DESIGNING FORM

Module 1: Lesson Plan

MODULE GOALS

Design drives innovation and can significantly impact the successful production of a new commodity or product. It is an iterative process which can be strategically performed using an approach known as **design thinking**. In this module, students will learn to utilize the stages of **design thinking** in order to cultivate ideas and respond to situations and challenges creatively.

ESSENTIAL QUESTIONS

- How/where do designers find inspiration for their ideas?
- How do designers turn their ideas into usable forms?
- What is **design thinking**, and what makes it an iterative process?
- How can **design thinking** and other iterative design processes be employed when approaching a new creative challenge?
- What role do the **design thinking** steps of empathize, define, ideate, and prototype play in developing a design?

MEANING AND ACQUISITION

- Students will engage in experiential learning through the application of **design thinking**.
- Students will understand strategies for applying material play for open-ended exploration.
- Students will know how to utilize **empathy** in order to help define the parameters of an inquiry.
- Students will know how to utilize **ideation** in order to engage with open-ended exploration of an inquiry.
- Students will know how to utilize **prototyping** as an effective way to try out new design ideas.
- Students will experience the use of "low-fidelity" materials such as clay, paper, and craft items to ideate.
- Students will be proficient at problem-solving with the use of **iterative** design processes.

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FORMATIVE ASSESSMENT STANDARDS

- Students demonstrate active problem-solving skills throughout the development of their design **(Cr2.I.8a).**
- Students know and use fundamental vocabulary relevant to design and the design thinking process **(Cr3.1.1a).**
- Students demonstrate the ability to form and defend judgments about the characteristics of their designs in order to accomplish commercial, personal, communal, or other purposes **(Pr4.I.IIa).**
- Students evaluate the effectiveness of their designs in terms of function reflected in the design thinking process **(Cr3.I.IIa).**
- Students ore able to discuss and explain their efforts with consideration of factors surrounding the origin and journey of their design **(Cr3.I.6a).**

SUMMATIVE ASSESSMENT STANDARDS

- Student work delineates a unifying concept through the production of a design that reflects skills in iterative processes and low-fidelity prototyping techniques **(Cr2.1.IIIa).**
- Students describe the origins of specific images and ideas and explain why they ore of value in their artwork and in the work of others **(CnII.1.Ia).**
- Student work demonstrates how design con communicate experiences and stories or address a creative challenge **(Cr2.3.7a).**
- Student work exemplifies on effective use of materials, equipment and tools into the production of design forms **(Cr2.1.IIa).**
- Student work demonstrates the conceptualization and use of both traditional and contemporary technologies within the design or product **(Cr3.I.8a).**

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MATERIALS

- Air-dry Modeling Cloy
- Cardboard
- Craft paper
- Pipe Cleaners
- Pencils & erasers
- Scissors
- Tape

KEY TERMS

- **Design thinking -** the idea that a hands-on, user-centric approach to problem solving can lead to innovation, reflected in an iterative process of "understand" (empathize and define), "explore" (ideate and prototype), and "materialize" (test and implement).
- **Empathize -** Conduct research in order to develop knowledge about what people (your neighbors, your school, users of a product) do, say, think, and feel about an issue.
- **Define -** Determine problem(s) to be solved, based on knowledge gained in the 'empathize' phase.
- **Ideate -** Brainstorm a range of creative ideas that the problems/needs identified in the 'define' phase. Give yourself and your team total freedom; no idea is too farfetched and quantity is more important than quality.
- **Prototype -** Build real, tactile representations for some of your ideas. The goal of this phase is to understand what components of your ideas work, and which do not.
- **Test** - Get feedback on your prototype(s). The best feedback comes from the people you are designing for, but fellow designers can also help.
- **Implement -** Put the vision into action! Materialize your solution and address the identified problem(s).
- **Iteration -** Looping back to a previous step in the process, to make changes based on new knowledge

Derived from Gibbons, S. (2016). Design thinking 101. https://www.nngroup.com/articles/design-thinking/

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PROPOSED ACTIVITY

1. Students will **define** a problem in their world, their community, or in their life by **empathizing** with what people do, say, think, and feel about an issue.
2. Students will **ideate** different material solutions to the problem they defined. Students will sketch their various solutions. In this process, students will:
   - Play with concepts through free association, exploration, chance, and reflection.
   - Look at examples to gain insight, source options, and remix possibilities.
   - Discuss possibilities with others.
3. Students will use cardboard, modeling clay, pipe cleaners, and other "low-fidelity" materials to **prototype** a chosen design from one of their sketches.
4. Students will **test** their prototype by getting feedback from their group, and **iterate** to revise their design.

