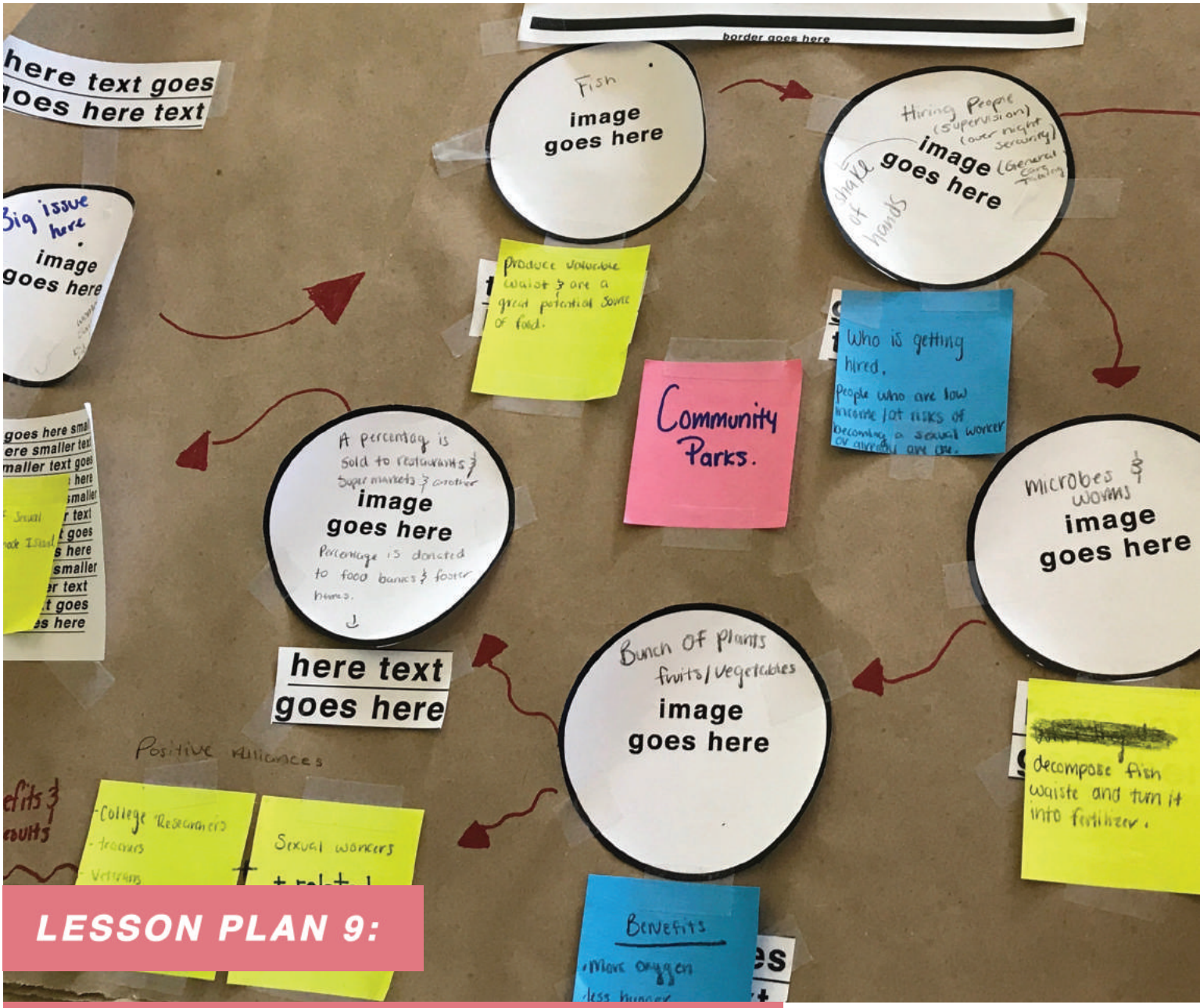

LESSON PLAN 9:

BIOSYSTEMS DESIGN CHALLENGE

PART II

Curriculum: Introduction to Biodesign
Unit: 3—Biosystems
Grade Level: 10th-11th

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TO FIND MORE LESSON PLANS AND TO READ MORE ABOUT THIS CURRICULUM VISIT: BIODESIGNMAKERSPACE.ORG

Background Information For Teachers

Overview of this lesson:

We continue in Lesson 9 with the Biosystems Design Challenge, this time focusing on creating and presenting a poster and proposal for the biosystems devised in the previous lesson. Students are tasked with creating a digital poster (we used a free, online graphic design software with them called Canva) and developing a five minute "proposal" to go along with their poster, both of which they will present to an imaginary city council.

