-

study would lose its inherent exploratory significance. Therefore, effort must be invested in achieving an appropriate degree of alignment, maintaining it within a reasonable range. This is particularly important for formative assessments such as monthly exams, where maintaining an appropriate distance between the difficulty of examination questions and the difficulty of textbook content is crucial. On one hand, if the overall difficulty and question types of examinations are highly convergent with the textbook, it will be difficult to stimulate students' intrinsic motivation for deep learning, and teachers' daily work may become mechanical and repetitive. On the other hand, if examinations are consistently overly biased or excessively difficult to the point where disconnection from the textbook becomes the norm, teachers and students may attribute poor performance to the textbook's inadequacy. This could lead teachers to abandon the textbook entirely and develop their own materials, and students to seek alternative resources, purchasing supplementary materials or even enrolling in expensive tutoring classes. Over time, this leads to detachment from the textbook, the curriculum standards, and the requirements for cultivating core competencies, resulting in the alienation of competency development.

5.3.2 De-emphasizing Score-Based Evaluation, Highlighting a Competency-Oriented Approach

Under an excessively utilitarian, score-driven orientation, if the textbook is narrowly viewed as a "vehicle for examination points" but fails to deliver the expected score improvement through its effective use, it becomes easy to form the cognitive bias that the textbook possesses an "anti-self-learning design." Based on this, "de-emphasizing score-based evaluation and highlighting a competency-oriented development approach" is particularly urgent. Regarding the core issue of "how to transcend the limitations of singular score-based evaluation and develop diversified evaluation methods," the new junior high school physics textbooks have already provided relevant clues. Taking the eighth-grade first-semester volume as an example, in addition to the introductory design and interdisciplinary practice modules mentioned above, the textbook includes sections such as "Practice and Application," "Review and Improvement," as well as some open-ended and reflective learning tasks. These serve as quality vehicles for recording students' learning trajectories and implementing process-oriented evaluation. For instance, in the "Think and Discuss" section of the chapter on "Refraction of Light," students are asked to discuss the reason for "pond water appearing shallower." During this process, a peer evaluation mechanism can be introduced, including criteria such as whether students actively share their personal observations and whether they can raise questions or provide supplements based on others' viewpoints.

6. Conclusion

As a key vehicle for teachers to fulfill their fundamental mission of fostering virtue and nurturing students, textbooks are by no means designed to inhibit users' self-learning. The transformation of teachers' roles from knowledge transmitters to learning guides has long become a trend. The current organizational form of textbook content adapts to the need for changing teachers' traditional identity as mere instructors. To fully leverage their role in guiding student learning, the organization of textbook content must be imbued with guiding elements. Whether the self-learning function of textbooks can be realized depends not on how much knowledge students can directly acquire through self-study, but on whether they can acquire effective learning methods, form effective ways of thinking, and develop good physics learning habits. These enable them to pursue further development at the core competency level and enhance their motivation for self-learning.

Junior high school physics represents the most foundational stage for students to learn physics at higher levels, and it is also the most critical period for forming awareness of self-learning abilities. Not only must physics teachers clarify the true positioning of textbooks as guiding materials, but they must also effectively convey this design philosophy to students, enabling them to build confidence in utilizing the textbooks well. This helps prevent the erosion of self-efficacy in physics learning and the loss of learning motivation due to ineffective textbook use. Rote memorization of knowledge and repetitive skill practice, even if undertaken actively, do not constitute self-learning. Only by incorporating active and deep deliberation can such self-study be considered meaningful.

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