



Analysis of Inquiry-Related Tasks in New China High School Mathematics Textbooks for Process Skills

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Abstract

This research focusses on process skills of inquiry-related tasks in new China high school mathematics textbooks. The results indicate: First, some process skills such as Inference, Compare, Observation, Use of Numbers, Construction of Tables or Graphs as well as Use of Space/ Time Relations are highly emphasized. Nonetheless, there are comparatively fewer using for Data Interpretation , an process skill which symbolizes the characteristics of mathematics; Second, In terms of integrated process skills, basic process skills attract more attention while integrated process skills own fewer using; Third, more than half of the inquiry-related tasks train students for several skills simultaneously. Overall, the arrangements of senior high school textbooks' inquiry-related tasks reflects the distinct features of mathematics, but we still should be more concerned with the training of high level process skills as well as to render the category number of process skills used in the single inquiry-related task in an appropriate range.

Key words: High school mathematics textbook; Inquiry-related tasks; Process skills

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INTRODUCTION

Dewey (1910) quoted in his letter to American Association for the Advancement of Science (AAAS): Science is not only a pile of knowledge that requires our eagerness of learning, meanwhile, it is also a form of the process and approach of the study. Moreover, he did encourage the scientific faculties of K-12 to regard inquiry as a way of strategy to science teaching. After the 1960s, the teaching approaches of Inquiry has gradually grasped more acceptance and recognition for mathematics educationists, they all were aware of the significance of “to think like a mathematician” and approved the idea of envisioning mathematics study as “an independent researching process by students” (Ning, 2005) Relevant researches have showed that the mathematics inquiry processes educational methods are conducive to the development of students' process skills as well as improve students' grades.

With the purpose of injecting more exploratory approaches into senior high school teachers' mathematics teaching process and exploratory training of students, China issued *The Ordinary High School Mathematics Curriculum Standards (Trial)* in 2003. In the standard, it clearly pointed out that “the curriculum of high school's teaching ought to lead and inspire students to experience the innovative and exploratory process of mathematics by various means of independent study and inquiry activities”, as well as appointed “mathematics inquiry” as one of the three latest added modules, suggested “amid the “textbook compilation process”, the authors could put ‘mathematics inquiry’ as an appropriate segment for the betterment of textbook quality.” Compared with the full-time ordinary senior high school mathematics textbooks that have been audited in 2002, the biggest distinction of the experimental version textbooks which were compiled under the guidance of the standard is the design of a quite number of inquiry-related tasks, they utilize the forms of specific study-columns like “Thinking”, “Research”, “Observation”, “Reading and Searching”,

“Discovery and Exploration”, “Information Technology Application” and other related “Experimental Practice Homework” to set throughout the main body and appendix of the textbook (Xu, 2012).

The primary purpose of the research is to analyze the inquiry-related tasks of current China’s senior high school’s mathematics textbook and get to know what kind of process skills require the most urgent training demands by students, through those researches we are able to acquire not only the compile characteristics and flaws of the inquiry-related tasks, but also a proper guidance for the teachers’ teaching to some extent.

1. LITERATURE REVIEW

1.1 Definitions and Previous Research on Process Skill

The earliest written research record of process skills was in the 1960s, scholars have figured out the connotations of process skills and pointed out that as a tacit procedural knowledge, process skills are an method of intellectual or action formulated with the foundation of practice, as well as an essential ability for scientists to operate the scientific researches. Meanwhile, the scholars has clarified the extension of process skill, such as AAAS’s Science-A Process Approach (SAPA) curriculum, which selected 13 process skills for science exploratory activities, including Observation; Classification; Measure; Communication; Inference; Prediction; Use of Numbers; Use of Time/Space Relationships; Formulation of Hypotheses; Identify and Control of Variables; Operational Definition; Experiment; and Data Interpretation. Otherwise, Oslund (1992) hold the perspective that science inquiry requires following 15 skills. They are Observation, Communication, Estimate, Measure, Data Collection, Classification, Inference, Prediction, Construction of Models, Data Interpretation, Construction of Graphs, Formulation of Hypotheses, Control of Variables, Operational Definition, and Investigate. Nonetheless, Gong (2007) indicates 25 science inquiry process skills in chemistry class: Definition of questions; Observation; Measure; Record; Material Searching; Prediction; Assumption; Design of Experiment Scheme; Design of Investigate Plan; Control of Variables; Experiment Operation; Compare; Classification; Analysis; Synthesis; Induction; Deduction; Analogy; Imagination; Construction of Models; Data Process; Expression; Communication; Introspection; Commendation.

