

Mathematics and Art Summer Camp: Creative and Joyful Experiences

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EXECUTIVE SUMMARY

This chapter describes a mathematics and art camp week-long experience in which middle school students informally explore the rich connections between mathematics and art as extensions of the traditional curriculum in a non-graded summer camp environment to elicit creative thinking and joy in mathematics. The mathematics and art curriculum was designed with activities that are accessible to all levels of students and are presented in detail to allow other mathematics teacher educators to replicate this model. Reflections on successes and challenges of the program, the logistics of planning, and student outcomes with respect to the learning of mathematics, student agency, and social-emotional considerations are shared.

INTRODUCTION

Math anxiety is a well-documented impediment to student success, often resulting in disengagement and avoidance of mathematics (Ramirez et al., 2018). In contrast, art is typically perceived as a more approachable and enjoyable discipline. Despite their perceived separateness, mathematics and art share a rich history of mutual influence, contributing significantly to aesthetics, structure, and understanding

in both fields (Danesi, 2020; Gamwell, 2016). For example, the use of the golden ratio in Renaissance art and architecture, the geometric symmetry in Islamic art, and the self-similarity of fractals at various scales exemplify how mathematical principles have long been integrated into artistic creations (Ernest & Nemirovsky, 2016). In recent years, there has been a growing pedagogical focus on integrating art into mathematics education. This interdisciplinary approach is aimed at enhancing student engagement, fostering creativity, and improving conceptual understanding. Many studies have demonstrated that art-based learning can improve students' retention of mathematical concepts. The visual and creative nature of art provides a tangible way to grasp abstract mathematical ideas, aiding in cognitive retention (Battista et al., 2018; Bruce & Hawes, 2015; Eberle, 2014). By blending the abstract and structure of mathematics with the expressive and visual characteristics of art, educators are finding innovative strategies to make mathematics more accessible and engaging for students.

Despite the growing interest in integrating art into mathematics education, there remains a significant gap in the literature concerning the specific features of tasks and learning environments that support this interdisciplinary approach, particularly in informal learning contexts (Kus & Cakiroglu, 2022; Portaankorva-Koivisto & Havinga, 2019). Few studies have provided detailed descriptions of how art and mathematics can be effectively blended in such settings, leaving educators with limited guidance on how to structure these experiences to maximize student engagement and learning outcomes (Hodekiss et al., 2018; Kus & Cakiroglu, 2022; Schoevers et al., 2020). To address this gap, a week-long mathematics and art summer camp was developed, specifically designed to engage middle school students in an interdisciplinary exploration of mathematical concepts through artistic processes. This camp differs from other STEM-based programs by focusing exclusively on the unique intersection of mathematics and art. Rather than emphasizing technology or engineering, the camp offers students a creative, hands-on approach to learning mathematical concepts through visual and artistic mediums.

For purposes of this Mathematics and Art Camp, *mathematical creativity* is defined as “the ability to generate new mathematical ideas, processes, or products that are novel to the students, though not necessarily to the broader academic community, through the discernment and selection of acceptable mathematical patterns and models” (Bicer, 2021, p. 253). Tasks that foster this type of creativity can be found throughout the Mathematics and Art Camp’s curriculum, where opportunities for students to use both divergent and convergent thinking are present. *Convergent thinking* occurs when students apply previous knowledge and procedures to a new situation, and *divergent thinking* occurs when students find non-routine solution strategies (Bicer, 2021). As Bicer, Aleksani, Butler, Jackson, Smith, and Bostick (2024) remind the reader, creativity and student achievement are positively correlated,

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