Application Number	M69
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Type	Creation of ancillaries for pre-existing OER
Course Number / Title	Biol 1010K Introduction to Biology I
Final Semester	Fall 2019

Grant Amount	$2,800
Works Being Revised	Openstax Concepts of Biology, Unit 1 The Cellular Foundation of Life (Chapters 1-5): https://openstax.org/details/concepts-biology

Description	Goals: Create elaborative chapter reading guides and retrieval exercises for Openstax Concepts of Biology Unit 1 The Cellular Foundation of Life (Chapters 1-5). Deliverables: • Five elaborative chapter reading guides • Five 3-part retrieval exercises aligned with each of the elaborative chapter reading guides • "How to" learning module designed to help students get the most out of the above materials For many students Introduction to Biology I may be the only life science course they will take during their time in college. Because this may be their only exposure to the life sciences, scientific reasoning, and the scientific method it is an invaluable, and limited, opportunity to prepare these students to make decisions in their daily life where science, data, or medicine are involved. To this end, I plan to use the OER Revisions and Ancillary Materials Creation Mini-Grant to create ancillary materials for the Openstax Concepts of Biology online textbook. I have two ancillary materials creation goals: elaborative chapter reading guides and retrieval exercises. It is my hope that these materials will help the students develop a better and longer lasting understanding of biology and science in general. The first goal is to produce elaborative chapter reading guides that will focus on Unit 1 The Cellular Foundation of Life (chapters 1-5). The elaborative chapter reading guides will be more interactive than a traditional chapter outline including a range of activities and exercises to develop conceptual understanding, as outlined below. Alternate routes to learning: I want to provide alternate routes to learning the content as well as to prepare them for the laboratory experiments that they will perform. To achieve this, I will embed QR codes to helpful external content at the beginning of each section of the reading guide. These will be in the same style as the QR codes provided within the Openstax PDF versions of the texts. For example, in the chapter over photosynthesis Openstax includes a link to an article quite similar to its own text, which is helpful but is the same format as the textbook. In the reading guide I plan to include a link to a video explanation of photosynthesis as well as a video of an experiment involving photosynthesis that is similar to the experiment they will perform in the lab (only freely available content will be used). Engaging with the content: When reading the text or watching videos students can become complacent and passive, letting the content just wash over them and hoping they will absorb it by osmosis. So more than just providing the content to students I want to help them engage with the material in a more meaningful and beneficial way. As they read the chapter and watch the videos they will complete comprehension and data analysis questions. These will give them the opportunity to change gears and work on their recall and analysis skills. Next in the guide will be elaborative activities like concept mapping, developing connections to one's own life, writing own questions, summarizing the content in their own words. These exercises will be content specific and introduce the students to different methods and approaches to elaborative learning that they will be able to apply to other courses.

	Reflection: At the end of each section there will be reflection boxes to encourage engagement of their metacognitive skills. Guided questions will help students to monitor their understanding, evaluate their use of the study tools, and plan future study sessions. Spaced studying: Finally, at appropriate intervals in the guides there will be study "coaching tips" on how to space their study sessions to get the most out of their time. Through these various methods of active engagement in the course content, students should gain better encoding of material. The second goal is to create retrieval exercises aligned with the chapters 1-5 elaborative reading guides. As supported by an extensive body of literature, retrieval practice produces a higher performance on summative assessments than studying alone or elaborative study (Karpicke & Blunt, 2011). Furthermore, repeated spaced retrieval (multiple sessions of retrieval practice spaced out over time) leads to enhanced performance over repeated massed retrieval (multiple sessions of retrieval practice done immediately one after another) (Karpicke & Bauernschmidt, 2011). Since our student's grades ultimately are dependent, at least partially, on performance on summative assessments I want to provide them with the resources most likely to help them achieve their performance goals. The spaced retrieval exercises will be structured to be completed over three sessions with instructions and reflections associated with each to encourage the student to space out their sessions and identify areas that need more work. I will be creating materials that could be used in class and/or through a class LMS that will provide examples of how to utilize the retrieval practice exercises to their best advantage. I have elected to focus on only Unit 1, The Cellular Foundation of Life, for two reasons. First, in my experience, it is more difficult for the students to develop their understanding of this content (the chemical basis of life, cellular metabolism). Second, I want to focus on creating high-quality materials that I am proud to share rather than a high volume of materials in my first solo attempt at OER creation. It is my intention to continue this work through Units 2 and 3 of Openstax Concepts of Biology through future ALG Mini-Grant applications. Reference: Karpicke, J.D., & Blunt, J.R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. Science, 331(6018), 772-775. doi:10.1126/science.1199327. Karpicke, J.D., & Bauernschmidt, A. (2011). Spaced retrieval: Absolute spacing enhances learning regardless of relative spacing. Journal of Experimental Psychology: Learning, Memory, and Cognition, 37(5), 1250-1257. doi:10.1037/a0023436.

Timeline	• March - April 2019: Complete initial drafts of reading guides and retrieval exercises for Chapters 1-3, reflect on format and utility. • April 2019: Create “how to” module. Offer completed chapters to students currently taking Biol 1010 as an extra credit assignment to prepare for their final exam, as part of assignment ask students to provide feedback. • May 2019: Revise Chapters 1-3 based on student feedback and make plan to complete Chapters 4 & 5 • June – July 2019: Complete initial drafts of reading guides and retrieval exercises for Chapters 4 & 5, reflect on format and utility. • Early August 2019: adjust syllabus and course to include the reading guides and retrieval exercises • August-October 2019: implement exercises in course, asking for feedback from students on their use. • November 2019: Analyze student feedback, consider any appropriate adjustments to materials. • December 2019: Prepare and submit final report. • Spring 2020: Attend (or present at) University System of Georgia Teaching and Learning Conference

Budget	$2000.00 – Kathryn M. Dye $400.00 – Travel & accommodations (USG T&L conference) $400.00 – Graphic design for supplemental figures Total: $2800.00

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