

# Study on the Integration of Textbooks and Basic Laws of Development of Things and Its Teaching Procedure

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**Abstract.** Most of the current textbooks are the crystallization of predecessors' production and life; however, according to the basic law of the development, they are the result of eliminating the antecedents and processes. For this reason, the integration of textbooks and the basic laws of the development is our overall vision for constructing new textbooks. This will bring the trinity of the structure of the new textbooks, the structure of classroom teaching and the cognitive process of students. The process of the trinity is "creating teaching scenes — sketching knowledge structure — raising a series of questions — solving problems individually". Consequently, teaching is no longer a burden, but a need for teachers and students, a pleasure, an enjoyment, and a manifestation of self-worth.

**Keywords:** textbooks, integration, creating teaching scenes, knowledge structure, efficient and simple

## 1 Introduction

Most of the current textbooks are selected and compiled from many excellent works or materials, therefore, they are more like digests rather than textbooks. In addition, the contents of the textbooks are also the crystallization of predecessors' life. Since it is the crystallization, there must be antecedents and processes. However, the current textbooks are exactly the result of eliminating the antecedents and processes. This makes that teaching can only put forth its strength to the consequences, leading to the overwork of teachers and students all day long and ultimately only an inefficient repetition. For this reason, it is of great urgency to reform the current textbooks.

## 2 Disadvantages of the Current Textbooks and the Harms They Bring

### 2.1 Unable to Give Full Play to Students' Learning Autonomy

Due to that the current textbooks are the result of eliminating the antecedents and processes, they lack the context and become a lifeless condition. Therefore, it is difficult for students to carry out independent learning. They have to rely on their teachers, learn the current textbooks mechanically, and then, solve problems based on the teachers' instructions and answer the questions in the examinations according to the current textbooks. They can only study in this way, or they will become the backward students.

### 2.2 Inevitable to Cause the Excessive Psychological Burden and Academic Burden

Since students cannot achieve independent learning and have to rely on teachers and textbooks, they are usually subject to great repression, their internal needs cannot be satisfied, leading to bear a huge psychological burden. Moreover, it is not easy to internalize or convert the contents teachers taught in class or written in the textbooks into their own knowledge. The only way to overcome this difficulty is to read and memorize repeatedly and continuously. Therefore, for students, the heavy academic burden is inevitable.

### 2.3 Unable to Ensure the Teaching Quality

Under the double pressure of psychological burden and academic burden, teaching quality is also difficult

to be guaranteed. To check the teaching quality is also to check the inner meaning, context, antecedents, consequences or the whole process of the textbooks and their connections through the current textbooks. In particular, the more flexible the examinations are, the lower the students' scores will be. This has resulted in the further increase of students' academic burden, forming a serious vicious circle.

#### **2.4 Causing Teaching to Violate Its Law Seriously**

In the teaching process of the current textbooks, the knowledge points of each new lesson must be taught bit by bit at the beginning. Even if teachers and students have tried the best efforts they can, they are still confused about what they are learning. Only after completing the new course, students will then have a general understanding to the knowledge of the textbooks. However, the understanding of new knowledge is neither complete nor profound, which necessitates great efforts to review bit by bit. This is actually a way of "part - whole - part", which exactly violates the teaching law of "whole - part - whole".

#### **2.5 The Fundamental Reason of Causing the Separation of Teaching from the Realistic Production and Life**

Someone proposed that the current textbooks are the crystallization of predecessors' production and life, but the requirement for the teachers is to transmit the background of the times about the knowledge in the textbooks when teaching! However, the problem is that there lacks a process between the background of the times transmitted by teachers (the antecedent) and the teaching content (the consequence), which happens to be the focus of teaching. In the realistic production and life, there are always causes first, while the consequences are often difficult to be predicted. However, in most cases, we have to study, judge and predict through a process. If we avoid the main teaching activities of "research, judgment and prediction" in teaching process, it is meaningless to make a big talk on the reasons of why this or why that afterwards. This is also the fundamental reason why the knowledge we have learned is not suitable for solving practical problems.

### **3 Vision for Constructing New Textbooks**

The integration of the textbooks compilation and the basic laws of development is our overall vision for constructing new textbooks. Based on this overall vision, the following three principles are proposed for the construction of new textbooks.