At the same time, scholars also implemented researches on the types of process skills. On the scale of complication, AAAS categorized the process skills into two types-basic and integrated, and the basic (simpler) process skills provide a foundation for learning the integrated (more complex) skills (Sheeba,2013). Sund and Trowbridge (1967); on the other hand, categorized the

process skills into collective skills, organizational skills, creational skills, operational skills and expressive skills in terms of the segments of exploration. The Chinese scholar Gong (2007), however, put process skills into intellectual and psychomotor skills respectively.

From the point of view of the subjects, previous researches on process skills are concentrated on science, physics, chemistry and other subjects, while we see comparatively fewer researches in mathematics. Despite the phenomenon, we have seen some researchers paid their attentions to the actual functions and benefits of cultivating students for their process skills in mathematics. A case in point is Shymansky’s (1974) series of experiments design and operation of “geometry connections”, via which he compared students’ grades differences related to process skills amid the general process of independent inquiry and traditional form of teachers’ teaching. He found out that they are an obvious better grades for the students who applied to the independent inquiry, especially some better performances for those so-called poorly-graded students.

1.2 Revious Research on Inquiry-Related Tasks in Curriculum Materials

Researchers from around the world have examined inquiry-related tasks in curriculum materials for level of inquiry, process skills and other features. For example, Tamir and Luneta (1981) reported that the activities in Israel high school science textbooks are poor in investigate and inquire opportunities for students. Okebukola (1988) analyzed the activities in the Nigerian revised pupils’ textbooks and workbooks I and II of the Integrated Science Project, the result indicated that the low level process skills were highly emphasized. Soyibo (1998) analyzed the practical activities prescribed in Caribbean eight process-oriented integrated science textbooks for students in grades 7-9, the results also reported that most of the tasks were emphasis on low level process skills. Mumba and Chabalengula et al. (2007) found that the process skills emphasized in the Zambian high school physics practical examinations were the same as those outlined in the physics syllabus, and the level of inquiry about the experiments in the practical examinations were restricted to structured and confirmation/verification. Xiang and Liu (2006) compared the the inquiry activities of Chinese and Japanese high school chemistry textbooks, reported that the process skills of observation and record were more frequently used in China textbooks, but those process skills were centralized with measurement were more common in Japanese textbooks.

But there were no research on inquiry-related tasks in mathematics curriculum materials for process skills, those previous studies paid close attention to the explicit attributes of inquiry activities in mathematics textbooks, such as Xu (2012) compared high school

mathematics textbooks for inquiry activities of four country, the results indicated that German textbooks are rich in real world problems and cooperative activities, Chinese textbooks focused on open-ended questions and tended to represent problems by interrogative sentences, Japanese textbooks provided plentiful mathematics reading materials, and textbooks of England lay emphasised on the team worked situation. Liu and Zhang et al. (2012) analyzed inquiry-related tasks in China high school mathematics textbooks published by People’s Education Press, and founded they are numerous in number, plentiful in the type of content and low in openness level.

This review of previous studies from around the world about different subjects indicates that many curriculum materials offered few opportunity for student to do open level inquiry and to develop their high-order process skills. The literature also indicated that the lack of studies on mathematics textbook for process skills. Yet in many country like China, textbook is the guide for teachers to teach in classroom(Liu,2014).Therefore, this study went beyond previous research studies by examining the inquiry-related tasks in new China high school mathematics textbooks for process skills.

2. METHODOLOGY

2.1 Sample

China high school mathematics education has a tradition of “One syllabus, One series of textbooks”, which means that all high schools in China follow one national mathematics curriculum. From 2003, this situation has a minor change. We still have a national mathematics curriculum for all high schools, but now we have six series of textbooks. They all boast common structures: 5 compulsory series of textbooks, 21 selective series textbooks (two textbooks of the 1st edition selective series are compulsory courses for arts major students while three textbooks of the 2nd edition are compulsory courses for science major students, the 3rd and 4th editions have selective series of total 16 textbooks, both majors students can select 1 from them). Nevertheless, in Chinese mainland, the majority of most high schools are adapting the A version of senior high school mathematics textbook published by People’s Education Press. Considering the compulsory series are essential for every student, so this research concentrates on the inquiry-related tasks of the mathematics compulsory textbooks, these 5 books’ detailed arrangements are listed in Table 1. The sample version of textbooks was published during 2007-2008, with a total of 265 inquiry-related tasks. Liu (2012) pointed out that 76.5% of the inquiry-related tasks are compiled for searching new knowledge and conveying a message to faculties and students: The mathematics knowledge needs to be explored by students.