We saw this lesson as a perfect opportunity to introduce students to some key graphic design concepts and tools. Information design and scientific knowledge go hand-in-hand; we wanted to underscore for students that scientists and designers alike must be in the practice of not just coming up with and unearthing new ideas, but also presenting those ideas in a way that is organized, **accessible,** and persuasive. As such, this lesson begins with a brief preview of the second part of Biosystems Design Challenge (to make a poster and a proposal and present it at the end of class) followed by a ten-minute (or less) lecture on graphic design. While there is no end to the amount of information on graphic design we could share with them, we focused on three key terms: composition, scale, and hierarchy (the definitions of which can be found in this lesson plan.) We also showed students a number of examples of how graphic designers had designed similar graphics for other cyclical systems like the ones they were designing.

To get students thinking about how they wanted to block out information on their posters, we let students physically arrange templates of sample text that we made prior to class. We felt this "blocking" helped our students plan their posters and see what information might need to go where, but it is not necessary to do this. If your students want to go straight to designing on the computer, feel free to bypass this part of the lesson. We then set students free to create their posters and proposals using shared laptops and the online graphic design software (Canva).

Adapting this lesson to your classroom:

Canva has a number of templates that depict cycles under the template category "Mind Maps" that can be very useful in this exercise. Or, if your students feel empowered by the graphic design lesson, you can start from a blank template. Our students had to acquaint themselves with the graphic design software, Canva, pretty quickly and immediately start making their posters. As with any design software, the more time you spend using it, the more facility you have with it. If you have the time, spend a half hour in a prior class exploring Canva or make a homework assignment the night before to spend thirty minutes on Canva and to design something. This way, when they approach this project with some understanding of how this software works and can get to designing right away.

Standards, Objectives, & Supplies

Grade Level: 10th-11th

Duration: 4 hours (can be split over two sessions)

Lesson Concept: We can take inspiration from nature's cyclical systems and use these systems as an analog for solving human problems, as in "cardboard to caviar". Through thoughtful information design, we can present our ideas for biosystems in a way that is cohesive, organized, and persuasive.

Lesson Objectives/Learner Outcomes:

1. Understand the principle of applying ecosystem cycles and input mapping to align with better organized human systems.

2. Design a cyclical system based on a local problem and arrange all components into a visually pleasing graphic.

Instructional Support Materials (if needed):

- Powerpoint with necessary images + journal prompts.
- LCD projector/smartboard
- Vocabulary cards
- Access to graphic design software ("Canva" is free online)
- Graphic design planning blocks (see end of PDF)

Materials + Supplies:

- Paper to write script for presentation (one sheet for each small group or use sketchbooks)
- Pens (several for each small group)
- Pencils (several for each small group)
- Sharpies or markers (several for each small group)
- Laptops/computers/ipads for students to work on graphic design project for Biosystems challenge (one for each small group)
- Printer to print posters (if desired)

Science / Art Standards

SCIENCE (Next Generation Science Standards):

Science and Engineering Practices - Obtaining, Evaluating, and Communicating Information - Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

ART (National Core Art Standards):

VA:Cr2.3.8: Select, organize, and design images and words to make visually clear and compelling presentations.

