What Can Kesler Science Do for You?

4th - 8th grade science teachers love our Life, Earth, and Physical Science materials! With these easy and engaging materials, teachers can save planning time and put their focus back on the teaching that really matters.

5E LESSONS

Two-week lessons with over 100 topics

ESCAPE ROOMS

Engaging activities for review

INQUIRY LABS

Three different levels to fit every student

AMAZING ANCHORS

Anchoring phenomenon to book-end your lessons

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Never worry about planning for a sub again.

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Bellringers for the entire year

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Student-led exploration

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Exclusive Steve Spangler lessons and videos

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Story-driven units with integrated activities

The Kesler Science Professional Learning Network (PLN) group on Facebook has a huge community of engaged and supportive science teachers - come join us!

KESLER SCIENCE

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Name: _____

Date: _____

AI-Powered Worms?

Have you heard how people are using AI to help with their daily choices? They'll ask an app to design their weekly calendar, choose their outfits, or make recipe suggestions for dinner.

Let's say you're in a city you don't know, and you want to meet a friend at a restaurant. It's also your friend's birthday, so you'll need to grab a card. And you'll need to take a subway to get there. Oh, and you **don't** have your phone! 😬 Could AI technology help you complete these tasks?

If you were a 1 mm long nematode worm named *Caenorhabditis elegans*, then the answer would be yes! Scientists have recently figured out a way to use AI to help the simple *C. elegans* worm find its way around a maze while reaching specific targets.

The worms are a favorite specimen in the science lab because of their simple nervous system. They only have 302 neurons, and we've pretty much mapped out everything they do inside of the worm's body. Scientists have even genetically engineered *C. elegans* specimens so that their neurons will respond to different colors of LED light. For example, flashing a blue light might signal that the worm should go forward, and a white light might cause it to speed up.

This is how AI is being used to move worms around a maze. There aren't little worms with tiny computers attached to them. Instead, AI was used to control the LED lights that signal to the worms. Scientists would plug a destination into a maze and ask AI to get the worm there. After a learning period, the system would figure out which signal pattern was necessary to move the worm towards its target.

Does that mean that the worms were completely controlled by the technology, like a character in a video game? The answer is no! The worms could override the AI signals if there was an obstacle in the way or some tasty food in its path. This added to the challenge for the AI.

And that's not all. Scientists are trying to figure out how *C. elegans* can make these complex decisions with only 302 neurons. In comparison, there are Artificial Neural Networks (ANN) with tens of thousands of "neurons" that can't respond to its environment as well as these simple worms can.

Research like this is inspiring a new type of AI called "liquid neural networks" where a system will user fewer "neurons" but respond to environment changes in a way that's a little more natural. This could help technologies like driverless cars react to changes more efficiently.

Will scientists soon be moving on to controlling the behavior of more complex life forms? Who knows! One thing for sure is that the nervous system of mammals is way more complex than a nematode.

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AI-Powered Worms?

Here's how certain mammals stack up in total brain neurons and those neurons just in the cerebral cortex, a special part of the brain:

1. A human has more intelligence than an elephant. Can this be explained using only the number of brain neurons?

_____
_____
_____

2. What other information on the graph could help explain why humans have more intelligence than elephants?

_____
_____
_____

3. Paleontologists are trying to learn about the intelligence of dinosaurs by mapping the inside of fossilized skulls. They hope to determine the overall size of the brain. To help the paleontologists, what would you explain about brain size and intelligence based on this graph?

_____
_____
_____
_____
_____

4. Why would it be difficult to include *C. elegans* on the graph?

_____
_____
_____

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1. A human has more intelligence than an elephant. Can this be explained using only the number of brain neurons?

   The number of neurons cannot be the only factor in an animal's intelligence because the elephant has 251 billion brain neurons while a human only has 86 billion brain neurons.

2. What other information on the graph could help explain why humans have more intelligence than elephants?

   A human has 16.3 billion cerebral cortex neurons, which is much greater than an elephant's 5.6 billion cerebral cortex neurons.

3. Paleontologists are trying to learn about the intelligence of dinosaurs by mapping the inside of fossilized skulls. They hope to determine the overall size of the brain. To help the paleontologists, what would you explain about brain size and intelligence based on this graph?

   Mapping a dinosaur's skull may give information about the size of the brain and possibly even the total number of neurons, but total number of neurons does not tell the whole story. The intelligence depends more on the number of cerebral cortex neurons.

4. Why would it be difficult to include *C. elegans* on the graph?

   C. elegans only has 302 neurons. The scale of the graph is in billions of neurons. The neuron count of the worms would barely show up with such a large scale!

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