Table 1
Main Content of High School Mathematics Compulsory Textbooks

| Textbook | Chapters | Numbers of inquiry-related tasks |
|---------------------|---|----------------------------------|
| Compulsory course 1 | Set and Concept of Function; Basic Elementary Functions (exponential function, logarithmic function, power function) | 45 |
| Compulsory course 2 | Geometry; Location Relations among Point, straight line and Plane; Straight line and equation; Equation of Circle | 78 |
| Compulsory course 3 | Primary algorithm;Statistics; Probability | 58 |
| Compulsory course 4 | Trigonometric Function; Plane Vector; Trigonometric transform | 54 |
| Compulsory course 5 | Solving a Triangle; Series; Inequation | 30 |

2.2 Framework

This research isn’t aimed to reveal the extension and categories of mathematics inquiry skills, but to analyze the process skills of inquiry-related task in textbooks. Consequently, with the researches which SAPA and Sund & Trowbridge (1967) posed on process skills’ framework, we read the inquiry-related tasks of the textbook repeatedly and recognized the required process skills within, plus we did some modifications of the process skills analyze framework in a proper manner, eventually we formed a complete analyzing framework which contains all required process skills. The analyzing framework contains 16 process skills and the first ten skills are basic process skills while the last 6 skills are integrated process skills which are presented in Table 2.

2.3 Analysis Procedures

From the foregoing analysis framework, we firstly read through an inquiry-related task and attempt to fulfill the tasks and identify the required process skills. Suppose each inquiry-related task we researched as a research unit, if there did train the students’ certain process skills, say observation, we would mark the number 1 under the process skill of observation, if there isn’t, we would mark the number 0 accordingly. To guarantee the reliability of the research results, the data code is composed by two different researchers who did the former analysis, and analyzed the two researchers’ results of their researches afterwards. The research codes for process skills in the textbooks are shown in Table 3.

Table 2
Categories and Connotations of Process Skills

| | Process skills | Connotation |
|---------------------------|-----------------------------------|--|
| Basic process skills | Observation | To visually observe objects/events under natural circumstances and utilize relevant thinking models to identify its forms, features and relations. |
| | Compare | To identify the commons and distinctions of objects |
| | Classification | To group objects into different types by certain criteria. |
| | Measure | To collect information of objects by using tools , such as ruler, scale, thermometer, measuring glass and so on. |
| | Prediction | Based on the regularities of objects or accumulated knowledge and experience to reasonably forecast and measure the developing momentum and solutions for questions. |
| | Inference | Indicates formal logic ratiocination, that is to acquire another unknown conclusion by one or several known judgments of various inferring formations, including deductive inference, inductive inference and analogical inference. |
| | Use of time/space relationship | To identify orientation of subjects by their shape, structure, location, connection, movement and speed, and other aspects of spacial and temporal structures. |
| | Use of numbers | To recognize and utilize number-related knowledge, including compute the numbers, use number's relations, as well as apply numerical values in place of variables and vice-versa to generate meaning. |
| | Construction of tables and graphs | Using tools to construct charts, tables, or graphs to express quantitative relation, spacial relationship, structure , etc.. |
| | Communication | To present ones' own views for others to learn and judge, the forms including oral, written, non-verbal, or symbolic etc.. |
| Integrated process skills | Identify and control of variables | To identify all kinds of variables in experiment, reduce or eliminate disturbing factors for the purpose of discovering the causalities within. |
| | Experiment | Amid artificial control, revolution or simulation, we observe objects and phenomena to get perceptual experience and scientific facts. |
| | Investigate | To participate in site to do the research by various approaches (like observation, interview and inquires papers, etc.) to get relevant information. |
| | Formulation of hypotheses | To predict the relationships between variables or give a temporary answer to the question with certain theories to support the results which came out of observations and experiments, and give a direct and clear judgments about whether they conform to the existed theories. |
| | Operational definition | To reveal certain word or technical terms' connotation to express, realize and identify related phenomena. |
| | Data interpretation | To organize and analyze data that have been collected as information about objects and events to draw conclusions from it by determining apparent patterns and relationships in the data, or explain the conclusions we've already got. |

Table 3
The Code Consistency of the Two Researchers

| Textbook | Fruquency of inquiry-related task | Percent agreement |
|---------------------|-----------------------------------|-------------------|
| Compulsory course 1 | 45 | 94.5% |
| Compulsory course 2 | 78 | 85.1% |
| Compulsory course 3 | 58 | 95.1% |
| Compulsory course 4 | 54 | 90.9% |
| Compulsory course 5 | 30 | 89.4% |

As Table 3 presented, the lowest consistent rate of two different researchers reached 85.1%, which indicates the

researching framework boasts high operational value. Due to the inconsistent coding, the two researchers interacted and explained with each other to form the final codes.