Learning Plan

Stage 1: Motivation

1. Introduction Lecture: Graphic Design for Biosystems Design Challenge Part II. Explain to students that we are now moving into the second part of our Biosystems Design Challenge: designing an informational poster and a proposal for their Biosystems ideas. Before students begin their posters and "pitches", go over some key concepts and terms to keep in mind when undertaking any graphic design project. Canva, the free graphic design software that we used has a great article for beginner graphic designers called "10 Rules of Composition All Designers Live By." (https://www.canva.com/learn/visual-design-composition/) You might spend ten minutes projecting this article on the screen and walking students through some of its key points, or else direct your students to read it during class time or for homework. Alternately, you can very simply and quickly introduce three key graphic design terms: Composition, Scale, and Hierarchy. Tell students: "you will be making a composi tion today—an arrangement of elements intentionally put together. A composition can be a piece of music, an artwork, or informational design. Today we're going to talk about just two graphic design terms to keep in mind while creating any composition: scale and hierarchy. Scale is exactly what it sounds like—making elements bigger or smaller depending on how you want the viewer to interact with it. Putting a small figure in a giant field of grass communicates to the viewer the enormity and isolation of the space in a way that showing a close-up shot of a person in the field does not. This is 'scale' in play. Hierarchy is the arrangement and design of elements in order to visually signal importance. Bigger, heavier text gets our attention first. Smaller, lighter text gets our attention second. When making your designs, consider where you want your viewer's eye to go first, second, and then finally, which information can be read closely and leisurely. If a key element of your poster is that aquaponics are built by students in order to grow food for their school cafeteria, maybe you don't want to bury the words 'aquaponics' and 'students' in the middle of a dense paragraph." Wrap up discussion of graphic design tips and transition to designing posters. *(10 minutes)*

Image: Canva uses this image to illustrate how scale can be used to a nubmber of effects, and here is used to communicate vastness. Rather than use a bigger type to advertise the concert date, the small type at the bottom works in conjunction with the dwarfed image of the two figures to contributes to sense of isolation and enormity. (Image Source: Canva. Designer: Scott Hansen)

2. Introduce Activity: Designing a Poster and Proposal. Explain to students: "Today's activity carries over from last class, in which you designed 'biosystems' that might make systems in your community more interconnected and sustainable. Now you need to present your idea to

Learning Plan

the public. We now know a little bit more about what makes for effective visual design. Your task is to create a poster depicting your biosystem and present it to an imaginary city council for approval. Each group will have five minutes to present and two minutes for questions. At the end of the class session, you will present your proposal to the class (who will act as the imaginary city council), using your poster as the focal point." *(10 minutes)*

Image: Newspaper headlines can be a great way of illustrating hierarchy of text for students. Show this or contemporary examples. (Image source: Canva).

Stage 2: Exploration

1. Biosystems Design Challenge Part II: Designing a Poster and Making a Proposal. In their same small groups from Biosystems Design Challenge Part I, students begin designing their informational poster about their Biosystems created in the prior class. Either simultaneously or after the poster is made, depending on the group's choice and the group members' strengths, students should begin to think about their five minute presentation and script out or practice what they will say. When students have finished their posters, export them as PDFs and send to an email address accessible on a computer connected to the projector, as posters will be projected during the presentations. *(90 minutes or as much time as practicable.)*

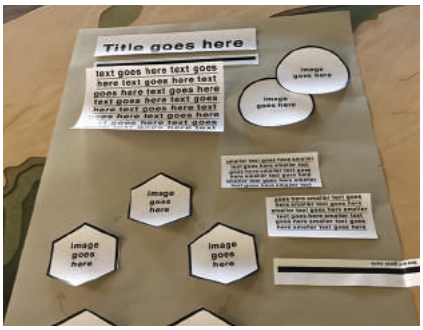


Image: A poster layout made with the planning blocks, which students then started to fill in.

Stage 3: Presentation and Reflection

1. Biosystems Proposal Presentations. Each group projects their poster onto the board (or prints the poster and places it on an easel, if poster-printing is a possibility for your school or classroom) and gives their five-minute (or less) proposal to the "city council." After the proposals each group will field questions from the council. If you want to add in this element (we did not do this with our students), there can be a "winning" design voted on by the council at the end of presentations. *(8-10 minutes per group)*

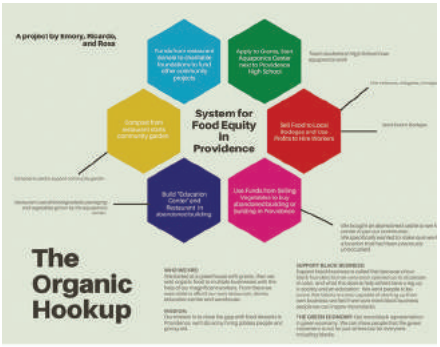


Image: One group's poster for their biosystem, which they called "The Organic Hookup."

