



# The Strategies to Instruct High School Students to Carry Out Mathematical Writing Activities

Yongzhong Xu

Xinghua Senior Middle School of Jiang Su Province

## Abstract:

Mathematical writing is an effective carrier to promote student's in-depth learning, however, this process can never do without teacher's instruction. This paper indicates that instructing high school students to carry mathematical activities should be based on classroom teaching, and students are supposed to learn how to select subjects and get their mathematical writing skills trained. Develop student's passion and interest in mathematics by carrying out related activities, promote the win-win situation by extension and communication to fully implement the teaching and research, and enlarge the effect of mathematical writing.

Feng Weidong, a famous educational expert, said, "One is not able to write without learning, in turn, writing is a necessity for in-depth learning. Writing is the best form of learning in any sense." [1] Undoubtedly, carrying out mathematical writing activities plays an extremely important role in promoting students' in-depth learning and cultivating their core competence in mathematics. Students need a process of understanding and digestion to transform from just comprehending and understanding to speaking and writing clearly, and mathematical writing is undoubtedly an effective carrier to promote students' in-depth learning, which is a process that needs teacher's guidance. Then how can we effectively guide students to carry out mathematical writing activities? This article summarizes the work and thoughts we have done for the knowledge exchange and sharing, so as to further promote the in-depth mathematical writing activities and students' deep learning, then improve the core competence of mathematics.

### 1. Based on classroom teaching, students are supposed to learn how to select subjects and get their mathematical writing skills trained.

**1.1 Extension based on textbook exercises.** Textbook is an indispensable material for students to study, which has also been carefully compiled and reviewed by experts. The selection and arrangement of exercises in the textbook acquire their own meanings. Teachers should guide students to make full use of teaching materials, and should especially pay attention to some expansion questions, reading materials, etc. in the textbooks. Students should be guided to research the outreach problems after exercises to get their competence trained. For instance, Chen of the 2020 Senior Class 6 has a question when studying the chapter of probability in the Compulsory 3. Then he cooperated with his classmates to carry out experiments, and recorded the process, and finally wrote a high-level essay named Open the Gate of based on Probability. The essay was published in the 6th issue of New Century Intelligence 2019.



**1.2 Summarize after reflection and correction.** Thus, students must think while studying mathematics, and can explore the direction of problem-solving through methods such as one problem with multiple solutions, multiple problems with one solution, and variant training. Besides, they should pay attention to the process of solving typical problems, including thinking, analyzing, obstructing, and finally solving problems. Students can obtain great problem solving ability in this process, moreover, a valuable mathematical writing subject is half the battle. Actually, a lot of students write about this subject in their essays, and some of those are of great quality. For example, Shen Wen, a student in Senior Class 6, wrote an article about her feelings and experiences during problem-solving research, named The Importance of Question Analysis during Problem Solving, which inspires a lot of students in problem-solving. The following is an excerpt from the article:

*Example problem: the sequence  $\{b_n\} (n \in \mathbb{N}^+)$  meets the following conditions:  $b_1 = 1, \frac{1}{S_n} = \frac{2}{b_n} - \frac{2}{b_{n+1}}$ ;  $S_n$  is the sum of the first  $n$  items of sequence  $\{b_n\}$ ; find the general term formula of  $\{b_n\}$ .*

From ①, (2), 20<sup>th</sup> Jiangsu Test Paper, 2019 National College Entrance Examination.

The reference answers provided by the proposition group do not offer the derivation process. Shen was not satisfied with only the answer, so she thought about the problem and got a briefer method from two different perspectives. She reflected on the whole process as followings:

The above two observing perspectives make the difficulty of problem-solving easier than mechanical calculation and reasoning, especially the second one. It is concluded from the process that, simple task-completing without thinking is meaningless. The observation of the formula structure seems to be a waste of time, but in fact, you can understand the structural features of the formula through observation and associating related structural forms, which can reduce the amount of calculation and solve the problem quickly. For the third observation, it might be uneasy to persist, but is helpful for the improvement of thinking ability. If you do more research on the subjects, you can quickly find an entry point to problem-solving.

Student can write a mathematical essay of great quality by reflecting on the problem-solving process and recording the inspiration.



**1.3 Select from observing life.** Knowledge application is one of the basic purposes of the mathematics learning. Guiding students to observe life with a mathematical perspective can promote students' understanding and interest of mathematics. What's more, there are a wide range of mathematics writing materials that can be selected in life. For example, Li Ting and Feng Jinjin from 2016 Senior Class 15 wrote an article, Measuring the Radius and Rim Linear Velocity of the Water Wheel at the Baziqiao Square (published in the 5th issue of New College Entrance Examination in 2015), after they learned the knowledge of trigonometric function and the triangle method and measured the landmark in Xinghua.

