



Science & Technology

Scientists Design Chips to Act Like Human Organs

Lesson Plan

by Jill Robbins, Ph.D.

Level: Intermediate

Introduction

This lesson plan is to accompany the VOA Learning English **Science & Technology** story, Scientists Design Chips to Act Like Human Organs.

Depending on the length of the class period, this lesson may cover more than one session. The approach used in this lesson is based on the CALLA approach. 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

Find out how much students know about the topic of testing drugs by asking questions such as:

- *How do drug companies know their products are safe?*
- *How do scientists test products on humans and animals?*

Lead a discussion on the topic. Then, make sure students know the key vocabulary words from this story. Try having students quiz each other on the words.

Vocabulary

cardiopulmonary – *adj.* relating to the heart and lungs.

grant – *n.* an amount of money that is given to someone by a government or company to be used for a particular purpose such as scientific research

model – *n.* an example; something, usually small, made to show how something will look or work

silicon – *n.* a chemical element that is found in the Earth's crust and is used especially in computers and electronics

Present

Explain “Today we’re going to **use resources** to help us understand a science article. This strategy helps by giving us more information or explanation of what we learn while reading or listening. **Using resources** means looking up a word, like when you use a dictionary, *or* it can mean asking a question, like when you ask your teacher about something. This article tells us about how scientists are working on new technology to test drugs. There are some new ideas that might be hard to understand in the article and the videos that you can watch with it. Let’s see how **using resources** can help us.”

Pass out sheets of paper or ask students to take out their notebooks.

“Let’s start by writing the numbers 1 – 5 on the paper. As we read the first part of the story, we’re going to write some questions. Then we will work together to find the answers.”

Play the first part of the story, to “In the case of a heart, it would be representing the heart muscles and be able to show contractibility and regular beating of the heart muscles.”

Questions on “Scientists Design Chips to Act Like Human Organs”

1.

2.

3.

4.

5.

Stop the recording and say, “Write your first two questions now.” Give students time to write two questions.

Show your questions on the screen or board.

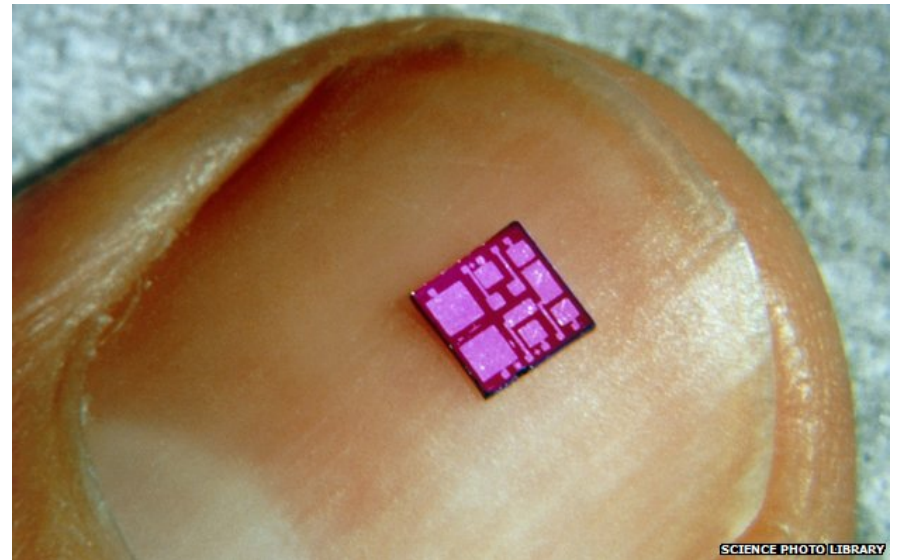
Explain, “I have a question about how big silicon chips are. The article says scientists are making them smaller than a child’s hand. I thought they were *very* tiny, like the size of a fingernail. How can I learn the answer to my question?”

Questions on “Scientists Design Chips to Act Like Human Organs”

1. How big is a silicon chip?
2. What is bioengineering?
- 3.
- 4.
- 5.

Give students a chance to make suggestions. If computers or devices are available in the class, they may suggest looking up the answer online.

“I looked online, and I found a picture showing a tiny chip. But I found some pages saying chips come in different sizes.”



Call students' attention to the second question.

“My next question is about the word, ‘bioengineering.’ How do I find out what that means? It’s not in my dictionary.”

Ask for student suggestions.

