WESTERN TEXAS COLLEGE
FOUNDATION

Western Texas College Foundation INSPIRE Program

Completed applications must be received on or before the due date (April 19, 2024) to the WTC Foundation located in the Library Resource Center (Building 2) OR via email to sheila.hale@wtc.edu. Applicants are encouraged to submit all necessary documents as soon as possible to assure that a last minute delay will not preclude consideration for a program award.

1. APPLICANT INFORMATION

FIRST NAME: Maedgen LAST NAME: Lindsey

DEPARTMENT: Biology TITLE: Instructor

EMAIL ADDRESS: maedgen.lindsey@wtc.edu PHONE: 3256651736

2. PROJECT

Project Name: Polymerase Chain Reaction for DNA Labs

Fund Amount Requested: $ 5000.00

Amount of funding from other sources for project: $ 0.00

Have you applied for funding before from the Western Texas College Foundation? ☐ YES ☑ NO

If yes, for what project and how much did you receive? _____

Project Abstract (In the space below, please provide a one to two sentence description of project):

Polymerase Chain Reaction (PCR) is a ubiquitous molecular biology technique in medicine, research, and teaching environments used to study deoxyribonucleic acid (DNA), the molecule that stores hereditary information. PCR uses a thermocycler to cycle through steps of denaturation, annealing, and elongation of DNA molecules via the enzyme DNA polymerase. Grant funds will be utilized in the purchase of a thermocycler, ultra-cold sample storage, and reagents itemized in supporting documents, ultimately in support of creating a robust and informative laboratory experience for students.

3. PROJECT PROPOSAL

Please prepare a project proposal (no longer than 2 -3 pages) that includes the items listed below. Additional pages may be included to provide supporting documentation if needed.

A. Description
   a. Provide a detailed description of the proposed activity or program
   b. Outline how completion of the proposed activity will benefit students, the department, division or the institution. Is there a community benefit?

c. Detail the implementation plan.
d. Explain how the activity or program will be evaluated.
e. If applicable, list the equipment and materials needed to complete the project.
f. If the amount requested does not fully fund the project, what other sources of funding are available?

B. Expenses
   a. Outline all *proposed* expenses. Be specific. The Western Texas College's policy on reimbursable expenses applies to all actual expenditures, e.g. travel, supplies, etc.
   b. Please inform the Western Texas College Foundation of any other sources of funding available for this proposal.
   c. If awarded, you will need to provide copies of all receipts for approved expenditures.

I understand and agree to the following provisions:

1. Ownership of materials produced as a result of this award will be in accordance with current policies of Western Texas College.
2. In addition to the final report, if applicable, I will provide Western Texas College Foundation with one complete copy of all materials produced.
3. I agree to present my project or report to the Western Texas College Foundation Board, if requested.
4. The expenditure of funds and request for reimbursement must be in the same fiscal year.
5. **Approved funds must be used within same fiscal year as designated by terms of award.**

CERTIFICATION

Applicant Signature:
My signature below certifies that the information provided in this application is accurate and complete to the best of my knowledge. I authorize Western Texas College Foundation to release any information contained in this application to WTC departments.

Signature: Maedgen Lindsey Date: 4/18/2024

Supervisor Signature:

Signature: Mitch Brumbelow Date: 4/19/2024

Administrator Signature:

Signature: Stephanie Duchesneau Date: 4/19/2024

Maedgen Lindsey

Biology Instructor

4/18/2024

Project Proposal: Polymerase Chain Reaction for DNA Labs

Background

Deoxyribonucleic acid (DNA) is the hereditary molecule of life. Polymers of nucleic acid subunits known as nucleotides, pair complementarily and wind into a two-stranded, antiparallel helix. Sequences of these nucleotides are organized into functional regions called genes, which ultimately inform the assembly of proteins via the Central Dogma of molecular biology. DNA is an integral part of biology, the study of life, as it is the mechanism by which traits are passed down. Due to its integral nature to the subject, DNA is covered in many of the Biology Department's courses including Majors Bio I, non-Majors Bio, Microbiology, and Anatomy & Physiology[1]. Replication of DNA to levels that can be studied is accomplished via the Polymerase Chain Reaction (PCR), the modern version of which was designed by Nobel Laureate Dr. Kerry Mullis and uses a heat-stable DNA polymerase to add nucleotides to a growing DNA chain in a cycle of denaturing, annealing, and elongation[2]. The resultant replicated DNA, known as the amplicon, is then applied to an agarose gel matrix and electrophoretically separated by mass in a process known as gel electrophoresis[4]. PCR has become a ubiquitous technique in medicine, research, and teaching.

