Unit 8.3: Art all around

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Introduction

In this unit, students explore connections between visual art, mathematics, and computing to create original works of abstract digital art. They begin by analyzing the elements of art and using algorithms to represent geometric transformations such as translation, rotation, and dilation. Students then use Scratch to program these transformations, creating and refining functions while applying concepts such as abstraction and variables. Using an artistic design process and guided constraints, students plan and develop their own interactive digital artwork. Throughout the unit, they maintain an artist's journal to document their ideas, decisions, and reflections. To conclude the unit, students write an artist statement explaining their design and programming choices and share their work in a collaborative gallery walk.

Overview of lessons

Lesson	Brief overview	Learning objective
1: Art through algorithms	Students examine the elements of art in a piece of artwork and connect them to mathematical concepts. They create an algorithm to translate a shape on a coordinate grid and compare their results to the artwork.	Students will create an algorithm to translate a shape.
2: Pattern playground	Students examine some Pop Art examples created by Andy Warhol and discuss how he used translations to create patterns. They use Scratch to	Students will create a function that translates a sprite.

	code sprite translations across the x and y axes, then apply abstraction by modifying their program with two functions.	
3: Fantastic forms	Students explore how dilation creates perspective in artworks. They use Scratch to scale sprites and apply variables to control dilation within their programs.	Students will control the dilation of a sprite with a variable.
4: Shifting shapes	Students explore how rotation transforms shapes in artwork. They use Scratch to create a function that rotates a sprite and then apply it to design a personalized geometric pattern.	Students will use functions to rotate a sprite and create a personalized geometric design.
5: Build it out	Students apply the art and computing concepts they have learned and the functions they've created to plan and create an interactive digital artwork. They are provided with constraints for their project and document their design and programming choices along the way.	Students will apply the concepts they have learned to create a piece of abstract art.
6: Art all around	Students create an artist statement by reflecting on their design and programming choices. They share their work and engage in a gallery walk to provide constructive feedback.	Students will reflect on their design choices through an artist statement.

Each lesson includes opportunities for formative assessment, which are outlined in the lesson plans. The unit also includes a summative assessment, with a clear rubric to assess students' final projects.

Standards

Computer Science Teachers Association (CSTA) Computer Science Standards	Lesson					
	1	2	3	4	5	6
2-AP-11: Create clearly named variables that represent different data types and perform operations on their values.			✔			
2-AP-13: Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	✔	✔	✔	✔	✔	
2-AP-14: Create procedures with parameters to organize code and make it easier to reuse.		✔	✔	✔	✔	
2-AP-17: Systematically test and refine programs using a range of test cases.			✔	✔	✔	✔
2-IC-20: Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.					✔	✔

National Core Arts Standards	Lesson					
	1	2	3	4	5	6
MA:Cr1.1.8: Generate ideas, goals, and solutions for original media artworks through application of focused creative processes, such as divergent thinking and experimenting.			✔	✔	✔	
MA:Cr2.1.8: Structure and critique ideas, plans, prototypes, and production processes for media arts productions, considering intent, resources, and the presentation context.	✔			✔	✔	✔

MA:Cr3.1.8 b: Refine and modify media artworks, improving technical quality and intentionally accentuating selected expressive and stylistic elements, to reflect an understanding of purpose, audience, and place.		✔	✔	✔	✔	✔
MA:Pr4.1.8: Integrate multiple contents and forms into unified media arts productions that convey specific themes or ideas, such as interdisciplinary arts or multimedia theatre.					✔	
MA:Pr5.1.8 a: Demonstrate a defined range of artistic, design, technical, and soft skills, through performing specified roles in producing media artworks, such as strategizing and collaborative communication.	✔				✔	
MA:Pr5.1.8 c: Demonstrate adaptability using tools, techniques and content in standard and experimental ways to communicate intent in the production of media artworks.		✔	✔	✔	✔	
MA:Re7.1.8 b: Compare, contrast, and analyze how various forms, methods, and styles in media artworks manage audience experience and create intention.	✔	✔			✔	✔
MA:Re8.1.8: Analyze the intent and meanings of a variety of media artworks, focusing on intentions, forms, and various contexts.		✔	✔	✔		✔
MA:Re9.1.8: Evaluate media art works and production processes with developed criteria, considering context and artistic goals.						✔

Common Core Standards Subject area: Mathematics	Lesson					
	1	2	3	4	5	6
CCSS.MATH.CONTENT.8.G.A.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.				✔		
CCSS.MATH.CONTENT.8.G.A.3: Describe the effects of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	✔			✔		
CCSS.MATH.CONTENT.8.G.A.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.		✔	✔			

ISTE Standards

- 1.4.a Design Process: Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- 1.4.b Design Constraints: Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
- 1.4.c Prototypes: Students develop, test and refine prototypes as part of a cyclical design process.
- 1.4.d Open-Ended Problems: Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
- 1.5.a Problem Definitions: Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.

- 1.5.c Decompose Problems: Students break problems into component parts, extract key information and develop descriptive models to understand complex systems or facilitate problem-solving.
- 1.6.b Original and Remixed Works: Students create original works or responsibly repurpose or remix digital resources into new creations.
- 1.6.c Communicate Complex Ideas: Students use digital tools to visually communicate complex ideas to others.
- 1.6.d Customize the Message: Students publish or present content that customizes the message and medium for their intended audiences.

Resources are updated regularly — the latest version is available at: experience-cs.org



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