



This presentation prepares students to begin looking for biological strategies (natural models) that can inform their design challenge. It introduces the online research tool AskNature and includes suggestions for other ways to research a “biologized” design question. Before viewing this presentation, students should have previously viewed the “Biologize the Design Question” Presentation.

Presentation Objectives:

- Explore several methods for researching biological strategy information.
- Investigate a taxonomy that helps organize biomimicry functions.

CREDIT:

Getty Images 153187546: Alvenmod: Bird Watcher Silhouette

**Objective:**

- Explore several methods for researching biological strategy information.

Suggested Teaching Strategy:

Tell students that once they have “biologized” their design challenge and have their “How does nature...” questions in hand, they can then start looking for inspiring natural models. Ask students where would you start looking if you needed to find answers to the question “How does nature sense movement in the dark?”

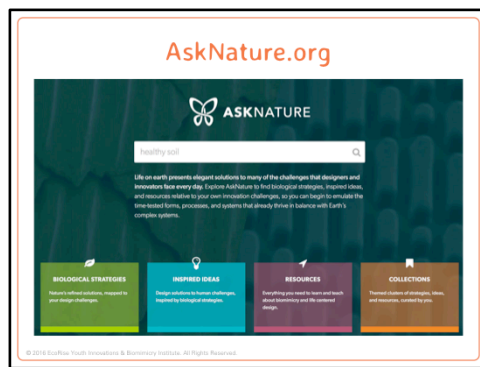
Accept all answers, asking clarifying questions to encourage further thought, and record key ideas on the board. Sample answers and clarifying questions:

- A library or museum: What parts of the library or museum? Would you talk with someone who worked there?
- Search online: Anywhere specific? What kinds of websites do you think would have this information? What search terms would you use?
- Ask a teacher or other professional: Which teachers or professionals do you think would be most likely to know about this topic? Why?
- Research animals that are blind or nocturnal: What about plants? Do plants sense movement?
- Research animals that live underground or in dark caves or in the deep sea: Where would you look for this information?

Then use the following slides to elaborate upon or reinforce ideas brought up in this initial discussion.

CREDIT:

Getty Images 599481142: H_Yasui: Scops-owl



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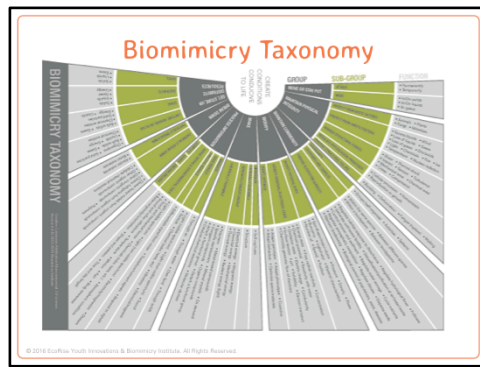
Suggested Teaching Strategy:

Share with students that the Biomimicry Institute has created a tool to help people find biological strategies to inspire design solutions. AskNature is a special database of biological information organized by function. So, if you know the function you want to design for, you can easily search for organisms that have strategies for that function! AskNature uses a special classification system called the “Biomimicry Taxonomy” to organize strategies by function. You can browse AskNature using this taxonomy by clicking the “Explore” button on the home page.

Note: AskNature is currently available only in English. If your students need a resource in a different language, do research to see if you can find something suitable. You may also wish to reach out to the Biomimicry Institute to see if they can make a recommendation: info@biomimicry.org. Alternatively, students can use the details about AskNature shown on the next few pages to guide the way they search the Internet and organize what they find.

CREDITS:

Resource and image: Biomimicry Institute. (2016). AskNature. Retrieved from <http://www.asknature.org>



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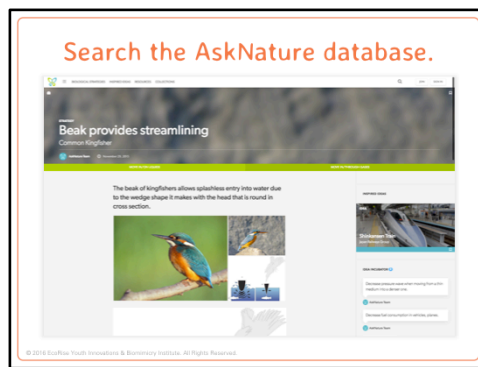
Suggested Teaching Strategy:

Explain that what we see here is an excerpt of the Biomimicry Taxonomy zoomed in so we can see some detail. Point out that the Taxonomy is organized into a hierarchy of functions, from simple to complex. The simplest, broadest functions are at the “group” level, followed by “subgroup,” and then a specific function. When you browse AskNature, it can be helpful to identify the function that best matches what you are looking for—the problem you are trying to solve. Then you can navigate straight to that part of the database. For example, if you were working with the question “How does nature reduce turbulence in water,” the best match would be at the group level “Move or Stay Put,” then “Move,” and finally the function “Move in/on liquids.”

