# Original Research Article

# Research on the Incomplete Learning for Mathematics Textbooks of Undergraduates Majoring in Mathematics

**Abstract:** Recently, the China government has increasingly attached importance to the development of basic science. As the reserve talents to promote the development of mathematics, university students majoring in mathematics have received the attention of researchers for their mathematics learning. However, in practice, their learning of mathematics textbooks is not comprehensive. Through interviews, coding methods, and quantitative analysis methods, the main reasons are investigated and analyzed in this paper. The conclusions are as follows: (1) The content of the textbook and the exercises at the end of the lessons are too difficult and beyond students' ability. (2) Teachers have lazy behaviors and ask too little of their students. (3) Students themselves are lazy and take exams very seriously, lacking motivation and initiative to learn. To change this situation, the mathematics textbook can be improved to explain profound theories in simple language. Teachers can also tighten the requirements for their students. In addition, mathematics majors should also improve their requirements for themselves, overcome inertia, and reasonable scheduling, and pay more attention to the use and study of mathematics textbooks.

**Keywords**: Mathematics; University students; Mathematics textbooks; Textbook learning; Situation analysis



## 1. INTRODUCTION

In 2018, the State Council of China proposed: "Diving into strengthening basic science research and giving more tilt to key basic disciplines such as mathematics and physics[1]." As an important foundation for all sciences, mathematical sciences have played a key, even decisive role in many important fields[2]. The development of mathematics undergraduates as the main workers in the field of mathematics in the

future deserves more attention from researchers. And mathematics textbooks are the main basis for teachers to teach, and the main material for students to learn mathematics[3]. Therefore, mathematics undergraduates' study of mathematics textbooks has an important impact on their own development. However, by observing reality, we found that many mathematics undergraduates are incomplete in their study of mathematics textbooks. In recent years, the domestic research can be seen that there is breadth and depth in the research of domestic scholars on mathematics learning of students in mathematics majors with diversity in research contents, subjects, and methods[4-19], as well as research on the reasons for incomplete learning of textbooks in English, Chinese and other subject[20-25], but the reasons behind mathematics learning problems of students in mathematics majors are rarely explored. In other words, the research on the analysis of the reasons for incomplete learning of mathematics textbooks by mathematics majors is the current gap point in the field. Therefore, this study intends to use the interview method to investigate the reasons for the incomplete learning of mathematics textbooks among mathematics majors. It will not only help to better play the role of mathematics textbooks, help university teachers to better carry out teaching, but also help mathematics undergraduates to improve their own problems and shortcomings, and a more solid grasp of mathematical expertise.

## 2. METHODOLOGY

### 2.1 Research Subject

In this study, 32 college students, 14 male and 18 female, including 5 freshmen, 8 sophomore students, 6 juniors, and 13 seniors, from the School of Mathematics and Statistics of Shandong Normal University were selected as the subjects. The interviewees in this study were balanced in terms of grade, gender, and major, indicating the reasonableness of the selection of interviewees, which in turn ensured the reasonableness and representation. The detailed basic information of the interviewees is shown in Table 1:

When choosing interviewees, communicate with them first, asking them if they have read all of the mathematics textbooks and completed all of the mathematics

textbook exercises in the process, then select students with both of these conditions for further interviews, targeting students with incomplete learning of mathematics textbooks.

Table 1 Basic information of interviewees

| Grade | Male | Female | Mathematics and Applied Mathematics | Information and Computing Sciences | Statistics |
|---|---|---|---|---|---|
| Freshmen | 2 | 3 | 2 | 1 | 2 |
| Sophomore | 4 | 4 | 5 | 2 | 1 |
| Juniors | 3 | 3 | 2 | 2 | 2 |
| Seniors | 5 | 8 | 6 | 4 | 3 |
| Total | 14 | 18 | 15 | 9 | 8 |

**2.2 Research Tools**

This study used semi-structured interviews to explore the reasons for incomplete mathematics textbook learning for students. The study divides the incomplete learning of mathematics textbooks into two aspects: the incomplete reading of the contents of mathematics textbooks by mathematics students, and the incomplete study of the after-school practice of mathematics textbooks by mathematics students. Based on these two aspects, the degree of incompleteness of mathematics undergraduates in these two fields and the reasons for these two phenomena were investigated respectively. The following eight interview questions were designed and 32 mathematics undergraduates in all grades were interviewed:

(1)Is your reading of the content of mathematics textbooks complete in your daily study?