2. Five-Minute Journaling. Students return to tables to journal for five minutes. Teacher can pick one prompt for all students to respond to, or students can choose from three prompts. (Writing: 5 minutes, if desired: 5 minute pair share or group share)

- If you had unlimited time or budget, what would you add to your biosystem? Write or draw a response.

Learning Plan

- If you could improve one thing about your poster or your presentation, what would you improve? Write or draw a response.
- Find an example of graphic design somewhere in the classroom. Draw or explain how scale or hierarchy are being used in this design.

3. "So what?" Lesson Recap. Ask students: What did we do today? Why is it important? Emphasize key ideas covered and larger context for today's learning—for example "We can take inspiration from nature's cyclical systems and use these systems as an analog for solving human problems, as in 'cardboard to caviar.' Through thoughtful information design, we can present our ideas for biosystems in a way that is cohesive, organized, and persuasive." *(5 minutes)*

Image: Another group's poster, which focused heavily on providing employement and child care for young mothers.

Image: A group presents their biosystem.

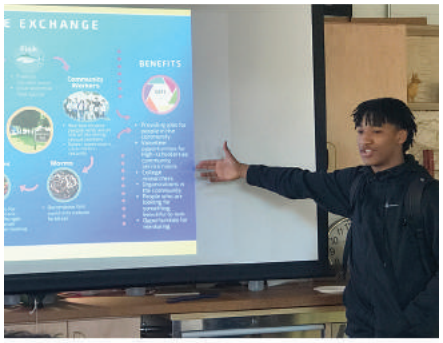
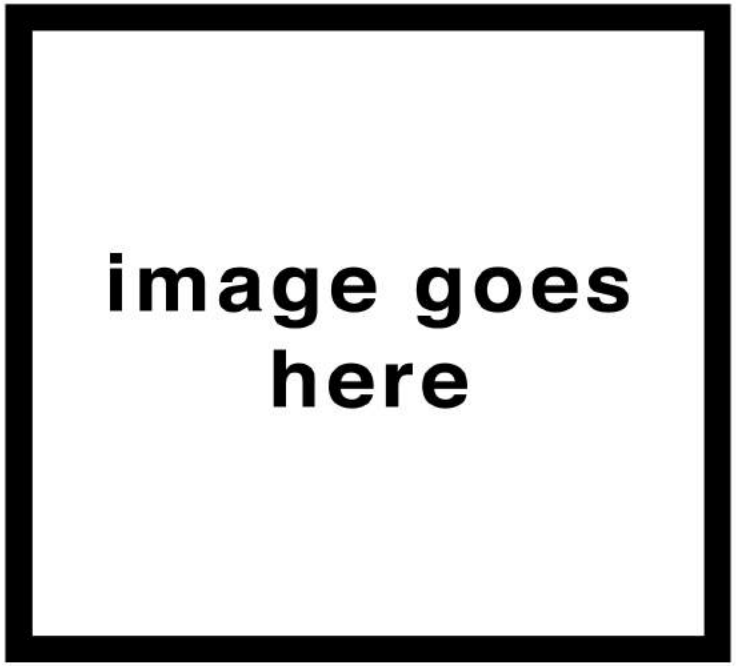


Image: A student presents during his group's Biosystems proposal.

