

# Analysis of the Summary Step Used at the End of the Period in Classroom Teaching: From Two Teaching Cases

Jun Lu

Rongbao Tu

Nanjing Normal University, China

*This paper analyzed the summary step used at the end of the period in a mathematics classroom through two observations in a senior middle school. It included three parts: what it is, what the effects are, and how to do it. The study suggested that every mathematics teacher should pay attention to the summary of their lesson and design the teaching of the end of the period carefully to ensure teaching effects.*

**Key words:** summary, summary step, the end of the period, classroom teaching.

## Introduction

The summary step used at the end of the period in a mathematics classroom is an important part of the whole teaching process. It means that the teacher makes a necessary and systematic summary about the teaching contents to classify students' thoughts and help them store knowledge so they can transfer and apply the new knowledge and turn knowledge into ability when teaching is ended.

Generally speaking, the art of leading-in and explanation is often attached more importance than the art of summary. In fact, the perfect summary has a good effect on linking up teaching contents and arousing the students' strong desire for the next step in the classroom teaching.

Specifically, through a series of activities in the form of repetition, emphasis, generalization, summary and students' exercises, the teacher systematizes and consolidates the knowledge in a timely way to plant the new knowledge into students' cognitive structures when he/she finished a teaching task. That is the summary step at the end of a period in teaching.

What we should realize is that the summary step at the end of the period can be used not only at the end of a lesson, but also at the end of any separate

teaching step, such as explaining a concept, a theory, an axiom, a formula or an example. Hence, although the skill of summary is called “summary”, in fact it is a combination of each separate period’s summary and should be utilized throughout the whole teaching process.

We’ll analyze two lessons to observe the skill of summary by two teachers who teach the same contents, but have different teaching styles and methods.

## Teaching Case I

### Brief Introduction

When Mr. W was teaching the new lesson - “The Image of Function  $y = A\sin(\omega x + \varphi)$ ”, he adopted the traditional method of indoctrinating teaching. At first, he asked the students to recall how to draw the image of sine function with five particular points. Next, he divided his lesson into three steps such as “the effects of  $A$ ’s change on the image of sine function”, “the effects of  $\omega$ ’s change on the image of sine function” and “the effects of  $\varphi$ ’s change on the image of sine function”.

At every step, he listed a table, traced its points and drew the graph first on the blackboard. He then asked the students to observe the changing rule of the graph, to explain it by oral language, and to verify it with a Sketchpad (software used to draw geometric graphs). It could be concluded that his teaching thought was clear, teaching rhythm was compact, and teaching effects were almost ensured.

### Analysis

After observing a recording of his lesson, it was not hard to see that Mr. W paid attention to the summary and was good at using the skill of summary at the end of the period. There were 8 times he used a summary in his lesson, including summarizing by oral explanation, simple blackboard writing, Sketchpad (after explaining the changing rule of the graph to the students, the purpose of using Sketchpad was to give them a visual cognition of the new knowledge and help them to consolidate it but not to explore it, as a result, it was one method of summary) and written language on the interface of the Sketchpad. From the view of the teaching process (the stage of using summary), three of them came after explaining new knowledge. And a summary of all the contents of the lesson were included at the end.

The following table is a statistical analysis of all types of summary methods

which were used in Mr. W's lesson.

Table 1

**A Statistical Analysis of All Types of Summary Methods Which Were Used in Mr. W's Lesson**

Summary Contents	Summary Methods				
	Blackboard Writing	Oral Explanation	Sketchpad	Sketchpad + Written Language	
Comparison of Images of $y = 2\sin x$ and $y = \frac{1}{2}\sin x$	√	√			
The Effects of $A$ 's Change on the Image of $y = A\sin x (A > 0)$		√	√	√	
The Effects of $A$ 's Change on the Image of $y = A\sin x (A < 0)$		√	√		
Comparison of Images of $y = \sin \frac{1}{2}x$ and $y = \sin 2x$		√			
The Effects of $\omega$ 's Change on the Image of $y = \sin \omega x (\omega > 0)$		√	√	√	
The Effects of $\omega$ 's Change on the Image of $y = \sin \omega x (\omega < 0)$		√	√		
The Effects of $\varphi$ 's Change on the Image of $y = A\sin(\omega x + \varphi)$		√	√	√	
The Respective Effects of $A/\omega/\varphi$ 's Change on the Image of $y = A\sin(\omega x + \varphi)$		√	√		

According to the above table, we can draw three conclusions as follows: Firstly, Mr. W hardly used blackboard writing except in the first summary. Maybe it can be understood in this way: With the combination of the application of multimedia equipment and the integration of classroom teaching, the traditional teaching method which relies on heavily using blackboard writing is weakening gradually. Compared with blackboard writing which consumes time, teachers prefer to choose the written language which has been inputted into the computer to pursue teaching efficiency. However, the traditional summary using blackboard writing has its irreplaceable advantages.