(2)If dividing the degree of incompleteness as slightly incomplete, and generally incomplete and very incomplete, what degree do you think you are?

(3)What is the approximate percentage of reading incomplete content?

(4)Do you complete all the after-school exercises in the mathematics textbooks in your daily study?

(5)If still dividing the degree of incompleteness as slightly incomplete, generally incomplete, and very incomplete, which degree do you think you are?

(6)What is the approximate percentage of after-lesson exercises that were not completed?

(7)What are the reasons for your incomplete reading of mathematics textbooks content in your daily study?

(8)What are the reasons why you do not complete all the exercises after the mathematics textbook in your daily study?

**2.3 Data Collection**

In order to avoid being limited by the choice of responses to the questionnaire and to explore the reasons as comprehensively as possible, the study asked interviewees questions through interviews, social media interviews, etc., and asked them to respond according to their circumstances. Interviews are also recorded by audio recording, which is then translated into a real and accurate textual record for further data processing.

**2.4 Data Collation**

In this study, the coding method and quantitative analysis method are mainly used for data processing. For the same problem, the author and partners integrated the same type of responses from the interviewees based on the content of the interviews respectively and summarized the different types of responses to the same problem by mathematics majors. Then the different types of answers were then coded, and the results of the interview content were tallied to calculate the percentage of each response. The two statistics were found to be relatively consistent. Finally, the two aspects of the reasons for incomplete learning of mathematics textbooks were summarized, obtaining the main reasons for generating incomplete learning of mathematics textbooks among students majoring in mathematics.

**3. RESULTS**

In this study, incomplete learning of math textbooks by students majoring in mathematics is divided into two aspects: first, the incomplete reading of the content of mathematics textbooks, and second, the incomplete completion of the after-lesson exercises of mathematics textbooks. On this basis, interviews were conducted on the reasons for these two situations, and 32 undergraduate mathematics students were interviewed during the study. After the statistics and analysis of the interview results, the following findings were obtained:

**3.1 The extent to the incompleteness of learning of mathematics textbooks**

Interview data are compiled to obtain how incomplete mathematics undergraduates are in reading the content of mathematics textbooks and completing after-class exercises in textbooks. Comparatively, more students read mathematics textbooks slightly incompletely than those who completed after-school exercises, and fewer students read mathematics textbooks very incompletely than those who completed after-school exercises slightly incompletely. Therefore, students have higher incompleteness in completing after-school exercises in mathematics textbooks. Detailed results are shown in Tables 2 and Table3:

Table 2 The extent of incomplete reading of mathematics textbooks by mathematics students

| Extent | Frequency | Percentage |
|---|---|---|
| Slightly incomplete | 9 | 28.1 |
| Generally incomplete | 22 | 68.8 |
| Very incomplete | 1 | 3.1 |

Table 3 The extent of incomplete completion of after-class exercises in mathematics textbooks

| Extent | Frequency | Percentage |
|---|---|---|
| Slightly incomplete | 2 | 6.2 |
| Generally incomplete | 24 | 75.0 |
| Very incomplete | 6 | 18.8 |

