

## Teaching Method of "Arc Connection" Unit

Hong-Mei SUN<sup>1,a,\*</sup>, Jun-Liang JIA<sup>1</sup>, Na ZHANG<sup>1</sup> and He-Huan WEI<sup>1</sup>

<sup>1</sup>Beijing Polytechnic, Beijing, China

<sup>a</sup>sunhongmei3412@sohu.com

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**Abstract:** The arc connection is a very difficult unit to grasp. The students often do not know the inside or outside cutting, or ignore the tangent point in the drawing process. For the complex graphics, it needs to be carefully analyzed and practiced. The reasonable choice and application of teaching methods can greatly improve the teaching effect.

### Introduction

Mechanical drawing has always been a difficult and specialized basic course, a compulsory course for freshmen and majors, and the first and major related course they encounter. Most of the students are already familiar with the learning methods of mathematics and physics, and generally understand the formulas and theorems, and then apply it on this basis. However, "mechanical drawing" is a completely different engineering course. It focuses more on methods and exercises and is directly related to engineering practice.

### "Arc Connection" Unit Teaching Methods and Techniques

The first chapter of "arc connection" and the back of the three views are not very close, is the basic method of drawing parts drawings. Because there is no contact with high school knowledge, many students feel unable to start, in particular, how to distinguish between shape, positioning size, how to distinguish between the cut, cut, the middle of the arc and the connection arc.

In teaching, we always think and guide from the perspective of the students. For example, the difference between fixed size and positioning size, for example. In actual processing, we need to make a hole, but how big is the bit? You must know the size of the hole, such as  $\varnothing 20$ ; then this hole is not just playing it? Obviously it does not work, we need to be based on the distance between the center of the two dimensions of the length and width to locate the distance and length and width of the benchmark is the positioning size. With this example of heuristic bootstrapping, students are much more likely to judge size categories.

This unit is the most difficult line segment analysis, that is

- (1) Known line segments: lines where the shape and positioning dimensions are all defined.
- (2) the middle of the line: where the note has a fixed size and incomplete positioning of the line size.
- (3) connecting line segment: where only note the fixed size without the need to note the positioning of the line size.

Take Fig. 1 as an example, the blue line segments are all known line segments. When the students draw the picture, they can basically draw it out, which is not very difficult.

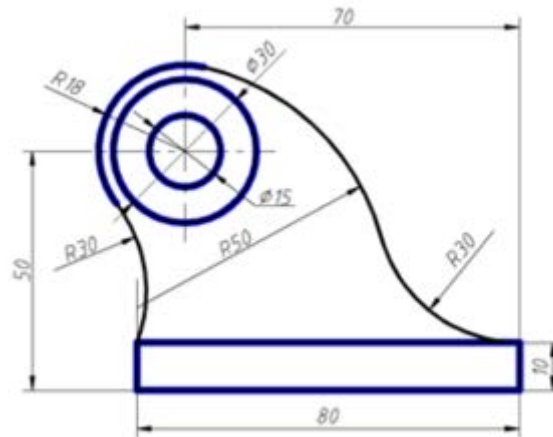


Figure 1. Known line segments

Take Fig. 2 as an example, the pink arc is the middle segment, and the center of the circle is different from the positioning dimension. It is necessary to know whether the arc and the arc to which it is connected are the external or internal relationship. In the actual teaching process, students have some difficulties in accurately discriminating endo-cutting, the author summed up a way to students: that is, the center of the two arcs on the same side for the inscription, the center of the two arcs to be drawn, the arc points on both sides of the cut.

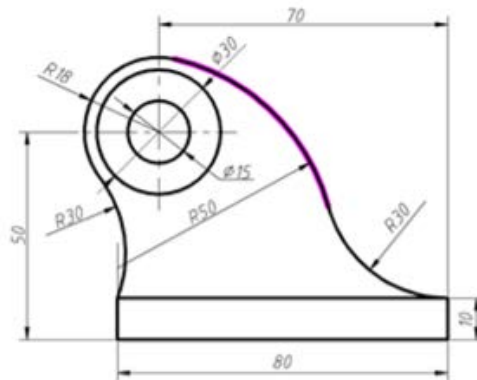


Figure 2. Middle section

For the inside and outside the cut, I also summed up a brief formula: plus, less, that is, the sum of the outer radius, the inner radius subtraction (large radius to reduce the radius). In this way, the center of a circle of a known arc is taken as the center of a circle, and the radius of the radius of the sum of the outer radius and the inner radius decreases.