With the flash of written language on the screen, it is hard to help the students to consolidate the new knowledge and give them adequate time to take notes. Hence, when using the modern information technology to make summaries, teachers should not give up traditional summary methods completely. This problem requires further study.

Secondly, using the Sketchpad to make summaries was the main method of teaching. Although we found the oral explanation was the one used most frequently from table 1, actual oral explanations were helpful and used more or less in any summary. In fact, the combination of using the Sketchpad effectively and teaching mainly with the traditional indoctrinating method was a unique characteristic of the lesson.

Lastly, let's think about these three questions: Were the summary skills used too frequently? Were the summary contents repeated many times? Were the summary methods too simple?

Although the quantity of summary steps in the lesson seemed a bit more, every one of them was necessary and stood independently. It was reasonable to divide the teaching contents into three steps, that is, "the effects of  $A$ 's change on the image of sine function", "the effects of  $\omega$ 's change on the image of sine function" and "the effects of  $\varphi$ 's change on the image of sine function". It was also reasonable to explain and summarize these three steps in a detailed analysis. It was beneficial to help the students to timely consolidate the new knowledge, build the new knowledge network, combine it with the old cognitive structure and lay a good foundation for their further study.

However, the lesson still demonstrated some defects in the use of summary skills. According to the subjects of summary, the summary at the end of the period in a classroom has two styles, teacher-centered and student-centered. Viewing the 8 summaries, they all adopted the former. It looked as if it was the teacher's one-man show and it inevitably gave us the impression that the teacher controlled the whole lesson and led his students by the nose.

In fact, in some steps in the classroom, the teacher could give the summary task to his students completely and summarize the students' activities. It could embody the teaching principle of student-centered activities and the teaching process of using thinking activities. At the same time, despite the fact that the conclusions made by some students may be imperfect in the facets of language, contents, logic and so on, in the long-term, the teaching effects would be more ideal, because letting students summarize what they learned by themselves will be more effective to accelerate the formation and consolidation of new knowledge.

This is the lesson in this case. For example, after leading students to create three summaries in the first teaching step about “the effects of  $A$ ’s change on the image of sine function”, in the following two teaching steps, the teacher could organize them to discuss the conclusion based on the change of dates and images in the table. The discussion could be arranged so one student gives a lecture and others correct or complete it. After several times operating the Sketchpad, the teacher could let the students operate it while explaining their conclusions. The summary at the end of the teaching could be given to all the students asking them to link up the three teaching steps and make verbal reports so as to sort and consolidate the knowledge points.

## **Teaching Case II**

### **Brief Introduction**

When Ms. Z was teaching the new lesson——“The Image of Function  $y = A\sin(\omega x + \varphi)$ ”, she adopted an entirely new teaching method which is different from the traditional. During the first 1/4 period of the lesson, Ms. Z asked the students to take part in cooperative learning groups to explore the new knowledge with a Graphing Calculator. In the last 3/4 of the period, she organized a lively “report meeting” about students’ exploratory results to let them report their conclusions clearly, raise some timely key questions and discuss problems heatedly.

The atmosphere of the lesson was lively and students’ learning enthusiasm was high. Based on the modern concept of education, however, the boisterous appearance could not cover up its flaws, including the shortage of each separate period’s summary, sorting out the knowledge points, and the fact that the teaching effects were not eventually ensured.

### **Analysis**

Contrasting this lesson with the lesson by Mr. W, there was little summary seen in the lesson of Ms. Z. It was obvious to see that the consciousness of using summary is not important for Ms. Z. She paid more attention to the process of students’ inquiry than the formation of conclusions in students’ minds. She simply regarded her role as an organizer and a question-master at a “report meeting”. Naturally, she thought her responsibility was to link up those

programs that were played by her students and to create the atmosphere for them. However, she wasn't aware that she should not only be the organizer of teaching patterns and the promoter of the teaching process in cooperative learning, but also be the main teaching guide, to participate in the "report meeting" in order to enlighten her students, ask them questions, and make comments on their answers. Before the "report meeting" ended, her summary speech was indispensable.