**3.2 Reasons for incomplete reading of mathematics textbook content**

The interview transcripts show that mathematics undergraduates do not read mathematics textbooks in their entirety for a variety of reasons, but more than half of respondents said the reasons include the textbooks being difficult to read, teachers not explaining them in class and the unread part not being related to the final exam. In addition, the lack of the habit of reading mathematics textbooks after class and insufficient time were cited more often in interviews, while other reasons were mentioned less frequently. The detailed results are shown in Table4:

Table 4 Reasons for incomplete reading of mathematics textbook contents

| Reasons | Frequency | Percentage |
|---|---|---|
| Teachers did not request to forcibly | 8 | 25 |
| The content of the textbook is too difficult or the foundation of students is too poor to read the textbook | 20 | 62.5 |
| Not interested in the content of the mathematics textbook, and not active in learning | 7 | 21.9 |
| The teacher did not explain it in class | 19 | 59.4 |
| The unread part is not related to the test | 17 | 53.1 |
| Do not pay attention to it, think there is no need to read | 4 | 12.5 |
| No habit of reading mathematics textbooks after class | 9 | 28.1 |
| There is no time | 9 | 28.1 |
| Self – indulgence and low expectations of oneself | 5 | 15.6 |
| Too much content in the mathematics textbook | 2 | 6.2 |



### 3.3 Reasons for not completing all the after-class exercises in the textbook

From the compilation of the results of the interviews, the majority of the respondents felt that they did not complete all the exercises after the mathematics textbook because the knowledge of the questions was too comprehensive, too difficult, and

beyond their ability. More than half of the interviewees cited too many courses taken during the semester, too many extracurricular activities, and not enough time as reasons for not completing all the after-class exercises in the mathematics textbook. The detailed results of the frequency and percentage of the remaining reasons mentioned are shown in Table 5:

Table 5 Reasons for not completing all the exercises after the mathematics textbook

| Reasons | Frequency | Percentage |
|---|---|---|
| The knowledge tested in the questions was too comprehensive and too difficult to be within their ability | 25 | 78.1 |
| Not good at solving difficult problems, and also not interested in doing | 3 | 9.4 |
| Self – indulgence with laziness | 6 | 18.8 |
| No time for too many courses taken and too many after-school activities | 17 | 53.1 |
| No mastery of class knowledge | 4 | 12.5 |
| Teachers did not request to forcibly | 14 | 43.8 |
| Some exercises have nothing to do with the examinations | 12 | 37.5 |
| Some exercises are so simple that skip them at a glance | 1 | 3.1 |
| Too many after – class exercises in the textbook | 4 | 12.5 |
| There are no standard answers to the after-class exercises, and the teacher does not explain them, so there is no way to know if correct or not | 7 | 21.9 |



## 4. DISCUSSION

### 4.1 Reasons for incomplete reading of mathematics textbook content

According to the reasons mentioned by the interviewees, it can be seen that the teacher did not explain the content in class, the content of the textbook was too difficult to read and understand, and some parts of the textbook were not related to the content of the final exam as the three main reasons why they did not read the content

of the mathematics textbook completely. In addition, a significant proportion of them believed that the lack of mandatory reading requirements for teachers, their own lack of extracurricular reading habits, and lack of time to read are also important reasons.

To further analyze the above results, first of all, the teacher did not explain in class, the content of the textbook can not be understood, and students will not read this part of the textbook content. This means that, on the one hand, the textbook content of the textbook part is really difficult, and students can only study themselves without the explanation and guidance of their teachers. On the other hand, it also suggests that students themselves are somewhat lazy and fear difficulty, choosing to avoid what they cannot understand rather than searching or asking others to improve their knowledge. Secondly, the absence of lectures in the teacher's class also indicates that teachers themselves are lazy and too relaxed with students and their unreasonable arrangements for the curriculum. In addition, some content will not be read if it is not related to the final examinations, suggesting that students have a more serious attitude to the test and test scores, rather than real learning.