3. RESULT

3.1 Process Skills' Frequencies Required by Inquiry-Related Tasks

Based on the former definitions of process skills, we did statistics on the required process skills of senior high schools' compulsory mathematics textbooks, which are shown in Table 4.

Table 4
Statistics on Frequency and Percentage of Process Skills Required in Mathematics Inquiry-Related Task

| | Compulsory course 1 | Compulsory course 2 | Compulsory course 3 | Compulsory course 4 | Compulsory course 5 | Total | |
|---------------------------|-----------------------------------|---------------------|---------------------|---------------------|---------------------|-------|-----|
| Basic process skills | Observation | 13 | 25 | 4 | 9 | 6 | 57 |
| | Compare | 17 | 5 | 10 | 2 | 4 | 58 |
| | Classification | 1 | 5 | 0 | 2 | 2 | 10 |
| | Measure | 0 | 5 | 0 | 1 | 1 | 7 |
| | Prediction | 1 | 3 | 10 | 4 | 2 | 20 |
| | Inference | 15 | 41 | 21 | 41 | 16 | 129 |
| | Use of Time/Space Relationship | 0 | 44 | 0 | 0 | 0 | 44 |
| | Use of Numbers | 14 | 9 | 7 | 6 | 2 | 39 |
| | Construction of Tables and Graphs | 9 | 9 | 2 | 7 | 5 | 32 |
| | Communication | 13 | 9 | 16 | 4 | 4 | 46 |
| Integrated process skills | Identify and Control of Variables | 2 | 0 | 0 | 0 | 0 | 2 |
| | Experiment | 3 | 1 | 1 | 1 | 1 | 7 |
| | Investigate | 0 | 1 | 3 | 0 | 1 | 5 |
| | Formulation of Hypotheses | 0 | 4 | 0 | 3 | 0 | 7 |
| | Operational Definition | 1 | 0 | 0 | 0 | 0 | 1 |
| | Data Interpretation | 2 | 0 | 9 | 1 | 3 | 15 |
| Total | 91 | 161 | 83 | 81 | 47 | 479 | |

As the Table 4 shows, in the senior high schools' compulsory mathematics textbooks, there are a total of 479 times of appearance of process skills, among which the Inference skills enjoy the most attention (account for 26.9% of the total frequency), about 48.7% of inquiry-related tasks need inference to complete, and about 11.7% need plausible inference (including inductive inference and analogical inference); The second frequently required process skill is Compare (account for 12.1% of the total frequency), about 21.9% of inquiry-related tasks require students to compare and discover the similarities and distinctions thus to construct their mathematics knowledge; The third most frequently required process skill is Observation (account for 11.9% of the total frequency), about 21.5%'s amount of inquiry-related tasks require students to gather information visually and utilize relevant thinking model to process, eventually get research conclusions; the 4th and 5th are Communication and Use of Space/Time Relationship, the 6th is Construction of Tables and Graphs, while the 7th is Use of Numbers. Moreover, the least focused is Operational Definition, there's only one inquiry-related task requires students to give definition, following Identify and Control of Variables with 2 inquiry-related tasks' mention; From the perspectives of process skills' complexity, students are usually required to utilize basic process skills to operate mathematics researches, with a total frequency of 398 times, 5 times of integrated process skills' 81 times and account for 80.1% of all process skills required in the textbook.

Liu (2012) pointed out that 76.6% of Chinese mainland senior high school mathematics textbooks' inquiry-related tasks appear before the knowledge that has not yet been learned, like compulsory textbook version 1, page 33, the inquiry-related task for the concept of even function (shown in Figure 1), it requires students to conclude the characteristics of "when independent variables adapt the opposite number, the function value is the same" so as to get the essential attributes as well as exact concept of even function, that is $f(-x) = f(x)$ out of the function value corresponding table (function $y=x^2$ and $y = 2-|x|$). In the process of completing this mathematics inquiry-related task, the core skill for a potential breakthrough for the mathematics exploratory tasks is integration, if students cannot smoothly complete the inductive inference the specific rule from two function's three pairs of special function value to the general rule of other functions, the concept construction of the even function would be inconceivable.