#### **3.1 Three Principles for the Construction of New Textbooks**

##### **3.1.1 Principle of the consistence between construction of new textbooks and the law of development**

The basic law of development is "causes - processes - results". Therefore, the construction of new textbooks should also follow the law of "causes - processes - results", otherwise it is incomplete, or is divorced from the basic laws of development.

##### **3.1.2 Principle of the consistence between the construction of new textbooks and classroom teaching process**

The teaching process depends on the textbooks, or, what kind of textbooks will be constructed depends on what kind of teaching process we need. Both of them should be consistent. Meanwhile, the teaching method can be further standardized.

##### **3.1.3 Principle of the consistence between the construction of new textbooks and the enlightenment of students' thinking**

For the new textbooks, there should be causes first. Then, according to the causes, students are urged to study, judge or predict through a process, and finally obtain the results. Only in this way can students' learning be independent and improved, then teachers can provide guidance and help. And only in this way

can the students' knowledge be the useful and living knowledge, meanwhile the students' own value can also be embodied.

Consequently, the trinity of the structure of the new textbooks, the structure of classroom teaching and the cognitive process of students has been formed (that is, integration).

### 3.2 How to Construct New Textbooks (How to Establish New Classroom Teaching Process)

According to the three principles for constructing new textbooks, a certain teaching scenes must be first created. Under this situation, students are encouraged to find problems, put forward problems and solve the problems independently, and finally draw conclusion.

#### 3.2.1 Creating teaching scenes

At the beginning of the teaching on each chapter or each text, a certain teaching scenes must be first created by talking, questioning, telling stories, watching courseware, investigating, interviewing and etc. Under the same teaching situation, students can produce the identical learning requirements and urgent need for the motivation and interest of learning.

Example 1: First, teachers can guide students to visit the nearby factories, let the manufacturers talk about the current environmental protection and low-carbon emission requirements, make the students know that it is all caused by carbon dioxide. Then they will produce the interest and the sense of urgency to research carbon dioxide. In this way, the teaching scenes can be created for teaching junior high school chemistry "Nature of carbon dioxide".

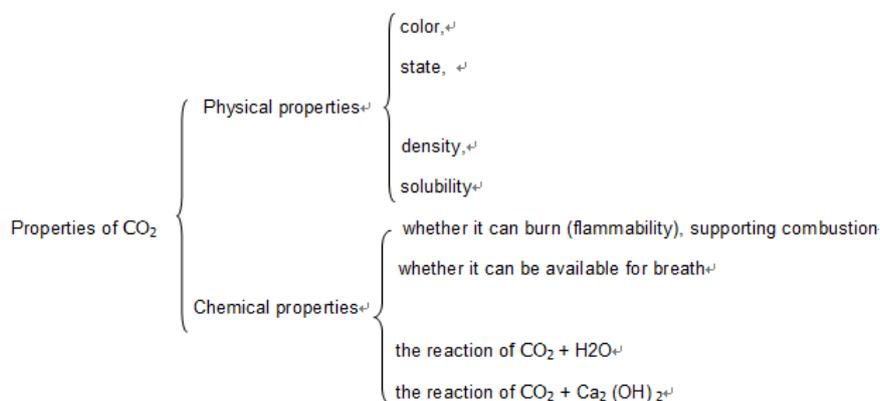
Example 2: Senior high school students have a deep understanding to the specific physical quantities such as length, weight and volume, but they are quite unfamiliar with the new physical quantity "momentum" when they begin to learn it. Then, the teaching scenes can be created as follows.

Ask the students: In addition to gender, what other rules are required for grouping the athletes in weightlifting, boxing, wrestling, etc. in various sports meeting? (The students will be scrambling to answer: weight category). This indicates that the effect of motion is not only related to the movement velocity of the object (v), but also related to the mass of the object itself (m). Thus, the formula of momentum  $P=mv$  is formed. Then, the teachers and students can smoothly enter the teaching stage of "momentum and momentum conservation" in senior high school physics.

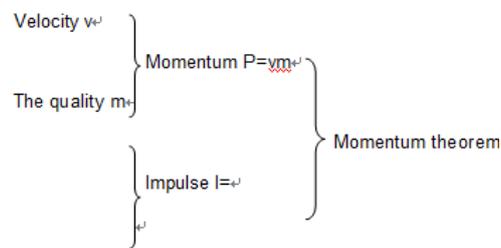
#### 3.2.2 Sketching knowledge structure

When the students enter an immersive teaching scene, they are subject to the existing learning resources formed by nature and nurture, and then they will find that there are many problems to be solved by themselves. At this time, teachers should guide the students to grasp the whole first, sketch the general outline or preliminary vision to solve these problems, that is, sketch the integral and initial knowledge structure.