**4.2 Reasons for not completing all the after-class exercises in the textbook**

From the frequency of the reasons mentioned in the interview, after-class exercises are too difficult and not within the student's own abilities, which is the main reason why students are unable to complete all of them. In addition, a lack of time to complete exercises due to too many classes during the semester or colorful life in the university, due to the lack of rigid teacher requirements to fully complete exercises, and the fact that some after-class exercises are unrelated to examinations are also three important reasons for the incomplete completion.

Analyzing the main reasons obtained above, on the one hand, the difficulty of some exercises in the mathematics textbooks is really beyond the students' present capacity, and they must acquire knowledge from other courses to be able to understand them, which results in their being no way to complete all the exercises. On the other hand, students majoring in mathematics themselves do not have the enthusiasm and initiative to learn, and they do not understand the knowledge in sufficient depth, which leads to the fear of difficulty in

learning when they encounter difficult problems in the process of completing exercises, and thus give up voluntarily.

Taken together, the reasons given more frequently during the interviews, both for two aspects, including points of difficulty in the textbook, lack of time, not being asked too much by the teacher, and the content being unrelated to the final exam. It shows that, on the one hand, some content and exercises in mathematics textbooks are hard for students to understand and master on their own. On the other hand, the students themselves have laziness and a test-taking mentality, as well as a lack of motivation and initiative to learn which results in the phenomenon of incomplete learning of mathematics textbooks. In addition, the teachers themselves have laziness and are too lax in their demands on the students, and do not arrange their courses rationally, leading to incomplete learning of mathematics textbooks by students.

## 5. CONCLUSION

Based on the findings of this study on the reasons for incomplete reading of mathematics textbook content and for their incomplete completion of the after-class exercises in textbooks for students majoring in mathematics, the following conclusions can be drawn:

(1) The content of the textbook and the exercises at the end of the lessons are too difficult and beyond students' ability is one of the major reasons for incomplete learning of mathematics textbooks by students majoring in mathematics.

(2) Teachers' lazy behaviors and asking too little of their students are also one of the major reasons for incomplete learning of mathematics textbooks by students majoring in mathematics.

(3) Students themselves are lazy and take exams very seriously, and lacking motivation and initiative to learn is one of the major reasons for incomplete learning of mathematics textbooks by students majoring in mathematics.

Teachers' curriculum documents are an important vehicle for implementing national educational goals and developing students' core literacy, and they are a key variable in improving the quality of education. In order to develop an advanced level of quality mathematics education with Chinese characteristics, we should continuously

strengthen the construction of mathematics curricula and teaching materials[26]. Therefore, given the incomplete learning of mathematics textbooks by college students majoring in mathematics, from the perspective of textbooks, the writing of textbooks can be improved to explain profound theories in simple language and make the difficulty of the exercises suitable for facilitating students' learning and comprehension. From the perspective of teachers, scholar Hou believes that the exercise class is an important part of the university mathematics curriculum and plays a significant role in students learning how to incorporate learning and reflection, and it is undesirable for schools to cancel the exercise class or to change it to a lecture on example problems[27]. Therefore, teachers in colleges can also strengthen the requirements for college students to supervise their study of mathematics textbooks and conduct appropriate exercises. In addition, at the student level, students should also improve their requirements for themselves, overcome their inertia, cultivate their enthusiasm and initiative in learning, rationally organize their time, and pay more attention to the use and study of mathematics textbooks, to have a deeper and more complete mastery of mathematical knowledge.

This study takes the incomplete situation of mathematics textbook learning by college students majoring in mathematics as the research problem, grasps the practical problem of mathematics major college students in real life, fills the research gap in this field, and has certain practical significance. At the same time, there are some shortcomings in this study: in terms of research subjects, all the interviewees in this paper come from Shandong Normal University, and only 32 mathematics majors were interviewed, so the sample size is small. In the research methodology, the interview method is not a quantitative research method and has some subjectivity. Therefore, future research can be optimized in two ways: by expanding the sample size and scope, and by taking a more objective approach to research in depth.



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