DESIGNING FORM

Module 1: Case Study 1

REBECCA STRZELEC

Rebecca Strzelec is an artist, designer, and educator at Penn State Altoona, where she has been a faculty member since 2002 (Lippincott, 2016). Strzelec's practice includes the creation of wearable art objects via computer-aided design (CAD) programs and 3D printing. Once she has completed a design, her objects are printed by Rapid Prototyping, which involves various computer-controlled machines that quickly fabricate a scale model of a digital design using CAD data (Strzelec, 2017). Her work is inspired by popular culture iconography as well as the lived experiences of those around her, and it investigates the relationship between the wearable objects that she creates and the surfaces of the body (Lippincott, 2016). Rebecca's work is a unique combination of the utilitarian, the political, and the whimsical, and exemplifies how everyday life can impact product design in unexpected ways.

Figure 1. Red Bracelet, 2008. This figure illustrates one of many projects in which Strzelec appropriated the form of a gas pump.

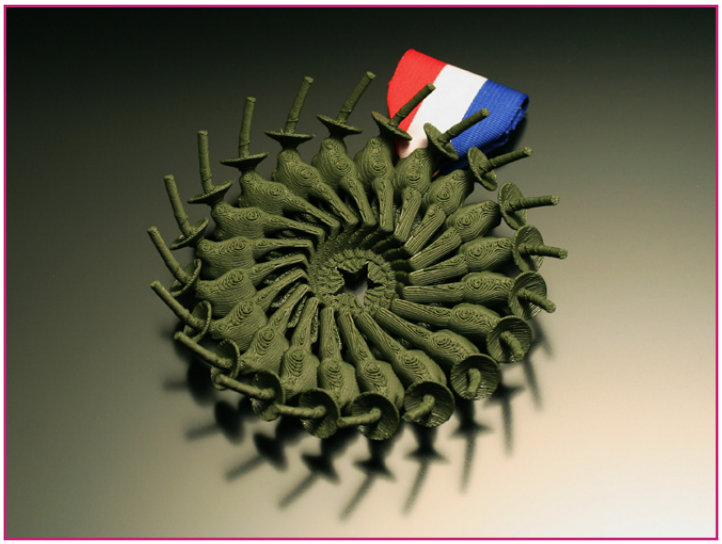

Figure 2. Octane Medal, 2007. In this piece, from Strzelec's "anti-war medals" series, the gas pump comments both on the way petroleum is used to justify war, and its presence in the plastics used for 3D printing.

DESIGNING FORM

Module 1: Case Study 1

PROJECT DESCRIPTION

Originally trained as a traditional bench jeweler, Rebecca Strzelec converted her practice to digital methods in 1999 ("Professor of Visual Arts Rebecca Strzelec named 2016-17 Penn State laureate", 2016). Strzelec originally began using digital design and additive manufacturing due to the flexibility it provided to her practice (Strzelec, 2004). At each stage of development, she saves the current **iteration** of her design which provides for and encourages risk-taking at later stages of the object's development (2004). In this sense, her work is inextricably linked to the **design thinking** skills that the making process needs in order to happen in a way that other forms of art practice wouldn't allow for, minimizing the potential consequences of experimentation through the use of rapid **prototyping** (Strzelec, 2004).

Strzelec's pieces have been exhibited throughout the United States and currently reside in multiple private and public collections (2016). Her current practice is driven by the creation of wearable objects via computer aided design and 3D printing, and is an ongoing investigation into the ways wearable objects interact with the surface of the human body (Strzelec, personal communication, May 11, 2017). The objects themselves are built layer by layer using various plastics and photosensitive resins ("Professor of Visual Arts Rebecca Strzelec named 2016-17 Penn State laureate", 2016). Strzelec's pieces find their origins in common or recognizable forms inspired by contemporary society, be it a gas pump, balloon, or a baseball diamond. These shapes are altered and conceptualized through their application as wearable objects ("Rebecca Strzelec: Gallery", 2017).