Take Figure 3 as an example, the red arc is the connecting segment. The location of the center of the two arcs is not directly given the size, by the adjacent line with the inscribed, circumscribed, intersecting relationship.

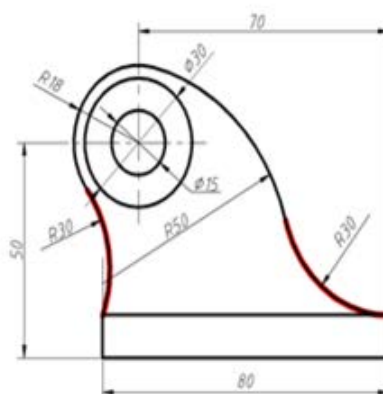


Figure 3. Connecting line segment

To ensure the smooth and beautiful arc connection, we must find a cut-point, and this step is also ignored by many students, cut-off point as two arcs starting and ending points is very important. For exo-cuts, the tangent point is at the intersection of the center of the two circles with the arc; for the inscribed, the tangent point is at the intersection of the arc with the extension of the line connecting the two circles.

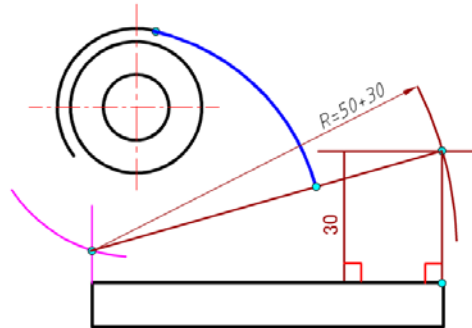


Figure 4. Cut point

### Students' Class Feedback

A basic understanding of this course is gained through the study of "Mechanical Drawing," which is the basis of the mechanical engineering profession. There are many problems encountered in studying cartography, such as circular arcs, encountered in circular arcs Do not know how to determine the fixed-point and tangent point and other issues, with the help of the teacher we summed up the sentence "external radius addition, the internal radius subtraction", plus the external radius is the addition, the reduction is the internal radius of the phase Subtraction, first of all, is to determine whether the inscribed or circumscribed, the center of the two circles are inscribed on the same side, the center of the circle is not on the same side is circumscribed, if it is circumscribed the two circles add the radius, the radius of the inscribed subtract. Well fixed, drawn by the arc known arc radius to connect the two circles. This avoids the misjudgment of the nature of the arc, and the cut-point is often forgotten. Simple formulas are also very easy to understand and easy to remember, to avoid reading a lot of content but cannot grasp the focus.

### After Class Practice, Consolidate

The great feature of "mechanical drawing" learning is that it is easy to listen to difficult to understand, understand the teacher's explanation does not mean to be right. Only repeated practice can be skilled and accurate. More representative of the map is the handle of the drawing.

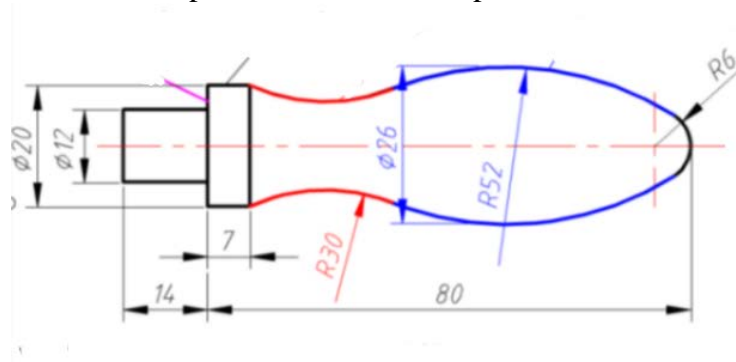


Figure 5. Handle

## **Summary**

For mechanical drawing "arc connection" unit, as a carrier, analysis of size, analysis of the line, the idea must be clear, explain some concise, the process to guide students to analyze their own. Summarize the summary of simple formulas, easy to forget, such as looking for cutting points, repeatedly emphasized, keep traces of graphics, supplemented by several graphics exercises, students will get a better grasp.

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