

MECHANICAL ENGINEERING WITH PROFESSOR PARSAORAN HUTAPEA

TALKING POINTS

KNOWLEDGE

1. What types of medical procedures are surgical needles used for?

COMPREHENSION

2. Why can surgical needles cause tissue damage?
3. Why is it useful to look at the natural world for solutions to problems?
4. Which features of honeybee stingers make a good design for surgical needles, and which do not?

ANALYSIS

5. Why do you think it is important for mechanical engineers to collaborate with people working in other fields?

EVALUATION

6. How would you assess whether a new needle design was better than a standard surgical needle?
7. Doyoung says that she always reviews her mistakes. When was the last time you made a mistake or had a plan that did not go as intended? What did you learn from this experience?

CREATIVITY

8. One of the challenges with designing new surgical needles is finding one that is suitable for different body tissues. Can you imagine any solutions to this problem? How would you go about testing these possible solutions?

ACTIVITIES

EXPLORE BIOINSPIRED ENGINEERING

Make a poster or PowerPoint presentation about another bioinspired object or device. Include information about the species that inspired the device and the relevant adaptation, as well as information about how scientists created the device and what it is used for. It does not have to be a medical device – you can get ideas about some bioinspired medical technologies here:

www.asme.org/topics-resources/content/9-bioinspired-medical-technologies

CREATE YOUR OWN BIOINSPIRED DESIGN

You can start either by thinking about species with amazing adaptations – how birds fly, how chameleons change colour, how whales communicate under water, how plants use chemical defences – and think about how these adaptations could be applied to a human problem.

Or, you can start by thinking of a problem or an object that does not work optimally and then think about which species might have the solution to your problem.

Be creative! Sketch out your design and label its features, including information about which species and adaptations inspired it.

MORE RESOURCES

- Visit the homepage for Chai's lab: sites.temple.edu/hutapea
- Watch a short video about Chai's work designing a new surgical needle: news.temple.edu/news/2018-03-22/3-d-printed-surgical-needles-engineering-franklin-institute
- Watch Janine Benyus talk about 'biomimicry' and the ways that humans have taken inspiration from nature to design new objects and face challenges: www.ted.com/talks/janine_benyus_biomimicry_in_action?language=en
- Chai recommends these useful resources from The American Society of Mechanical Engineers in the US: www.asme.org/topics-resources/content/infographic-where-do-americas-mechanical-engineers-work
- www.asme.org/topics-resources/content/how-engineers-are-thriving-today
- US News explains the range of job sectors open to mechanical engineering: www.usnews.com/education/best-graduate-schools/top-engineering-schools/articles/what-you-can-do-with-a-mechanical-engineering-degree
- Educating Engineers also provides careers information: educatingengineers.com/careers/mechanical-engineer
- In the UK, the Institution of Mechanical Engineers provides useful information: www.imeche.org
- Information about mechanical engineering in the UK can be found here: www.prospects.ac.uk/job-profiles/mechanical-engineer