Wielding the iconography of everyday life, Strzelec's work seeks to create and communicate hybrid histories in new spaces by blurring borders and using cutting-edge technology (Strzelec, personal communication, May 11, 2017). The relationships born from these interactions are meant to promote dialogue and question the status quo of contemporary society ("Rebecca Strzelec: Statement", 2017, para. 8). In her lecture "Hybrid Makers: The Role of Rapid Prototyping in Jewelry and Metalsmithing", Strzelec explains: "It is the duty of the technology driven artist to create work that exceeds the novelty of their process."

DESIGNING FORM

Module 1: Case Study 1

REFLECTION QUESTIONS

1. Rebecca Strzelec tokes the forms and objects that inspire her pieces and turns them, through design, into artworks that ore able to convey ideas. What kind of criteria do you think she uses to select and alter those objects in order to explore her ideas? How might **empathizing** with others and **defining** problems play a part in her choice of source material?
2. Strzelec believes that technology driven artists ore obligated to make work that "exceeds the novelty of their process." What do you think she means by this? Do you agree or disagree?
3. How does Strzelec utilize **design thinking** in her artistic practice? Does her use of rapid **prototyping** technologies facilitate this process?

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IMAGE ATTRIBUTIONS

Figure 1. Retrieved from http://personal.psu.edu/ras39/red%20bracelet.html

Figure 2. Retrieved from http://personal.psu.edu/ras39/octane.html

DESIGNING FORM

Module I: Case Study II

JONATHAN KEEP

Artist Jonathan Keep works in Suffolk, United Kingdom, and is a pioneer in synthesizing traditional techniques in ceramics with digital fabrication processes. In his studio, Jonathan describes his process as seeking to explore the use of objects to communicate thoughts and express emotions in a way that goes beyond utilitarian need (Keep, n.d., para. 2). Keep's works ore often inspired by patterns and forms from the environment such as icebergs, petrified wood, and even the sound waves of a bird (Han, 2014, para. 2). His practice reflects upon the aesthetics of the natural world while simultaneously experimenting with process and materiality. The integration of computer-aided design into his process urged Keep to problematize aspects of digital fabrication as they compared to analogue work in his studio (Keep, n.d., para. 3).

Figure 1. Icebergs, porcelain, 2016.

Figure 2. Jonathan Keep pictured with recent work.

DESIGNING FORM

Module I: Case Study II

PROJECT DESCRIPTION

Jonathan Keep has a long history of utilizing computer software to develop new ceramic forms. This practice was developed from his interest in the hidden numerical codes and patterns that occur naturally in the world (Keep, n.d., para. 1). This interest in sequence and order is intimately linked to Keep's design process, whereby the shapes of his vessel formations are written in computer code using Processing (n .d.). Despite there being more visually-oriented design software available, Keep chooses to utilize parametric design to create his forms in a significantly more abstract, code-oriented way (Keep, 2014, para. 1). He says of this process: "It was that 'blind forming' in code that interests me ... 'Form' is my driving fascination . So the question for me is then, assuming we and our psychological make-up has evolved out of the same natural system out there in the wilderness what is the relationship between natural form and artistic form. I was seeing how scientists were gaining a better understanding of us and our world through computational modelling and thought, 'why can't artists be doing the same?' Architects had developed a whole new formal language through computation, so why not potters?"

Keep admits to a fascination with abstraction, favoring it over and above representation (Han, 2014). This visual appreciation combined with a love of instrumental music have intimately informed the forms he creates and the sources of his inspiration (Keep, n.d., para. 4). All these abstract visual ideas turn later into digital objects designed via computer code. After these unique forms are generated, the digital information is then passed on to a DIY studio-based 3D printer which Keep created by adapting a Delta-style 3D printer for clay (Han, 2014). The process concludes with the combination of digital and traditional fabrication techniques, when the forms are glazed and fired as traditional ceramic vessels would be.