Ms. Z was not up to the standard on this issue, a point with which we can find many problems. For instance, the first group spent the longest time in reporting their exploratory results and did very well. They researched not only the effects of  $A/\omega/\varphi$ 's change on the image of  $y = A\sin(\omega x + \varphi)$ , but also the effects of  $b$ 's change on the image of  $y = A\sin(\omega x + \varphi) + b$ . But after reporting, the teacher only said "We thank them very much", then arranged the next program, to invite other groups to report. Obviously, it was not enough. Faced with such excellent results, instead of just giving the students high praise, the teacher should repeat and emphasize their important conclusions so as to help them affirm their correct conclusions and in time adjust this comprehension. Only when the correct conclusions are understood and agreed upon, can the students sort out their thoughts and avoid confusion in the following study. In a word, lack of any evaluations during the teaching may be the biggest shortcoming of the lesson.

As another example, there was no class-ending step. It was confusing to hear the teacher's questions such as "yes or no", "can be or not can be" before the end of the lesson. To the question of one group to "make contractive transformation first or make elongation transformation first", there was no clear answer. Instead, the teacher only said "If we make translational transformation after that, it will be not the same, yes or no?" As to the question "How to distinguish the difference between the two transformations", again, no answer was given. Then she said, "So I must remind you to pay attention to it", which also puzzled the students. Could it be that she asked her students to pay attention to "It will be not the same to make translational transformation after that"? The desirable and effective way of teaching was to explain the difference between the two methods that the students were asked to pay attention to——"make translational transformation first then make stretching transformation" and "make stretching transformation first then make translational transformation" fully and articulately. Adequate time should be set apart for the summary before the end of the teaching and summative language should be succinct, with a lot of generalizations, and related by

assertive sentences as far as possible. Otherwise, just as the lesson that ended in a hurry with lots of question made incoherently, it seemed to be a play which had no ending and gave us an impression of a fine start but a poor ending.

As we all know, in a class with open inquiry and mainly discussion-based learning, a teachers' original, leading role has been changed gradually to that of a teaching guide and the teaching structure has been not only diversified but also changed quickly. For this reason, it is necessary for the teacher to fully play the role of a teaching guide before the end of the classroom lesson in order to ensure the effects of the teaching. The teacher should sort out and summarize the results which were concluded by the students (that is the new knowledge and new methods of the lesson) for the purpose of strengthening and consolidating the learning.

In this lesson, for instance, Ms. Z used an open-ended question—"What's the relationship between the images of these two functions?" to introduce the new knowledge. It was problem one for the students. The whole teaching process is the process of problem-solving. Only if she adopted the "call and response" pattern and gave clear answers before the end of the teaching, could we feel the lesson was intact and satisfactory. Therefore, Ms. Z should give a summary speech before the end of the "report meeting". She could make use of the electronic writing on the blackboard that she had prepared before to present the systematic knowledge points and stress those crucial points and repeat them dynamically. Meanwhile, she could use the Sketchpad to do an integrative and dynamic demonstration about all kinds of image changes to make up the deficiency in the Graphing Calculator which lacked dynamic pictures and help the students to deepen their impression for the conclusion.

In addition, the summary can be started not only from the main contents so that the lesson is explained using the method that is used by some concepts, axioms and theories but also by thinking. In the lesson of Ms. Z, when each group (especially the first group) was reporting their exploratory results, they all consciously or unconsciously used some mathematical methods of more or less thinking, including conjecture, analogy, generalization and so on. But Ms. Z was only concerned as to whether their conclusions were correct while she neglected to distill and summarize these mathematical methods of thinking. Although Mr. W was good at summarizing, he also had problems. In fact, it is very important to summarize the thinking methods. If the teacher can help the

students timely summarize these thinking methods, it will certainly be highly beneficial to raising their mathematical level. Therefore, our teachers should pay attention to it in the future.

### **Conclusion**

The successful summary step used at the end of the period in classroom teaching includes not only being able to generalize, summarize, refine and sublimate the teaching contents and teaching activities, but also to expand the teaching contents, arouse students' interesting for knowledge, and improve the efficiency of classroom teaching and future study. It is an important task to design the teaching at the end of the period carefully. Every mathematics teacher should incorporate the teaching method at the end of the period which is in accord with students' cognitive characteristics, stem from students' practical situations and follow the principles of timeliness, generality, validity, compactedness and diversity.

### **Reference**

Tu, R., Wang, G., & Ning, L. (2006). New edition of mathematics teaching theory. *East China Normal University Press*, 9, 201-210.

#### **Authors:**

*Jun Lu*

*Nanjing Normal University, China*

*Email: lujun284@126.com*

*Rongbao Tu*

*Nanjing Normal University, China*

*Email:rbtu304@hotmail.com*