Project

In order to study DNA in a lab setting, I am proposing the use of grant funds for purchase of a thermocycler, the instrument which controls temperature cycles in a PCR reaction, as well as an ultra-cold benchtop freezer for preservation of biological samples. The ultra-cold freezer would have multiple benefits, as our current -20 Celsius freezers are inadequate to house the Biosafety Level 1 bacterial culture catalogue that Abilene Christian University's Biology Department (ACU) has offered for use in WTC's biology labs. Students would get a hands-on experience pipetting the appropriate reagents, which would also be purchased by the grant, designing thermocycler programs, and performing analysis of banding patterns after gel electrophoresis. As biology students graduate from WTC and matriculate into higher university, industry, and medicine, they will encounter PCR and gel electrophoresis in some form or another. Preparing students for this process by giving them first-hand experience will be a boon to them, and reflect positively on WTC's commitment to experiential learning. Project success will be evaluated by laboratory report, integrated with the Project Based Learning method, as well as formally by laboratory exams.

Expenses

While I do not have another funding source at this time, WTC has received a generous donation of DNA-related equipment from ACU—including a gel electrophoresis power supply, three calibrated micropipettors, tips for the micropipettors, and a casting tray for the agarose gel. In order to implement the DNA lab in its fullness, WTC would need to purchase a thermocycler for the PCR, an ultra-cold freezer for sample storage, reagents including DNA polymerase, nucleotides, primers, and magnesium ions. These can obtained in preportioned mixtures, and

one purchase would be sufficient for many semesters worth of labs[3]. WTC biology department currently has reagents for gel electrophoresis, but would need to refresh them as they are consumable.

Table 1. Summary of Estimated Expenses for DNA Lab, assuming 100 Sequencing Reactions

Item	**Model/Item#**	**Vendor**	**Cost**
Ultra-Low Sample Flash Freezer 20 L	DW-86W20	EAWK	$2150
Thermocycler	EdvoCycler 2 Classroom PCR Machine	EdvoTek	$2200
PCR Master Mix	ReadyMix Taq PCR Reaction Mix	Millipore Sigma	$200
Forward Primer	16S RNA 51-01-19-06	Integrated DNA Technologies	$11.50
Reverse Primer	16S RNA 51-01-19-07	Integrated DNA Technologies	$11.50
Agarose	BS-A-100	Stellar Scientific	$150
50x Tris-Acetate-EDTA	B49 TAE Buffer	Thermofisher	$120
SYBR Safe DNA Stain	S33102	Thermofisher	$100
DNA Gel Loading Dye	RO611	Thermofisher	$50
		Total	**$4993**

Works Cited

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2002). The Structure and Function of DNA. In *Molecular Biology of the Cell. 4th edition*. Garland Science. https://www.ncbi.nlm.nih.gov/books/NBK26821/
2. Canene-Adams, K. (2013). Chapter Twenty Four—General PCR. In J. Lorsch (Ed.), *Methods in Enzymology* (Vol. 529, pp. 291–298). Academic Press. https://doi.org/10.1016/B978-0-12-418687-3.00024-0
3. *Standard PCR Protocol*. (n.d.). Retrieved April 18, 2024, from https://www.sigmaaldrich.com/US/en/technical-documents/protocol/genomics/pcr/standard-pcr
4. Voytas, D. (2001). Agarose gel electrophoresis. *Current Protocols in Immunology*, *Chapter 10*, 10.4.1-10.4.8. https://doi.org/10.1002/0471142735.im1004s02