CELTSS Faculty Development Funding Application
Innovation in Teaching & Pedagogy

This form should be submitted to Blackboard. Only complete applications will be considered. The application deadlines are October 4, November 8, and March 6. **Up to $1,500 may be awarded** for: 1) Developing new courses or improving pedagogy in existing courses. The proposal must include substantial activities beyond normal and contractual professional responsibilities. 2) Improving applicants' teaching effectiveness. 3) Extending and improving students' learning experience. 4) Enhancing student engagement in either the face-to-face or online classroom environment. 5) Developing curriculum or pedagogy related directly to current or planned FSU courses or programs. The department chair must approve new course development. Recipients of an award for development of online or hybrid courses are expected to work with the Education Technology Office, so that use of technology and incorporation of Quality Matters standards are maximized. Full-time temporary faculty and librarians must complete work on teaching innovation awards by the end date of their employment contracts.

Name:	Amanda SImons	Department:	Biology	Today's date:	11/3/20
Employment status (Full-Time Tenured or Tenure-track OR Full-Time Temporary): Full-time tenured				Date of hire:	9/1/2008

If this application involves more than one faculty member, please indicate the names of those in the group:	
Date department chair notified of this application (applications require notification of chair):	11/7/2019

If you received funding from CELTSS in the last year, attach a copy of your end-of-year report (either at the end of this application or uploaded as a separate file).

Project Title (will be included in A Day in May program, if approved):	Dynamic DNA modeling kit
Project Abstract (will be included in A Day in May program, if approved):	Students often struggle with understanding the molecular mechanisms of DNA replication and transcription. Our existing models of DNA are great representations of DNA structure but cannot be manipulated the way DNA is manipulated in the cell. The purchase of 9 dyanamic DNA modeling kits will allow students to complete hands-on activities in small groups. Active learning instructional methods have been shown to boost student understanding and retention above lecture-based instruction. This also aligns with the AAAS Vision and Change Core Competency of "Ability to use Modeling and Simulation".

PROPOSAL

Please explain your reasons for requesting funding for your project and provide specific details about its contribution to your professional development (2 pages). You should include a list of specific and tangible results of the project, emphasizing its benefit to Framingham State University, as well as dates and timeline showing when you expect results. If you are requesting funds for travel to a conference, please provide the URL link to the conference program. If you expect that you will need additional funds to maintain equipment and materials later, please describe how you will obtain additional funding.

I use a modified form of a flipped classroom in my Genetics course (Biol 208) where about 75% of course time is spent on active learning modules. About a third of the course covers DNA structure and the flow of information from DNA to RNA and protein through the processes of replication, transcription, and translation.

These processes can seem very abstract to students. We discuss molecules that are not visible to the naked eye or even through light microscopy. Experimental methods to study these processes generally rely on measuring changes in populations of cells or molecules, so even those experimental methods are indirect ways of understanding these processes.

I currently use a static DNA model to emphasize features of DNA structure that are important to DNA replication and transcription. However, DNA is not a static molecule. In the cell it bends, twists, and writhes into larger coils. While the most accurate static models of DNA show that one turn of DNA contains about 10 basepairs, in practice this can fluctuate in the cell. Although we think of DNA as a double helix, in the living cell it is dynamically unwound for replication and transcription and can exist as a single stranded molecule. These are challenging concepts for students to visualize.

When it comes to the process of replication, the number of pieces to the replication machinery can be daunting for students, who often resort to memorizing what each piece does without truly understanding how the pieces fit together. Students also struggle in understanding how the ends of linear chromosomes (telomeres) are replicated.

I'd like to use CELTSS funding to purchase 8 12-basepair Dynamic DNA kits from 3D Molecular Designs that will allow students to manipulate DNA in small groups. This is a new modeling kit that has been introduced only in the last year. With CELTSS funding $1500 of the purchase, the Biology Department chair has agreed to fund the remaining $223 to purchase enough kits for 8 student groups. A description of this (super cool) product can be found here:

https://www.3dmoleculardesigns.com/Education-Products/Dynamic-DNA-Kit.htm

I will use these models to develop new instructional materials to teach DNA structure, replication and transcription.

I anticipate purchase of the materials in time for these activities in Spring 2020.

Outcomes are as follows:

- Develop new activity to support existing DNA structure module
- Develop new module to teach DNA replication and telomerase function
- Use the models to support existing laboratory experiment (demonstration for PCR)
- Use the models to support existing transcription module
- Measure student outcomes through performance on post-module assessments (including exams)
- Revise modules following assessment to improve student learning gains.

Numerous studies have documented the increased learning gains that come from active learning vs passive instructional methods. The instructional modules that I propose will require students' active engagement and manipulation of the models.

The use of these models also aligns with the goals of numerous professional organizations dedicated to improving undergraduate STEM education. In particular, the use of these models aligns with the AAAS Vision and Change Core Competency of "use of models and simulation". These modules also align with the American Society for Biochemistry and Molecular Biology guidelines for undergraduate education Foundational Concept of "Information storage and flow are dynamic and interactive".

I am uploading the following supporting materials related to my application:

BUDGET INFORMATION

All CELTSS funding is administered by the University Business Office and is subject to university policy. To complete the portion of the budget form that applies to you, double click on the table below and fill in the fields:

Transportation		
Personal car:	Enter number of miles:	0
	Standard mileage rate:	$0.53
	Total mileage:	$0.00
City/State you are traveling to:		
Parking:		$0.00
Airfare:		$0.00
Luggage fees:		$0.00
Rental car:		$0.00
Fuel (only applies to rental car):		$0.00
Taxis/ground transportation:		$0.00
	Total transportation:	$0.00
Lodging		
Hotel:	Enter number of days:	0
	Daily rate:	$0.00
	Total hotel:	$0.00
Hotel parking:		$0.00
Hotel other:		$0.00
	Total Lodging:	$0.00
Meals		
Breakfast	How many days of breakfast:	0
	Per breakfast:	$7.50
	Total breakfast:	$0.00
Lunch	How many days of lunch:	0
	Per lunch:	$12.50
	Total lunch:	$0.00
Dinner	How many days of dinner:	0
	Per dinner:	$20.00
	Total dinner:	$0.00
	Total meals:	$0.00
Other Costs:	Itemize item:	
Materials*:		$1,500.00
Books*:		$0.00
Equipment*:		$0.00
Licenses*:		$0.00
Wages (student assistants, secretarial support):		$0.00
	Total Other:	$1,500.00
(*all materials purchased with CELTSS funding are property of FSU)		
	Total Cost:	$1,500.00