**Biomedical Sciences – Artificial Retina Receives FDA Approval**

**Title of Text/Article:** **Artificial Retina Receives FDA Approval**

**Teacher Notes:**

* Materials:
  + Text or article (of sufficient complexity to promote high-level thinking)
  + Sticky notes (for opening “topic question, question generation, written responses, etc.)
  + Chart paper
  + Markers, rubrics (for Text-Based Discussion, Student Written Responses, Question Generation, etc.)
  + Student copies of handouts (for Written Responses, Direct Note-Taking, and Question Generation).
* Preparations:
  + Number paragraphs of selected text/article for ease of locating text evidence during discussions.
  + Develop and display Final/Essential Question at the beginning of the lesson to communicate upfront for students the lesson’s final question and learning outcome.
  + Text-marking: Develop and display a code system appropriate for the text to use in text-coding. Select a small text segment and preplan corresponding coding example(s) to model the text-coding process for students.
  + Directed Note-taking: Develop a graphic organizer with headings appropriate for the text. Select a small text segment and preplan corresponding note(s) to model the note-taking process.
  + Question Generation: Select a small text segment and preplan a corresponding question(s) to model the Question Generation process for students.
  + Any audio visuals, specimens, and/or samples to enhance lesson.

**Tasks:** Teacher asks topic question to launch opening discussion, teaches a few vocabulary words directly, reads aloud to model text marking for students, students read the text and participate in directed note-taking and extended text-based discussion.

**Purpose:** To bring world relevance to text reading, establish a purpose for reading, model fluent reading, provide opportunities for students to become interactive with the text, and think critically about information in the text.

**Topic Question: What impacts would the invention of a device that would provide restoration of sight have on the lives of the blind?**

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| **Predictive Written Response to the Text-Based Question**  Predict which factors may impact the development and design of a technology based medical innovation. |
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**Vocabulary Instruction**

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| **Para-graph #** | **Academic or Discipline Specific Vocabulary** | **Word Part or Context** |
| 1 | *Prosthesis* – Word part: from Greek – pros- (toward) + tithenai (to put) Context – **Argus II** is **first approved** *prosthesis* to **restore limited vision to those blinded**… …**concepts and early devices that led to** the **Argus II**. | Both |
| 3 | *Microelectrode array* – Word part: from Greek – micro (small) + electrode – coined by English physicist Michael Faraday (1834), from, electro- (amber – alloy of gold and silver) + Greek hodos “way”+ array – from Germanic origin (arranged) Context: …**transmits images from a small eye-glass mounted camera wirelessly** to a *microelectrode array* **implanted on a patient’s damaged retina**. The **array sends electrical signals via the optic nerve, and the brain interprets a visual image.** | Both |
| 6 | *Ophthalmology* – Word part - from Greek *ophthalmos* (eye) + *-logy* (study of) Context – "**Seeing my grandmother go blind motivated me to pursue** *ophthalmology*… **to develop a treatment for patients** for whom there was no foreseeable cure," says the technology's co-developer, Mark Humayun, **associate director of research at the Doheny Eye Institute** | Both |

* Direct students to locate words introduced in the text by paragraph number.
* Model for students how to derive word meaning(s) from word parts (prefix, root, suffix) and/or context. Record meanings of word parts and words on chart paper.
* Variations for Vocabulary Instruction:
  + record meanings of word parts and words in word study guide, journal writing, graphic organizers, etc.
  + post word parts, words, and their meanings on a vocabulary word wall; refer to word wall during reading, discussions, and writing throughout the lesson and subsequent lessons.

## Reading #1

**Text-marking**

H – this section of text provides information on the history of the development of the Argus II

C – this section of text provides information on current events in the development of the Argus II

F – this section of text provides information on future events or proposals regarding the development of the Argus II

* Model for students by reading the text aloud and coding a portion of the text. Students follow along and mark their copy. Students proceed to code the rest of the text independently. Students share text markings with table group or partner.