Say, “Maybe I should ask a friend. Together we might be able to figure it out.” Choose a student to ask, “What do you think bioengineering means? I know that ‘bio’ means ‘relating to life,’ and when I look up ‘engineer’ I find that it means ‘to plan, build, or manage (something) by using scientific methods.’ So let’s try to guess, what does it mean?” Guide students to the meaning, ‘to make something with living things.’

Say, “So the two resources I used are the Internet and a person. What other resources can we use?”

Take students’ comments and write them on the screen or board. Possible resources are:

1. Textbooks
2. Internet dictionaries
3. YouTube or other online videos
4. Teachers or experts
5. Fellow students
6. Classroom materials, notes, etc.

Practice

Say, “Now it’s your turn. Let’s read the next section. When you find something you want to ask about, write your question. Then we will **access resources** to learn more.”

Play the story to “Experiments with the tissue chips have produced more detailed information than tests using animal or cell models.”

Next, ask students to write their questions. Have one or two share a question. Ask the student to say what resource they will access to find the answer.

Say, “Now it’s your turn. Let’s read the next section. When you find something you want to ask about, write your question. Then we will **access resources** to learn more.”

Play the story to “Experiments with the tissue chips have produced more detailed information than tests using animal or cell models.”

Next, ask students to write their questions. Have one or two share a question. Ask the student to say what resource they will access to find the answer.

List students' suggestions and add to them if possible. Explain, "Now we will watch the two videos in the article."

Play the first video. Stop and ask for student questions.

Ask, "Does the video help you to understand the article? I like seeing the pictures of the chips. Now I can understand better."

Play the second video. Stop and ask for student questions, then play to the end of the story.

Self-Evaluation

Explain to students: “**Using resources** can help us in many ways. How did it work for you? What was a new resource you learned about today?.”

Have students turn to discuss with another partner. Ask them to tell each other the new resource they will use next time they need more information.

Expand

Wrap up the lesson by asking students to think of other times they can **use resources** to find more information. Possible answers are 'reading the newspaper, listening to the news, or watching TV.'

Encourage students to go home and **use resources** with a homework assignment or material being learned in their next class.

Expand

If the class has access to the Internet, ask them to watch the video at <http://spacecraftforall.com> by clicking on the box, “See the Journey.” This video is a documentary about the citizen-scientists. At the bottom of the screen there is a timeline. After watching it, students can compare their own timeline with the one shown in the video. When they return to class, ask them how their timeline was different from the one in the video.

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.





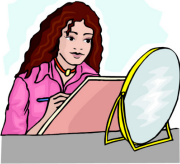
CALLA was developed by Anna Uhl Chamot and J. Michael O'Malley, and is being implemented in approximately 30 school districts in the United States as well as in several other countries.

Below is an illustrated list of language learning strategies.







Metacognitive Strategies

CALLA CONTENT AND LANGUAGE LEARNING STRATEGIES		
STRATEGY	DESCRIPTION	
METACOGNITIVE STRATEGIES		
Plan / Organize	 <p>Planner</p>	<p>Before beginning a task:</p> <ul style="list-style-type: none"> -Set goals. -Plan the task or content sequence. -Plan how to accomplish the task (choose strategies). -Preview a text.
Monitor / Identify Problems	 <p>Check</p>	<p>While working on a task:</p> <ul style="list-style-type: none"> -Check your progress on the task. -Check your comprehension as you use the language. Do you understand? If not, what is the problem? -Check your production as you use the language. Are you making sense? If not, what is the problem?
Evaluate	 <p>I did it!</p>	<p>After completing a task:</p> <ul style="list-style-type: none"> -Assess how well you have accomplished the learning task. -Assess how well you have used learning strategies. -Decide how effective the strategies were. -Identify changes you will make the next time you have a similar task to do.
Manage Your Own Learning	 <p>Pace Yourself</p>	<ul style="list-style-type: none"> -Determine how you learn best. -Arrange conditions that help you learn. -Seek opportunities for practice. -Focus your attention on the task.