## 3. Promote the Win-win Situation by Extension and Communication, Fully Implement the Teaching and Research, and Enlarge the Effect of Mathematical Writing



In September 2019, our school hosted the third Mathematical Writing Forum and the 2019 Teaching Seminar (Taizhou, Jiangsu), which fully demonstrated some of our school's practices and achievements in guiding students to carry out mathematical writing. On one hand, it further promoted the in-depth mathematical writing activities, and on the other hand, it expanded the visibility and influence of the Alliance and the school. Dr. Li Shanliang, deputy director of the Jiangsu Province Teaching and Research Office, was invited to the forum to give a keynote speech "Mathematician's Teacher". With "ideal, love, exploration and dedication" as the key words, Dr. Li introduced the mathematics teachers behind the famous mathematicians with vivid and detailed cases. He encouraged the front-line mathematics teachers: "We may not become mathematicians, but in our lifetime of teaching career if we encounter Newton, Abel, Galois, Euler, Gauss, I hope you will not miss him. Don't miss him."

In conclusion, guiding students with the concept of coal quality-oriented education to carry out moderate mathematical writing activities can help (1) cultivate mathematical reading ability, which can make students read consciously and actively, while mathematical reading inspires students' mathematical writing; (2) improve the ability of reflection and error correction, which can make students continuously optimize their learning behavior, while the optimization process provides sources of mathematical writing; (3) enhance the ability of mathematical inquiry, which can let students feel the charm of mathematics in practice, while mathematical inquiry promotes the effective presentation of mathematical writing; (4) promote students' deep learning, and then enhance the core mathematical competence, while the capability improves the quality of mathematical writing. We think in practice, refine in thinking, improve in refining, and act in improving.

### References

Feng, W. D. (2017). Writing is the best learning – Teaching for Real Learning, a new book, as an example. The Horizon of Education (Intelligent Management), 7/8, 47–50.  
Xu, Y. Z. (2019). Carrying out mathematical writing and paying attention to students' emotions. Math News Report, 4.

## 2. Develop student's passion and interest in mathematics by carrying out related activities.

### 2.1 Establishing Clubs and Holding Mathematics Lectures

In December, 2017, we successfully applied for the 12th Jiangsu Province Teaching and Research Project, Research on the Practice of High School Mathematical Writing based on the Development of Mathematical Core Competence. Then the research group organized a mathematical writing club to divide the work according to the plan, and give lectures on mathematical writing to students, including lectures for all club members, as well as tutorial lectures for different grades. In the first lecture, Mr. Xu introduced the situation of the School Alliance of Mathematical Writing and the activities carried out by the alliance schools, and also introduced the achievements (awards and published articles) of students in mathematical writing.



### 2.2 Taking Part in Contests; Publishing Articles

In order to improve students' mathematical writing level, we should not only instruct students in methods, but also allow students to get trained by practicing. And we should try our best to organize students to participate in mathematical writing essay contests. The participation and holding of these contests has the following significance: all teachers and students in the school know about the mathematical writing, indicating the publicity and promotion; the mathematical essay contest has improved students' enthusiasm for writing mathematics essays and also improved the quality of writing, so that they can further learn the mathematical expression and study the mathematics well. Meanwhile, the teacher's ability to guide students in mathematical writing has also improved.

### 2.3 Teacher's Guidance and Emotional Communication

Mathematical writing is a powerful way to improve students' mathematical learning ability. In view of this, the teachers squeeze time to guide students in mathematical writing. The accumulation of materials, the polishing of students' work, the printing of the manuscript, even the illustrations, and so on, all involve the teacher's efforts. For example, Mr. Xu has been guiding students to write weekly mathematics journals, and carefully reviewing them. He selects some creative and inspiring articles with high quality, and guides the students to revise them, and asks the students to transcribe them on A4 paper and send to the document printing room for printing. After that, the selected articles will be sent to participate in small essay contest or to a relevant journal. For example, Student Jiao's article named Example of the "Elimination" Method in the Series was reviewed and revised several times and was fully recognized by the magazine Mathematics Newsletter, which won the first prize and was published.

Another important function of mathematical writing is to build a platform for teachers and students to exchange their feelings. Students may write about their perceptions of mathematics, their appreciation and advice to their teachers, or their requests to their teachers; in turn, teachers can learn about students' emotions and attitudes towards learning mathematics, and can also understand where students have difficulties in learning mathematics, providing a good way for teachers to help students in a targeted way. The figure below.



I hope the teacher will be a little slower when giving lectures, because sometimes we are not that fast to respond. **In addition, if I don't do well in the exam, I hope the teacher can criticize me and don't let me feel that I'm not important at all and the teacher has given me up.**

I will work hard, listen carefully in class, write homework well, sort out the wrong questions, and seize the time to do more exercises. I feel that the reason why I didn't do well in the exam this time is that I didn't do many exercises. I hope I can get improvement in the next exam.[2]

The student made a request in this weekly diary, hoping that the teacher would pay attention to her.

In fact, the teacher had been concerned about this student, but in consideration of the student's emotional changes, he silently helped her. The emotional communication between teachers and students is smoother, which lays an emotional foundation for students to learn mathematics well. As the saying goes, "If you are close to your teacher, you will believe in teacher's way".



第三届数学写作论坛暨2019年教学研讨会（江苏泰州）