REFLECTION QUESTIONS

1. Jonathan Keep uses computer code as an art material, just like he uses clay as an art material. How does thinking about computer code as an art material change how you might use it? If you're not comfortable "writing" code, do you think you could "sculpt" code like clay or "chop" code like wood?
2. Why do you think Keep chose to design his vessels using computer code? How does the code, and the rules Keep programs into it, help the final object communicate his intentions? If he sculpted the same objects by hand, how would that change them?
3. Jonathan's work is made possible by utilizing "open source" software and hardware. Open source means the technology is made free for others to use and change. Jonathan has developed and disseminated his own open source tools. Large 3D printing companies have not shown an interest in 3D printing with clay, so the development of clay printing has been carried out by a loose group of artists, designers, and engineers working and sharing information. What are the perceived benefits and drawbacks of using an entirely open source process? What are the challenges?

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Keep, J. (2014). Studio journal: Sunday, march 2014 [Blog post]. http://www.keep-art.co.uk/journal_4.html

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from http://www.keep-art.co.uk/digital.html

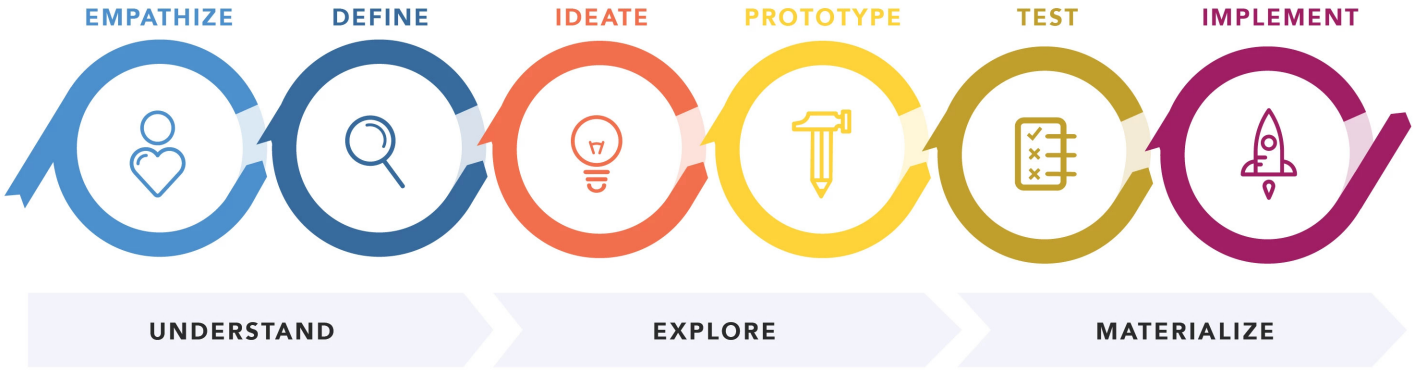
Figure 2. Retrieved from http://www.keep-art.co.uk/digital.html

DESIGNING FORM

Module 1: Handout

DESIGN THINKING PROCESS

Any design process requires creative thinking. It starts with **defining** a problem by **empathizing** with people's needs, **ideating** and **prototyping** possible solutions, and then **testing** them to **iterate** and improve on ideas. (See all those arrows looping back? That's **iteration**!



Source: https://www.nngroup.com/articles/design-thinking/

1. UNDERSTAND

In the spaces below, identify problems faced by you, faced by people you know, and faced by humankind in general. By open-minded about what constitutes a "problem." These problems can be as serious ("global warming") or as frivolous ("my desk at school doesn't serve me ice cream") as you want. These problems could be as real ("economic inequality") or fanciful ("it's hard to eat a cloud") as you want.

Empathize with what people do, say, think, and feel about an issue (maybe interview some people!). Then **define** problems based on that empathy.