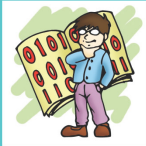
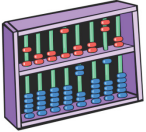
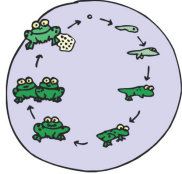
Task-Based Strategies

CALLA CONTENT AND LANGUAGE LEARNING STRATEGIES		
STRATEGY	DESCRIPTION	
TASK-BASED STRATEGIES		
 <p style="text-align: center;">USE WHAT YOU KNOW</p>		
Use Background Knowledge	 <p style="text-align: center;">I know.</p>	<ul style="list-style-type: none"> -Think about and use what you already know to help you do the task. - Make associations between new information and your prior knowledge. -Use new information to clarify or modify your prior knowledge.
Make Inferences	 <p style="text-align: center;">Use Clues</p>	<ul style="list-style-type: none"> -Use context and what you know to figure out meaning. -Read and listen between the lines. -Go beyond the text to understand its meaning.
Make Predictions	 <p style="text-align: center;">Crystal Ball</p>	<ul style="list-style-type: none"> -Anticipate information to come. -Make logical guesses about what will happen in a written or oral text. -Make an estimate (math). -Make a hypothesis (science).
Personalize	 <p style="text-align: center;">Me</p>	<ul style="list-style-type: none"> -Relate new concepts to your own life, to your experiences, knowledge, beliefs and feelings.



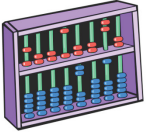
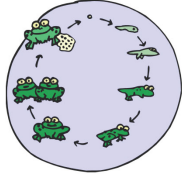
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TASK-BASED STRATEGIES		
Transfer / Use Cognates	 Coffee/Café	<ul style="list-style-type: none"> -Apply your linguistic knowledge of other languages (including your native language) to the target language. -Recognize cognates.
Substitute / Paraphrase	 Make it work	<ul style="list-style-type: none"> -Use a synonym or descriptive phrase for unknown words or expressions.
  USE YOUR SENSES		
Use Images	 See it in your mind	<ul style="list-style-type: none"> -Use or create an actual or mental image to understand and/or represent information. -Use or draw a picture or diagram.
Use Sounds	 Sound Out	<ul style="list-style-type: none"> -Say or read aloud a word, sentence, or paragraph to help your understanding. -Sound out/vocalize. - Use your "mental tape recorder" to remember sounds, words, phrases, and/or conversations.


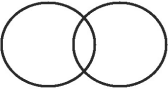


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CALLA CONTENT AND LANGUAGE LEARNING STRATEGIES		
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TASK-BASED STRATEGIES		
Use Your Kinesthetic Sense		<ul style="list-style-type: none"> --Act out a role, for example, in Readers' Theater, or imagine yourself in different roles in the target language. -Use real objects to help you remember words, sentences, or content information.
  USE YOUR ORGANIZATIONAL SKILLS		
Find/Apply Patterns	 abacus	<ul style="list-style-type: none"> -Apply a rule. -Make a rule. -Recognize and apply letter/sound, grammar, discourse, or register rules. -Identify patterns in literature (genre). -Identify patterns in math, science, and social studies.
Classify/Sequence	 Life cycle	<ul style="list-style-type: none"> -Categorize words or ideas according to attributes. -Classify living things; identify natural cycles. -Identify order and sequences in math, science, and social studies. -Sequence events in history.


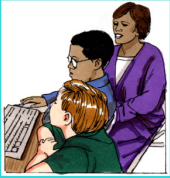



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TASK-BASED STRATEGIES		
Take Notes	 <p>PDA</p>	<ul style="list-style-type: none"> -Write down important words and ideas while listening or reading. -List ideas or words to include in speaking or writing..
Use Graphic Organizers	 <p>A Venn diagram</p>	<ul style="list-style-type: none"> -Use or create visual representations (such as Venn diagrams, time lines, webs, and charts) of important relationships between concepts.
Summarize	 <p>Main Idea</p>	<ul style="list-style-type: none"> -Create a mental, oral, or written summary of information.
Use Selective Attention	 <p>Focus</p>	<ul style="list-style-type: none"> -Focus on specific information, structures, key words, phrases, or ideas.

Task-Based Strategies

CALLA CONTENT AND LANGUAGE LEARNING STRATEGIES		
STRATEGY	DESCRIPTION	
TASK-BASED STRATEGIES		
 		
USE A VARIETY OF RESOURCES		
Access Information Sources	 <p>Look it up!</p>	<ul style="list-style-type: none"> -Use the dictionary, the internet, and other reference materials. -Seek out and use sources of information. -Follow a model -Ask questions
Cooperate	 <p>Together</p>	<ul style="list-style-type: none"> -Work with others to complete tasks, build confidence, and give and receive feedback.
Talk Yourself Through It (Self-Talk)	 <p>I can do it!</p>	<ul style="list-style-type: none"> - Use your inner resources. Reduce your anxiety by reminding yourself of your progress, the resources you have available, and your goals.