ORIGAMI PAPER CUP: FROM PAPER FOLDING TO DATA ANALYSIS AND ALGEBRAIC EXPLORATIONS

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Abstract

We present the case of an origami paper cup and its extensions to data collection, analysis, and dimensional reasoning in K–12 teacher education, featuring the integration of GeoGebra. The paper cup case has been implemented numerous times in our K–12 mathematics methods classes, targeting a variety of issues of mathematics teaching and learning—multiple representations, mathematical discourse, intuitive perceptions, rational reasoning, data analysis, as well as hands-on engagement and ownership. To implement the instructional tasks, we need an adequate supply of commercial or self-made origami paper, copy paper of various sizes, and a few pounds of pinto beans or similar beans that are safe for classroom use as well as access to GeoGebra.

Keywords: Origami, Data Analysis, Algebraic Reasoning

1 INTRODUCTION

Mathematics is a coherent system of ideas and processes with ubiquitous connections to the real world and other branches of mathematics. Not only is our understanding of mathematics grounded in making connections, but the teaching of mathematics also involves the design and use of rich contexts and activities to support classroom sense-making and communication that explores the interplay among diverse aspects of mathematical connection and integration (National Council of Teachers of Mathematics[NCTM], 2000). Accordingly, teacher candidates must experience mathematics as a "connected and integrated whole" (NCTM, 2000, p. 65) through meaningful activities that embody the holistic nature of mathematics. This article showcases an origami-inspired learning sequence in our mathematics methods course that provides teacher candidates with rich opportunities to see the evolving mathematical landscape around a simple origami paper cup. The sequence has an easy entry point—unfolding along physical, visual, algebraic, and statistical dimensions in a manner that appeals to the interests of teacher candidates.

Origami paper folding is traditionally a form of art widely known for its appealing realism, cultural relevance, and values in recreational mathematics (Gardner, 2008; Lang, 2021). In recent years, origami has found its way into industrial design and applications (e.g., National Aeronautics and Space Administration, n.d.) and has also been reported in numerous articles in K–12 mathematics education, serving a host of pedagogical purposes such as student engagement, language development, geometric communication, habits of mind, and algebraic thinking (Cipoletti & Wilson, 2004;