According to the teaching scenes created above, it can be proposed that: The properties of carbon dioxide are extremely important, so what properties of carbon dioxide should be studied? Subsequently, the following knowledge structure can be sketched:



Regarding the teaching of “momentum and momentum conservation”, the integral and initial knowledge structure can be sketched together with the creation of teaching scenes:



### 3.2.3 Raising a series of questions

With the sketch and presentation of the knowledge structure, students will naturally raise a series of specific questions to be solved.

For example: What color is carbon dioxide? What is the state of carbon dioxide? What is the density of carbon dioxide? How to observe or measure it? etc.

What is momentum? What is the magnitude of momentum related to? What is the formula?

Note: A space between each question should be left (see the example below), which is convenient for students to answer it by themselves. Only if the usual class teaching is treated as an examination, the examination will be then the same as the usual class teaching.

### 3.2.4 Solving problems individually

Each problem will be solved by the students themselves, and teachers only provide guidance or help. This process can be divided into four steps:

- (1) Raising questions — Teachers raise each question in the “series of questions” successively, encourage students to find out the growth point of the knowledge in the existing learning resources by associating and guessing, and consider how to solve the question independently.
- (2) Guiding exploration — At the critical moments when students are exploring how to answer questions independently or when students encounter difficulties, teachers provide the students necessary guidance.
- (3) Answering questions independently — Students can refer to or do not refer to the teachers’ guidance, and then answer questions through independent learning. Usually, students answer questions by writing first and then answer questions orally. There will be a competitive situation among the students.
- (4) Rectifying and strengthening — According to the situation of students’ independent answer, teachers strengthen the previous “guidance” and rectify the students’ problems. There will be extensive cooperation and communication between the teachers and the students.

The “four-step process” can be varied according to the teaching practice, for example, step (2) and step (3) can be used repeatedly and interchangeably.

In the process of solving problems separately, the knowledge structure can be constantly enriched and improved. When the first problem is solved, the second problem is immediately raised. Then, the second round of the four-step process is carried out, and so on. In addition, the “knowledge structure” is used to connect each lesson.

### 3.2.5 Drawing the final teaching conclusion

After each problem is separately solved with the above four-step process, the initial knowledge structure is constantly enriched and adjusted, thus forming a relatively complete knowledge structure. This relatively perfect knowledge structure is the final conclusion of teaching, and is also the cognitive structure rooted in the deep heart of students.

## 4 Style of New Textbooks

### Senior High School Mathematics — Solving Triangle

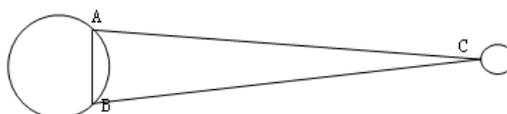
#### I Creating teaching scenes

In 1671, the French astronomer Hollande and his teacher measured out the distance between the earth and the moon by observing simultaneously from the Cape of Good Hope and from Berlin.

Now the question is: what kind of mathematical model can they build?

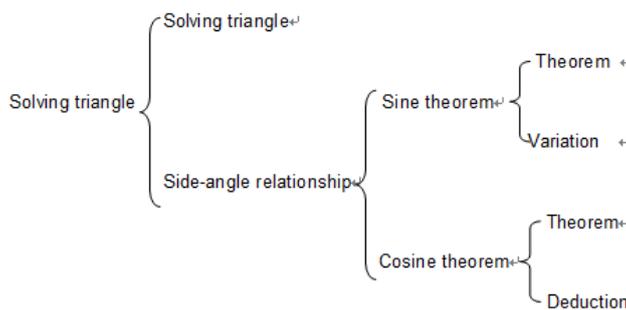
What data can be measured out?

How can the distance between the moon and the earth be calculated?



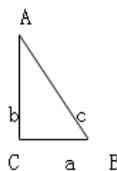
This is an astronomical measuring problem. In addition, there are nautical measuring problems, geographical measuring problems and so on. We have been able to solve the problems related to right triangle with the help of the acute triangle function. However, it's obviously not enough to use this knowledge to solve the above problems. Therefore, solving right triangle must be generalized to all or any triangle, that is, solving triangle.