Graphic Design Planning Blocks

In the following pages, you will find blocks used to physically “block out” the graphic design of the Biosystems poster. For our students, these blocks helped the group have conversations about where information could go, rather than one or two students making these choices independently in front of a computer screen. We found that it was a way for everyone in the group to be involved in the preliminary planning stages of the poster before it went to the computer, and prompted the group to visualize and write the necessary components of their poster: image, title, and text. This may not be a necessary step for your students, however—some students feel most comfortable immediately beginning to play with layout on-screen. If you feel that doing some physical mapping of the poster might be helpful to your students, please utilize these blocks.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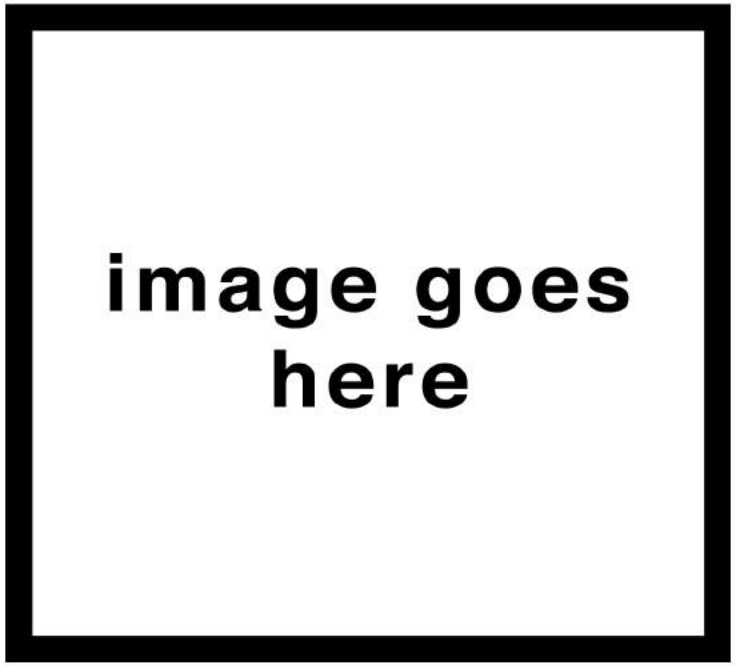
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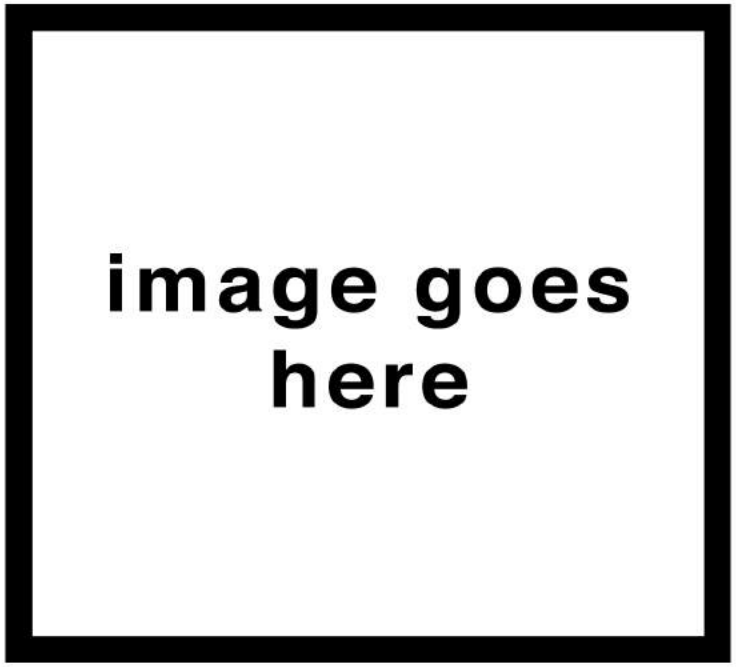
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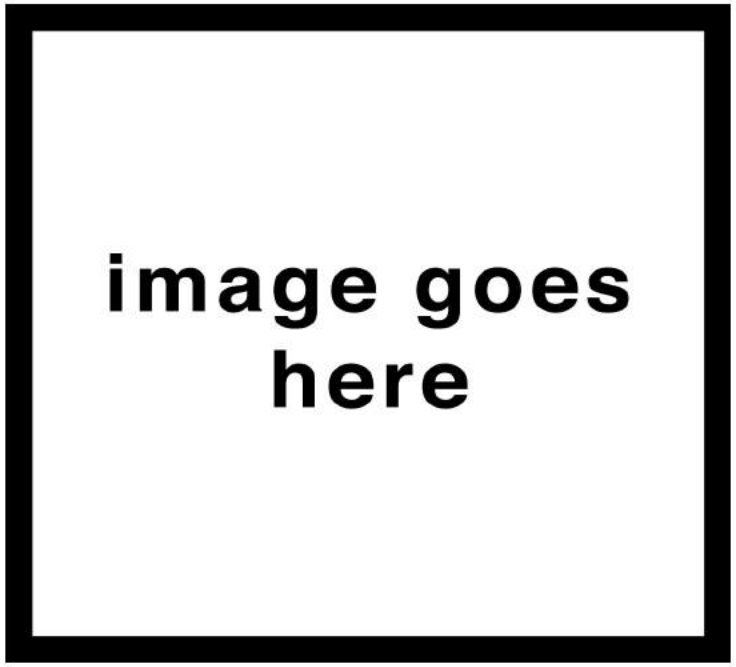
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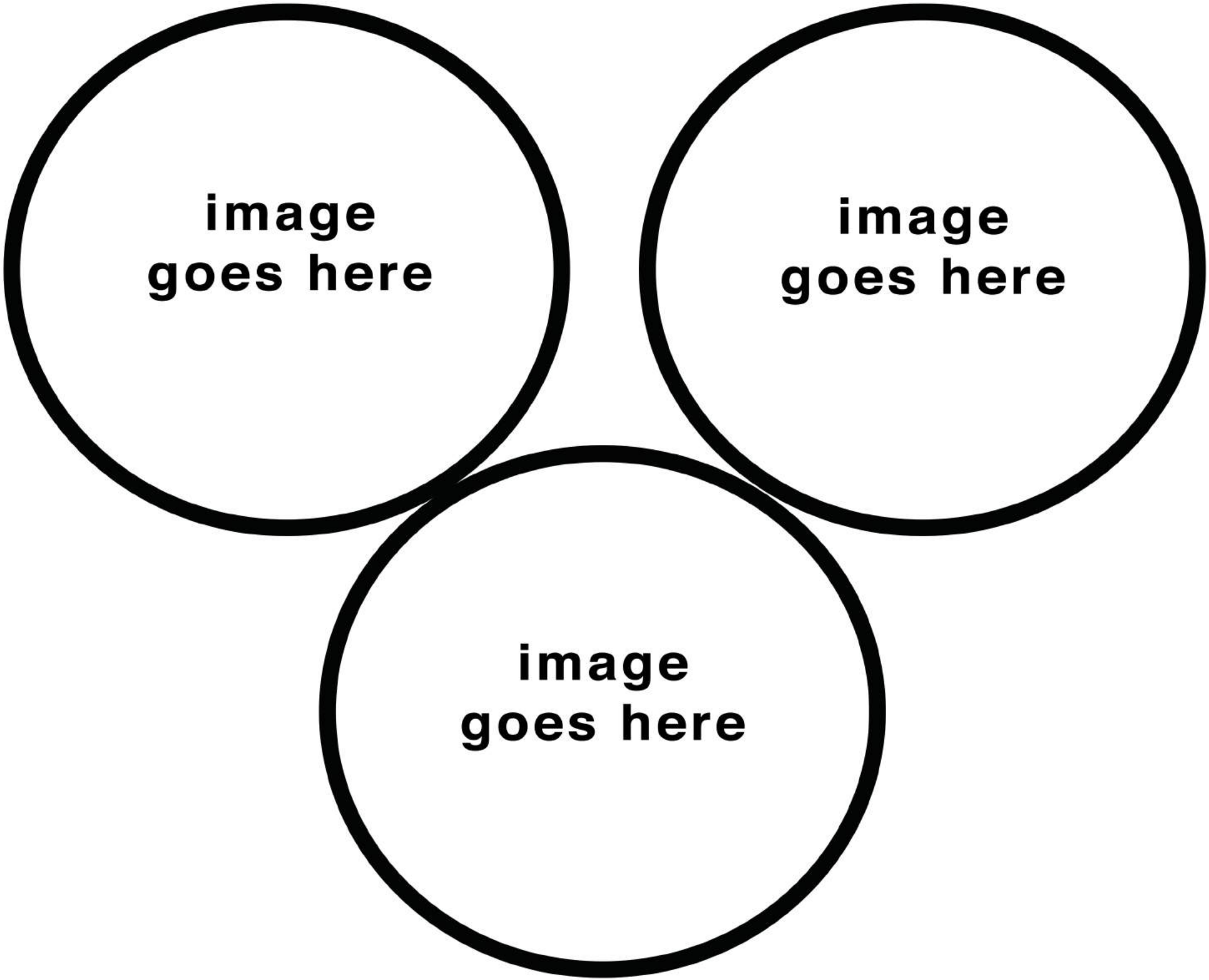
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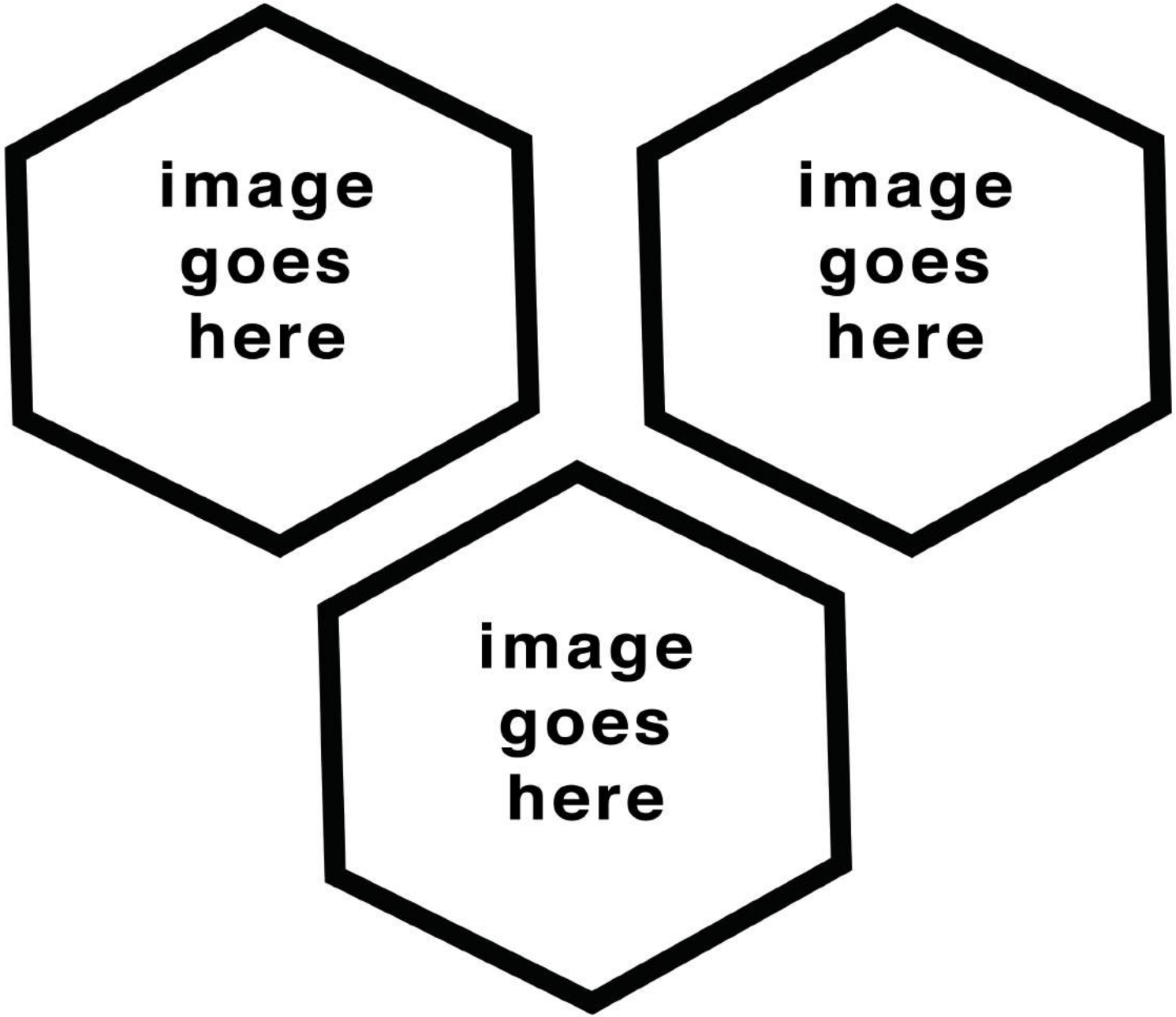
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Vocabulary

Terms:

Composition: the arrangement of different elements in an artwork, or, putting together the “ingredients” of an artwork.

Scale: the size of an object in relation to another.

Hierarchy: the arrangement of elements in a way that implies importance. In other words, visual hierarchy influences the order in which the human eye perceives what it sees.

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Scale

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the size of an object in relation to another.

Composition

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the arrangement of different elements in an artwork, or, putting together the "ingredients" of an artwork.