Inclusivity in mathematics and computer discoveries about loops on surfaces

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A random snapshot of a mathematical conference in the US will show a lack of variation in the gender and ethnicity of the attendants. First, we explore some of the reasons for this, and discuss with the audience ideas to change it.

Secondly, we will discuss three numbers associated with a closed curve on a surface that don't change as the curve deforms continuously. They are: the minimal word length (given an appropriate "alphabet"), the smallest number of self crossings of a curve in its continuous deformation class, and its minimal geometric length in the deformation class (given a geometrically defined notion of length). These three numbers can be explicitly approximated with a computer and satisfy many interesting patterns. These computations have led to counterexamples to existing conjectures, new conjectures and sometimes to new theorems. Many of these computations and proofs were done by or jointly with undergraduate students, in a Geometry Lab-like environment.