



Science and Technology

Researchers Work on 3-D Printing of Living Tissue

Lesson Plan

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Introduction

This lesson plan is to accompany [Researchers Work on 3-D Printing of Living Tissue](http://learningenglish.voanews.com/content/researchers-work-on-3-d-printing-of-living-tissue/2470265.html).

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The approach used in this lesson is based on the CALLA approach. Through exploration of the science content of this article, students can develop their use of English. See the end of the lesson for more information and resources on teaching with the CALLA approach.

Lesson Elements

Prepare

Present

Practice

Self-Evaluate

Expand

Prepare

Introduce the topic of the story: “We are reading about a new scientific process today. As you know, 3-D printing is advancing. What do you know already about the uses of 3-D printing?” Allow students time to share what they know about the new printers.

"For this lesson, we will read about scientists in South Carolina, USA. There are some scientific terms used in the article that you will learn.

"Let's look together at some of the key words in the article."

Vocabulary

automate - v. to run or operate (something, such as a factory or system) by using machines, computers, etc., instead of people to do the work

biofabrication - *n.* the process of creating new tissue

glucose - *n.* a type of sugar that is found in plants and fruits

implant - v. to put something in a person's body by means of surgery

laser - *n.* a device that produces a narrow and powerful beam of light that has many special uses in medicine, industry, etc.

protein -*n.* a substance found in foods (such as meat, milk, eggs, and beans) that is an important part of the human diet

tissue - *n.* living material; a group of cells that are similar in appearance and do the same thing

Present

Explain “Today we’re going to use the strategy **use context clues**. This strategy helps us *guess the meaning of new words* that we read or hear. **Using context clues** can help us to understand the story. In this story there are some technical terms. Let’s look at the first part of the story. If there is a new word, we can use the context to guess its meaning.”

Play the first part of the story; to “American research scientists are now working on creating replacements for living tissue.”

“That word, replacements, is not on our vocabulary list. Do you know what it means? If I don't know what it means, I will look at the sentences around it for clues, or hints about the meaning.”

Show students the next slide or write the sentences on a chalkboard.

Using context clues

The new word is in red in the sentence below.

Three-D printers are used to make everything from automobile parts to bone **replacements** for human patients. American research scientists are now working on creating **replacements** for living tissue.

Look at the words before the word. What words hint at the meaning?

Three-D printers are used to **make** everything from automobile **parts** to **bone**

I see that the words '**make**' and '**parts**' and '**bone**' appear before this word. Hum. Are they making new bones to put in humans? I'm going to use the context to make a guess about the meaning of '**replacements**.' My guess is:

My guess is, "**replacements** are like parts that people make for the human body." I'm going to check it by looking at the other sentence where it appears.

American research scientists are now working on **creating replacements** for living **tissue**.

Are there any clues here? The word '**creating**' is like '**make**.' And I know that **tissue** is living material. So now I'm pretty sure of my guess. I can check by clicking on the word on the screen, to see the definition. Or I can look it up in the dictionary.

Record of my guesses

New Word	Clues from the Context	My Guess
replacement	parts, make, create, tissue	A replacement is something made to put into a human body

Practice

Say, “Now it’s your turn. Make a chart on your paper like the one I showed you. Let’s listen to and read the next section. Be ready to look for new words. Then watch or listen for their **context**, that is, the words around them that help you *guess their meaning*.”

Play the story to “She says new technology, like the Palmetto bio-printer, is a great help to the biofabrication process.”

Next, ask students to write the new words in their chart. Show the chart with the words they found as on the next slide.

Record of my guesses

New Word	Clues from the Context	My Guess
replacement	parts, make, create, tissue	A replacement is something made to put into a human body
biofabrication	creating, manufacturing, living tissue; special printing equipment; ink	Biofabrication is when people use the printer to make living tissue.

Say, “Let’s read another section now. Use **context clues** to help yourself guess the meaning of new words.”

Play to the end of the story.

Repeat the procedure in which students fill in the new words they found and their guesses.

Self-Evaluation

Ask students if they think *guessing the meanings of new words* helped to understand this story. “Do you think **using context clues** helped you guess the meanings of the new words in this story? Try to tell the story in your own words now.”

Ask students to turn to their neighbor and summarize the story in their own words. If time allows, ask a couple of students to share their summary with the class.

Expand

Wrap up the lesson by asking students to think of other times they can **use context clues**. Possible answers are ‘listening to a lecture, studying a textbook, or answering questions.

Encourage students to go home and guess the meaning with a reading assignment; or when listening in another class. A follow up lesson on vocabulary can include looking at parts of longer words (such as bio-) to make guesses.

About the CALLA Approach

The Cognitive Academic Language Learning Approach (CALLA) is an instructional model for second and foreign language learners based on cognitive theory and research.

CALLA integrates instruction in priority topics from the content curriculum, development of the language skills needed for learning in school, and explicit instruction in using learning strategies for academic tasks.

The goals of CALLA are for students to learn essential academic content and language and to become independent and self-regulated learners through their increasing command over a variety of strategies for learning in school. CALLA can be used in ESL, EFL, bilingual, foreign language, and general education classrooms.

CALLA was developed by Anna Uhl Chamot and J. Michael O'Malley, and is being implemented in approximately 30 school districts in the United States as well as in several other countries.

See a list of language learning strategies here: <http://calla.ws/wp-content/uploads/2014/04/strategylist.pdf>