Moreover, the compulsory version 2 of the textbook, page 54-55, the two inquiry-related tasks for the judgement theorem of line-surface parallel. The first one got the abstract assumptions that "If a straight line a which lies outside the plane α parallels with a line b which inside the plane α , then the line a parallels with plane α " from observing the realistic model for book coverage's moving process and the position relation between coverage marginal lines and book spine lines as well as the coverage marginal lines and the plane of the book. The latter inquiry-related task requires students to answer

“When straight line a , which lies outside plane α is parallel to the straight line b , another straight line inside the plane α , (1) Are these two straight lines in the same plane? (2) Does

straight line a and plane α intersect each other? ”In fact it is to ask students to prove the assumptions through deductive reasoning.



Please look at Figure 1.3-7, and then think about it
 (1) What are these two function images in common?
 (2) How does the function value correspondence figures embody the features?

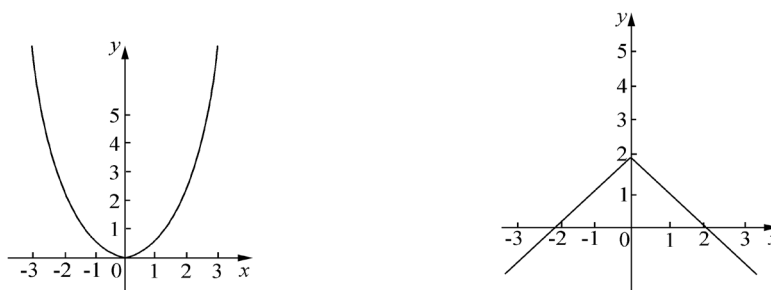


Figure 1.3-7

| | | | | | | | | | |
|--------------|-----|----|----|----|---|---|---|---|-----|
| x | ... | -3 | -2 | -1 | 0 | 1 | 2 | 3 | ... |
| $f(x) = x^2$ | ... | 9 | 4 | 1 | 0 | 1 | | 9 | ... |

| | | | | | | | | | |
|------------------|-----|----|----|----|---|---|---|----|-----|
| x | ... | -3 | -2 | -1 | 0 | 1 | 2 | 3 | ... |
| $f(x) = 2 - x $ | ... | -1 | 0 | 1 | 2 | 1 | 0 | -1 | ... |

Figure 1
The Inquiry-Related Task of Even Function Concept

From those 2 cases we are able to notice that on the one hand, while the inquiry-related tasks in textbooks are training students’ process skills, on the other hand, they simultaneously are expressing the receiving process of new mathematics knowledge, an independent construction based on students’ prior knowledge, as well as a logical process and strict activity that in line with logic of mathematics. The purpose of deepening process skills is to render students to experience the recreational process of mathematics knowledge, accumulate practical and innovative mathematics knowledge as well as experience the pleasure of successes during the process, reduce the misunderstanding that mathematics is a form of absolute truth and develop a scientific views of mathematics: Mathematics possesses the features of artifact, it is a

human production amid human’s struggles against natural predicaments. Hopefully, we could render students to arm with the possibilities and abilities of innovation of mathematics.

3.2 Categories of Process Skills in the Inquiry-Related Task

As foregoing discussion goes, there are altogether 265 inquiry-related tasks in senior high school mathematics compulsory textbooks, with the frequency of 479 of all process skills, so we can observe that quite a few inquiry-related tasks train a variety of process skills at the same time. In order to get a more precise look of the training process skills’ varieties, we did statistics on each column’s required skills respectively, which is showcased in Table 5.

