drawings; the separation from the straightedge tool; the need to adjust and readjust the compass; and safety concerns.

Compasses can be difficult for learners to use. Indeed, the dynamic process of operating a compass is not simple from a kinesiological point of view. The learner must successfully roll the top of the compass between forefinger and thumb to enable the rotation, whilst maintaining pressure on the leg with the needle so it stays firmly in place, and simultaneously apply enough pressure on the other leg that holds the pencil so as to draw a clearly visible curve during the movement. But, the learner cannot apply too much pressure or there is a risk that the opening of the legs will change, or the legs will bend or flex during operation. If this wasn't enough to keep track of, the learner usually angles the top of the compass in the direction of rotation to assist with the movement. As we can see, a collection of significant fine motor skills are required for this sort of operation. In particular, it has meant that younger learners encounter significant challenges when trying to use compasses.

However, it is not just younger learners who face challenges with operating compasses. Hendroanto and Fitriyani [10] recently reported the findings of a survey that was administered in Yogyakarta, Indonesia indicating that a significant percentage of teachers struggle to efficiently, effectively and safely use traditional tools when constructing geometric figures. They reported over 40% of teacher respondents disagreeing with the statement that traditional instruments such as compasses were "efficient and practical to use", and more than 40% of teacher-respondents agreed with the statement that compasses tend to slip on a surface when in use [10].

Indeed, the tendency of the needle point or pencil to slip when in use is something that probably all learners and teachers could identify with, and is aptly captured in the following edited cartoon [11].

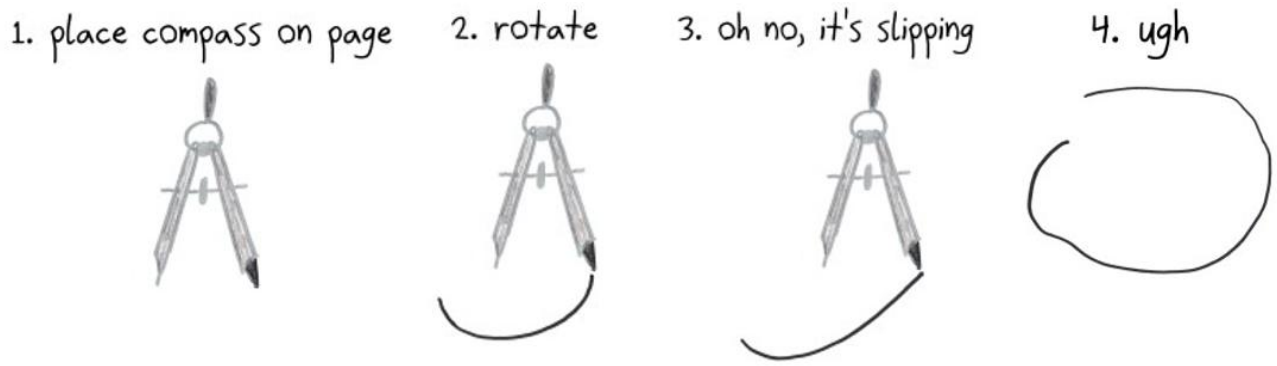

Figure 1. Compass constructions made easy [11]

Another problem is that the resulting arcs or circles produced when using a compass may be inaccurate. Even if learners possess the significant fine motor skills needed to operate a compass, then there are challenges remaining regarding the quality of the tool itself that is being used. For example, Richeson [12] takes the position that "If it is a cheap discount-store compass that stays in place using friction only, then after it has swept out 360 degrees, the jaws may have opened or closed slightly and the pencil doesn't close up the circle" (p. 178) [12]. Thus, even the most dexterous student may struggle to produce accurate geometric constructions if the compass they are using is of low quality.

In addition to the above, compasses present several inconveniencies for learners. Firstly, they are separate entities from the straightedge tool, so that learners need to keep track of two tools when learning geometric constructions. As such, there is a risk that a compass can become forgotten or lost.