#### II Sketching knowledge structure (This structure is partly enriched and adjusted in the later period of teaching)

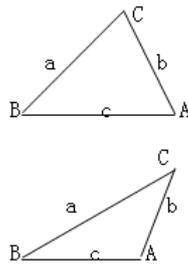


#### III Raising a series of questions IV Solving problems individually

1. What is solving triangle? What is the key to solving a triangle?  
 [Guidance: Understand the basic elements of a triangle —... are known ... calculate ... — the side-angle relationship...]
2. Which kind of triangle does the known side-angle relationship belong to? What is the side-angle relationship of this triangle?



- [Guidance: ..... can be considered according to the definition of sine function]
3. What other kind of triangles' side-angle relationship need to be known? How can we know the side-angle relationship of these triangles?



[Guidance: How to transform these triangles into right triangle — it can be considered based on the definition of sine function .....]

4. Describe in words and express sine theorem with formula (fill in the knowledge structure at the same time)

[Guidance: Notice the relationship between the words and formula]

5. What kind of the problems of solving triangle can we solve using sine theorem?

[Guidance: ..... can be considered according to the formula of sine theorem]

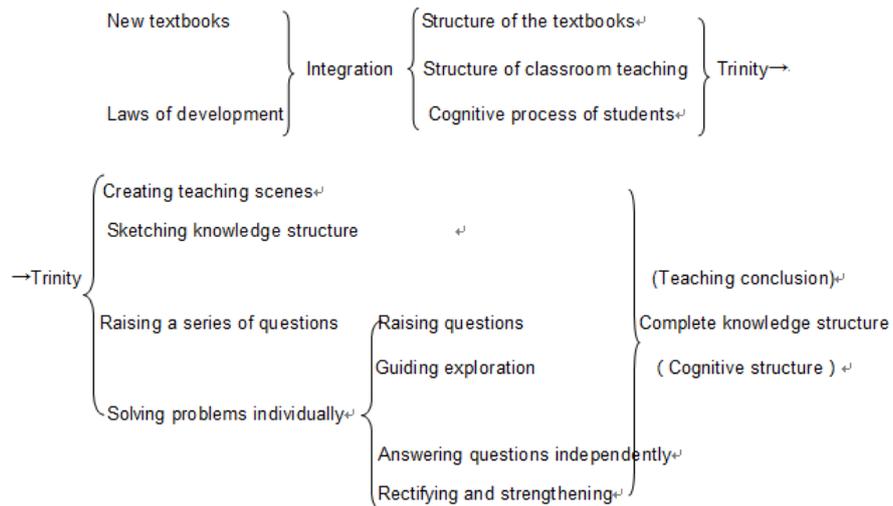
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10. In the question at the beginning of part I, if it is measured that  $A=80^\circ$ ,  $B=84^\circ$  and  $AB=6400\text{km}$ , then, please calculate the distance from the earth to the moon (AC).

### 5 Conclusion

The integration of textbooks compilation and the basic laws of development, and the resulting trinity of the structure of new textbooks, the structure of classroom teaching and the cognitive process of students will make the teaching more efficient and simpler. Meanwhile, it will relieve students from the artificial academic burden and psychological burden that come from all aspects. Teaching will become a need, a pleasure, an enjoyment, and a manifestation of self-worth for teachers and students. Students will devote themselves to their study with more interests and enthusiasm.

The structure or process of the structure of new textbooks, the structure of classroom teaching and the cognitive process of students can be reflected in the following structure chart.



**About the Author.** Hui Lan, male, Chinese citizen, born in November 1977, director of Digital Media Design Department, Art Design College, Zhejiang Gongshang University. He has focused on the research of classroom teaching model, and actively practice and promote the theories and research results.

Shoutian Lan, male, Chinese citizen, associate professor, researcher at Suizhou Institute of Education, Hubei Province. He is passionate about efficient classroom modeling, and has concentrated on the studies and experiments for "three-dimensional teaching" that can accommodate students of different personalities.

In addition, he always sets up the experimental base for the subject, preaches theories, provides demonstration classes, trains teachers, tutors students, and constructs new textbooks.

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