Furthermore, it is possible to design a circle arc template as part of a larger tool that also has a straightedge. In this way, the two tools are conveniently together and thus less likely to become separated, forgotten or lost.

A circle arc template is less likely to damage the paper. Unlike the compass, there are no sharp points or edges in the circle arc template and so students will not damage the paper by producing holes when in use. Although no instrument is completely safe, the circle arc template does not have sharp, needle points like the compass does, and thus we believe that it has a reduced risk of being weaponized.

The circle arc template in Figure 2 is currently subject to a patent application by the first author and John Lawton of Objective Learning Materials.

3. Circle arc template in geometric constructions

Is it possible for students to perform all of the common constructions seen in high-school curricula with just a straightedge and a circle-arc template? The answer is yes. Francesco Severi [20] built on the famous Poncelet-Steiner theorem which states that if students have one circle—any circle—together with its centre point, then they can construct every compass-and-straightedge constructible point using only a straightedge. Severi [20] showed that it is not necessary to start with an entire circle: if students have just an arc of any circle (however short in length) and its centre point, then the conclusion of the Poncelet-Steiner Theorem still holds.

So, it is possible for students to place the circle arc template on a piece of paper, draw an arc and from that then use their straightedge to complete the geometric constructions in the curricula. This is significant from a theoretical point of view because we know that one arc and its centre point is enough, and that the circle arc template can certainly produce this.

However, from a practical perspective, having students draw a circle arc, and then discard the circle arc tool for a straightedge alone does not necessarily lead to an efficient solution method for the constructions involved. This is because solely relying on a straightedge after an initial arc is drawn can significantly increase the number of steps in the solution algorithm, even for "basic" constructions. As an example, consider a student constructing the perpendicular bisector or a midpoint to a given line segment with one arc and then only a straightedge. There are many moves to keep track of before these can be found, see Steiner [21]. As we will see, using both tools (a circle arc template and a straightedge) offers convenience since there are fewer steps to undertake if students work with both tools.

Although there are many who have worked with the rusty compass and straightedge, including Pappus, Abu al-Wafa, Duerer and Leonardo Da Vinci (see [12]), we are particularly inspired by the work of the Italian geometers: Tartaglia, Ferraro and Cardano [22]. We believe their work is practical and relevant for the younger learner within the school setting of geometric constructions because their ideas are direct and accessible.

We now examine three basic geometric constructions (plus a variation) in greater detail, utilising the circle arc template seen in Figure 2 in place of the traditional compass.

3.1. Perpendicular bisector of a given line segment

Suppose A and B are given points and students are asked to construct the perpendicular bisector to the line segment $\overline{AB}$. That is, students are challenged to construct a second line segment that is perpendicular to $\overline{AB}$ and intersects $\overline{AB}$ at its midpoint. The initial data is given in Figure 3.