Table 5
Statistics on Frequency of Process Skills Required in Each Inquiry-Related Task

| Type of process skills | Compulsory course 1 | Compulsory course 1 | Compulsory course 1 | Compulsory course 1 | Compulsory course 1 | Total (percent) |
|------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-----------------|
| One | 15 | 21 | 31 | 34 | 17 | 118 (44.5) |
| Two | 10 | 34 | 22 | 14 | 6 | 86 (32.5) |
| Three | 16 | 19 | 3 | 4 | 4 | 46 (17.4) |
| Four | 3 | 3 | 1 | 2 | 2 | 11 (4.1) |
| ≥Five | 1 | 1 | 1 | 0 | 1 | 4 (1.5) |
| Total | 45 | 78 | 58 | 54 | 30 | 265 |

As Table 5 shows, about 44.5% of inquiry-related tasks only require a single process skill, 32.5%’s inquiry-related tasks require 2 skills while 17.4%’s inquiry-related tasks require 3 skills. Actually, there are about 5.6% inquiry-related tasks’ required process skills were more than 3 types. Overall, more than half of the inquiry-related tasks’ required process skills surpass 2 types, the most one reached 7 types, so the textbooks’ inquiry-related tasks usually demand students to vigorously participate in the comprehensive training of process skills. Researchers hold the opinions that senior high school students have already mastered certain amount of mathematics knowledge and process skills. For students in this phase, the majority of knowledge that they need to learn belongs to elementary mathematics, which have comparatively typical and realistic prototypes, and we can utilize observation, compare and some other related skills to explore and abstract. Judging from the aspects of single inquiry-related task’s process skills, the design of textbook is suitable for the student’ phase of studying.

CONCLUSION AND DISCUSSION

The research results indicate that the various inquiry-related tasks in new China’s senior high school mathematics textbook provide an opportunity for students to inquiring mathematics knowledge, as well as a possible approach for the training of process skills. Overall, the process skills required in inquiry-related tasks boast following characteristics:

Firstly, of all 16 process skills, Inference, Compare, Observation, Use of Numbers, Construction of Tables and Graphs as well as Use of Space/Time Relation are highly-focused, which indicate the compile of inquiry-related tasks in senior high school mathematics textbooks is sufficiently showing the distinctive subject characteristics of mathematics. However, as an process skill with symbolic mathematics features, there is only 15 times of using and 3.1% amount of all using frequency, a far fewer frequency compared with Inference and Tables/Graphs’ Constructing., and it’s hard to meet people’s satisfaction for Data Intepretation is an essential skill amid the era of big data. Besides, we have seen much attention in PISA test on this, so the compile of textbook should concentrate more on the training of Data Intepretation process skills.

Secondly, the results also show the unbalanced using frequent situation of basic process skills and integrated process skills. Liu (2012) pointed out that as for the inquiry-related tasks in Chinese mainland senior high school mathematics textbook, 76.5% of that are for the construction of mathematics knowledge, in the rest 23.5% of applied knowledge tasks, there are 6.0% aim to the innovative application of new knowledge, that’s a total of 82.5% to the formation of models (concepts, proposition and problem-solving model). In the in-depth phase of

model formation, usually it requires to utilize the process skills like Formulation of Hypotheses and Operational Definition, but there’s only 10 times of those two process skills. Therefore we can make the conclusion that the mathematics inquiry-related tasks in textbooks are usually stays in an initial phase of mathematics research. In order to advance the level of mathematics exploration, the compile of textbooks’ inquiry-related tasks ought to focus more on Formulation of Hypotheses and Operational Definition and other integrated process skills.

Thirdly, more than half of the inquiry-related tasks use more than 2 process skills simultaneously. In terms of process skills using, the inquiry-related tasks of senior high school textbook are complicated, which is in line with the study phase. Moreover, the inquiry-related tasks that use more than 4 process skills are account 5.6% of all inquiry-related tasks, and more than half appeared in the appendix after each chapter, which is seen as a proper arrangement. As the application of process skills increases, the time duration of each inquiry-related task will last longer, thus compiling this segment in the appendix indicates the teachers’ right to choice use or not. Nonetheless, if those tasks were compiled in the main context, due to the limited time of class, it will be barely possible for teachers to utilize these parts to encourage students to explore, that is tantamount to stir teachers to give up utilizing these tasks. Consequently, each inquiry-related task’s targeted types of using process skills are a question which is worth some serious consideration in the compile process of textbooks.

So as the foregoing analysis, the results of this research could provide a few enlightenments for the compile and use of textbooks. Of course, this research only discusses the inquiry-related tasks’ process skills in the textbook, but not expands the research and analyzing scale to inquiry levels, types of inquiry-related tasks nor the description of process skills in textbooks’ upper material curriculum standards, which is the flaw of this research as well as a potential approach of continuous research direction. Besides, whether the teachers’ applications of these inquiry-related tasks implemented the original compile purpose of required training process skills are also another realm that is worthy of further researching as well.

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