Problems I personally face	Problems people I know face	Problems faced by humankind

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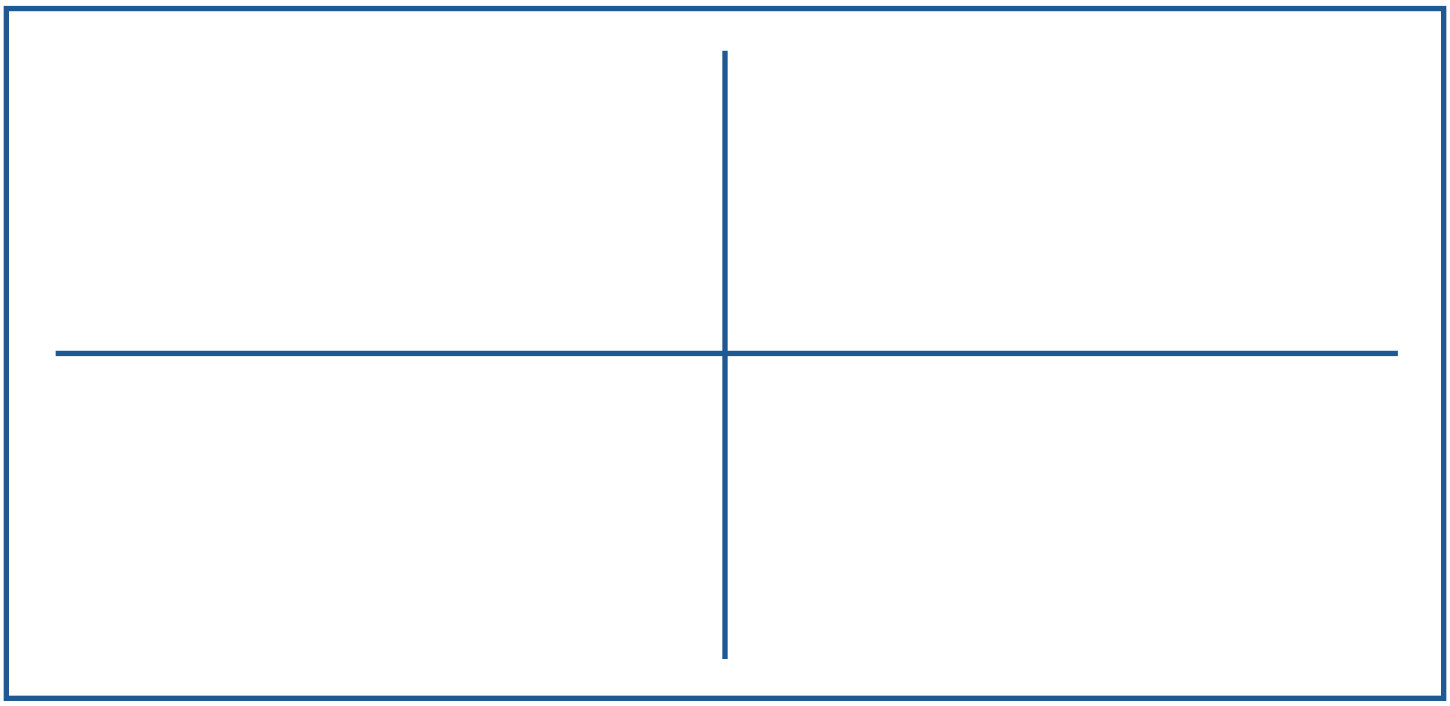
Module 1: Handout

2. EXPLORE

Ideate. Choose one of the problems from the previous activity, and sketch (below, or on a separate sheet) at least 4 different possible objects that might address that problem in different ways. No idea is a bad idea at this point - feel free to be as inventive or wild in your concepts as you want!

- Play with concepts through free association, exploration, chance, and reflection.
- Look at examples to gain insight, source options, and remix possibilities.
- Discuss possibilities with others. You can **test** your ideas before **prototyping** them by getting feedback from others on your brainstormed concepts.



3. MATERIALIZE

Prototype. Use the materials provided to build a model of your strongest sketch/idea from part 2, based on your own reflection and feedback. Your model could be functional, or could be a physical "sketch" that represents your idea, even if it doesn't "work" yet.

Test. Share your prototypes with your groupmates. Explain the problem(s) you are trying to solve, and how your design addresses them. Take note of the feedback, and provide thoughtful feedback on your groupmates' designs.

Iterate. Revisit and revise your prototype, based on the feedback.