## Reading #2

**Directed Note-Taking** - Record notes containing the most important information relevant to the guiding question

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| **Directed Note Taking:** *Artificial Retina Receives FDA Approval* | | | | | |
| **Guiding Question:** | | | | | |
| **Para-**  **graph #** | **NOTES**  **According to the text, how do the following factors impact the development of the artificial retina?** | **Check relevant categories below** | | | |
| **Bio-logy** | **Tech-nology** | **Fund-ing** | **Regu-lations** |
| **2** | **FDA granted market approval to an artificial retina technology today, the first bionic eye to be approved for patients in the US.** |  |  |  | **X** |
| **2** | **Technology developed in part with support from the NSF.** |  |  | **X** |  |
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* Present a guiding question to direct students thinking while taking notes. Teacher models note-taking using an example statement from the text, then selecting the category or categories that support the statement. Students complete note-taking collaboratively or independently.
* Conduct small- and whole-group efferent discussion. Ask groups to come to consensus on which category is the most impactful according to the support from the text.

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| **First Draft Written Response to the Text-Based Question**  According to the text, which factors impact the development of the artificial retina? |
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* Ask students to complete the second Written Response.
* Variations for this Written Response: Sticky notes quick writes, collaborative partners, written conversations

**Tasks:** Teacher models the generation of a complex question based on a section of text, relating to a broad perspective or issue. Students record the questions, and then students re-read the text to generate their own questions.

**Purpose:** To provide students with a demonstration of question generation and the opportunity for them to interact with the text by generating questions to further deepen their comprehension.

## Reading #3

**Question Generation**

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| **Question Generation:** *Artificial Retina Receives FDA Approval* | | | | | |
| **Para-**  **graph #** | **Questions** | **Check relevant categories below** | | | |
| **Bio-logy** | **Tech-nology** | **Fund-ing** | **Regu-lations** |
| **4** | **Will this technology help patients with blindness caused by factors other than retinitis pigmentosa?** | **X** |  |  |  |
| **11** | **What other conditions is BMES working to address?** | **X** | **X** | **X** |  |
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* Teacher models re-reading a portion of the text and generates one or two questions.
* Students continue to review/scan the text and use their recorded notes to generate questions about information in the text collaboratively or independently.
* To conclude question generation, the teacher has students:
  + share their questions with the related category whole class and discuss which questions they have in common, and which questions are most relevant or significant to their learning.
  + record/post common and relevant/significant questions to encourage:
* extended efferent text discussion
* students to seek/locate answers in text-reading throughout the remainder of the chapter/unit focusing on unanswered questions in collaborative inquiry.

**Task:** Teacher posts an essential question that is text-based, students discuss answers, and review/revise answers to the final/essential question based on discussion.

**Purpose:** To provide opportunities for students to interact with the text and with their peers to:

* identify text information most significant to the final/essential question.
* facilitate complex thinking and deep comprehension of text..

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| **Final Written Response to the Text-Based Question**  According to the text and further discussion, in your opinion, which factor has had the most significant impact on the development of the artificial retina? |
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**CTE Framework and CCSS Literacy Connections:** Carefully select text that aligns

**From Biomedical Sciences, CTE Curriculum Framework**

1. Examine medical interventions in the past and the present including but not limited to, surgery, medication, technology and lifestyle choices.
2. Understand medical research and the process of writing a scientific grant.

Investigate how advances in medical knowledge and technology can aid in building a better human body for the future.

55.0 Explore the process, knowledge and skills required to design a medical innovation.

**From CCSS Reading Standards for Literacy in Science and Technical Subjects 6-12**

LACC.910.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LACC.910.RST.1.2: Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

LACC.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LACC.910.RST.2.6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

LACC.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.

LACC.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

**From CCSS Writing Standards for Literacy in Science and Technical Subjects 6-12**

LACC.910.WHST.1.1: Write arguments focused on discipline-specific content.

LACC.910.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LACC.910.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LACC.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LACC.910.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.