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INTERSECTION OF MATH, ORIGAMI, TECHNOLOGY AND ART

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Intersection of Math, Origami, Technology, and Art

Synopsis:

A math-art project that includes explorations with GeoGebra software will be described. The presentation will display how art and technology can be integrated as an in or out of math class project. The project was used at a regional STEM conference for junior-high female students, but part of this project could be adapted to different college classes.

Intersection of Math, Origami, Technology, and Art

The project that will be described in this presentation shows how math can be used to combine the ancient Origami art and powerful technology to develop interesting and eye catching art designs. It will reveal the math hidden behind the amazing Origami folds and used in geometric constructions with GeoGebra.
This project can be used in a variety of undergraduate classes especially the ones that require the use of technology and integration with other disciplines, such as: liberal-arts math classes, classes where conic sections are taught, geometry, etc. The main goal of this project is to demonstrate to students the integration of math, art, and technology in developing some amazing art designs.
The presentation will have a few parts. The first part will introduce Origami Geometry [2, 3, 5, 6, 7, 8], in particular Origami Axiom 5 that produces a fold that lies behind the art designs in question. This part of the presentation will include exploration using this axiom [4] through paper folding. The math behind these origami folds will reveal why these folds create tangents to some curves.
The second part of the presentation introduces the dynamic software GeoGebra [9] that will be used to demonstrate the construction of the tangents done in Part One. A few explorations with this software will be shown. The third part of the presentation will show how these constructions can be used to create some interesting and fun art designs [1]. Some of these amazing art designs will be shared.
Time permitting, we will discuss the custom GeoGebra tools that can be created to simplify the work on these art designs [10].
At the end of the presentation, goals, objectives, and outcomes of using this project with students will be discussed.
It is worth mentioning that the presenter used this project to engage junior high-school female students at the local STEM conference in hands-on exploration with GeoGebra and Origami. While the students were involved in these explorations, they also learned about the math behind the art designs they were constructing.
The experience of working on this project with the high school students and their feedback about the project will also be shared.

Reference:

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[4] Hull, T. 2013. *Project Origami: Activities for Exploring Mathematics.* Boca Raton: CRC Press.

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[6] Huzita, H. 1992. Understanding Geometry through Origami Axiom. In J. Smith, editor, *Proceedings of the First International Conference on Origami in Education and Therapy* (COET91). British Origami Society. 37--70.

[7] Hvidsen, M. 2005. *Geometry with Geometry Explorer*™, New York: McGraw-Hill.

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[10] Vasilevska, V. *Math-Origami, GeoGebra, and Art*. (Submitted)