Tell students you will give each team a copy of this taxonomy to help them organize their thoughts about specific functions. Note that students may come up with functions that don’t directly match those within the Biomimicry Taxonomy—either because they used a different vocabulary or because their functions can be further simplified. Students can still use the Taxonomy by looking for one or more close matches.

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Resource and image: Biomimicry Institute, The. (2016). AskNature. Retrieved from <http://www.asknature.org>



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Suggested Teaching Strategy:

Tell students: This is a screen shot of a strategy page from the AskNature website. This strategy relates to the Kingfisher's streamlined beak, which allows it to enter water with almost no splash. You can see that relevant functions from the Biomimicry Taxonomy are displayed prominently in the green bar. Further down the page for this strategy, you can find a summary description of the strategy and a diagram that explains how it works, as well as additional information about the bird. On the right, there is also a link to a design (the Shinkansen bullet train) that was inspired by the kingfisher's beak.

AskNature has about 1,600 strategies in its database right now. That may sound like a lot, but there are over eight million different species on planet Earth today. So, use AskNature as a starting place, but don't limit your research only to AskNature.

(Note: Not all strategies on AskNature are as fully featured as this kingfisher example.)

CREDITS:

Resource and image: Biomimicry Institute, The. (2016). AskNature. Retrieved from <http://www.asknature.org>

Statistic: ScienceDaily. (2011). How many species on Earth? About 8.7 million, new estimate says. Retrieved from <https://www.sciencedaily.com/releases/2011/08/110823180459.htm>

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Suggested Teaching Strategy:

Tell students that it can also be very helpful to talk to people who know a lot about nature. These people might not know much about biomimicry, but if you know how to ask the right biology questions—focusing your questions on the context and functions you are interested in—these people may have a wealth of knowledge share. For example, you could ask someone who works at your local nature center, “What strategies do animals that are awake at night use to be able to see in the dark?”

Later, as you learn more and identify a particular strategy that interests you, you might want to talk to a specialist who knows more about that specific organism or natural phenomenon.

If you don’t have local people you can ask, Arizona State University offers a service for students called “Ask a Biologist.” You can send them a question and volunteers will try to answer it for you. Be sure to read and follow the guidelines for submitting questions.

CREDITS:

Resource: Arizona State University. (n.d.). Ask a question. Retrieved from <https://askabiologist.asu.edu/contact/askaquestion>

Image: Getty Images 533767955: Hill Street Studios: Students and teacher talking on park benches

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Suggested Teaching Strategy:

Tell students there are a lot of magazines and websites that specialize in writing about scientific research for the general public. These are called “secondary literature” sources, and they are a great place to find information. They are not organized by function the way AskNature is, but keyword searches can often lead you to relevant information.

Wikipedia can be good for a start, but don’t rely on it as a sole source of information. Always check article references and read some of the source material, if you can. If you are having trouble finding the information you need, ask a librarian for help.

CREDITS:*Resources:*

Discover. [n.d.]. [Home page]. Retrieved from <http://discovermagazine.com/>

EurekAlert! [2016]. [Home page]. Retrieved from <http://www.eurekalert.org/>

National Geographic [2016.]. [Home page]. Retrieved from <http://www.nationalgeographic.com/>

ScienceNews. [2016.]. [Home page]. Retrieved from <https://www.sciencenews.org/>

Image: Getty Images 519476132: FactoryTh: Edge of open book pages



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Suggested Teaching Strategy:

Remind students to keep going outside! Encourage students to keep a nature journal, as it can be very helpful and rewarding for noticing and recording biological strategies. Tell students to record their observations, sketches, speculations, and questions, and then to follow up with research to answer questions and gain additional knowledge.

CREDIT:

Getty Images 472126727: baona: book