

Fourth Grade STEAM Tour: The Design Process—Chairs

Introduction

Students will study examples of everyday objects (especially chairs) designed by artists in Mia’s galleries to learn how artists, like scientists, use the Engineering Design Process: Ask, Imagine, Plan, Create, and Improve. With an end-goal of designing their own unique chair in mind, students will observe and discuss seats from around the world and explore how form follows function in the design process. They will also look at prototypes and sketches to understand how artists and engineers change and improve their designs. Hands-on activities throughout the tour reinforce the idea that art, math, and science are very closely related.

Supplies (in pink tour bag)

Images provided for math problems and observation:

- *Side chair*
Frank Lloyd Wright; John W. Ayers
85.82
- *“Red-Blue” chair*
Gerrit Rietveld; Gerard A. van de
Groenekan
98.276.42

Chair prototype/sketches and images of corresponding chairs

Rulers

Student notebooks

Clipboards

Pencils

Blank sheets of paper for sketches

Artworks

At the outset of the tour explain that each of them will become a chair designer on this tour. At the end they will create a drawing of an original chair for someone they know.

Select four or five chairs (another designed object would work okay as well for variety) throughout the galleries. At the first stop review the steps of the design process, explaining that good design begins with understanding the needs of the people you are designing for. Ask students to observe the chairs and other seats they will be studying closely to make educated guesses about what problem they think each artist was trying to solve (e.g. comfort and visibility for driver of Tatra, creating a chair from a single piece of wood, creating a chair that signified the power of its user). Use the laminated sketches and pictures of the actual chairs shown in the sketches (if you don’t start in the Prairie School galleries) to show how sketches lead to final designs.

Encourage students to sketch on half sheets of blank paper (in your bag) and make notes about design ideas they might like to incorporate into their own designs. What kinds of designs, materials, and features would the person they are designing for like? Why?

Measuring Up

In order to emphasize the connection between math and design, ask students to consider the importance of measurement to chair design. Using the provided illustrations of the Frank Lloyd Wright side chair and the Rietveld “Red/Blue” chair invite students to figure out the area of the seats and the total height of the side chair. Ask them to notice the angles of incline in chairs as well. Discuss: how does the area of a seat or the angle of incline impact the comfort of a chair? Have them think about who they will be designing a chair for later—what kinds of seat area and measurements will a chair for that person have to have? (Is the person tall? wide? small?) Why is it critical that a designer can communicate measurements? (Their objects are usually manufactured by someone else.)

Invite students to estimate the seat measurements and seat height of any of the Chinese yokeback chairs and the zig zag chair (a particularly fun chair for kids to think about angles) using a ruler.

Take a Seat

Time and crowds permitting, ask students to try out some of the seating in the galleries and the different types of seating in the community commons hallway. Discuss which they think are comfortable and uncomfortable, and why. Remember to make sketches and notes!

Support visual arts standards

At each work of art on the tour, describe a few of the elements of visual art that the artist used: color, line, shape, value, form, texture and space. Ask the students how repetition, emphasis and balance are used in the works of art. When possible, show or describe the tools an artist would have needed to create such a piece. Using the Engineering Design Process, have the students revise their own artwork after a few moments of self-reflection.

Art making

Using paper and pencils, students will design their own chairs, following the Engineering Design Process they have been discussing throughout the tour. The checklist in their notebook will serve as a reminder of the key steps. Each student should identify who they are designing the chair for, identify that person’s likes or needs, sketch a few designs, get feedback from a classmate and finally, draw a full-fledged design. Rulers are provided for drawing. Time permitting, students could add measurements to their designs.

Science 4.1.2.2.3 Engineering design is the process of identifying problems, developing multiple solutions, selecting the best possible solution, and building the product. Benchmark: Test and evaluate solutions, considering advantages and disadvantages for the engineering solution, and communicate the results effectively.

Math – Geometry and Measurement Name, describe, classify, and sketch polygons. 4.3.1.2
Benchmark – Describe, classify, and draw quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms and kites. Recognize quadrilaterals in various contexts.

Understand angle and area as measurable attributes of real-world and mathematical objects. Use various tools to measure angles and areas. 4.3.2.4 Benchmark – Find the areas of geometric figures and real-world objects that can be divided into rectangular shapes. Use square units to label area measurements.

Visual Arts 4.1.1.5.1 Describe the characteristics of the elements of visual art including color, line, shape, value, form, texture and space.

Visual Arts 4.1.1.5.2 Describe how the principles of visual art such as repetition, pattern, emphasis, contrast and balance are used in the creation, presentation or response to visual artworks.

Visual Arts 4.1.2.5.1 Describe the tools, materials and techniques used in a variety of two-and three-dimensional media such as drawing, printmaking, ceramics or sculpture.

Visual Arts 4.2.1.5.1 Create original two-and-three-dimensional artworks to express specific artistic ideas.

Visual Arts 4.2.1.5.2 Revise artworks based on the feedback of others and self-reflection.

Visual Arts 4.1.1.5.3 Identify characteristics of Western and non-Western styles, movements and genres in art.

