ANATOMAGE PROJECT DESCRIPTION – TITLE III NASNTI SUPPLEMENTAL FUNDING

I. Introduction and Need for the Supplemental Project

Northland Pioneer College (NPC) proposes to use $150,670.00 in supplemental funding from the Title III NASNTI program to build upon the success of its Technology to Advance Learning Outcomes at Northland (TALON) project. The goal of TALON is to extend dual enrollment opportunities to high school students across our rural and remote service area, especially at those high schools where attracting and retaining qualified instructors, especially those who teach in the areas of math and science, is prohibitively difficult.

Supplemental funding from Title III NASNTI will allow us to address a compelling unmet need. Specifically, NPC has been unable to offer a laboratory science class that meets college general education requirements to students in remote areas, because of the required hands-on lab component. Emerging virtual-reality technology will enable us to pilot NPC's BIO 160 course, *Introduction to Human Anatomy and Physiology*, over the interactive network established through Title III NASNTI for TALON, thus expanding our general education dual enrollment offerings to include a laboratory science. Per NASNTI Supplemental application guidelines, this project addresses "skills that align with the skill needs of industries in the State or regional economy involved for careers in STEM fields…" as well as the following suggested activity: "Purchase of educational materials or the purchase, rental or lease of scientific or laboratory equipment for educational purposes, including instructional and research purposes."

II. Background, Goal and Objectives

Northland Pioneer College has always prioritized the ability to provide equitable course offerings at all nine campus and center locations across its 21,000 square-mile service area. The inability to offer a lab science class prevents students at our most remote locations from being able to enroll in a general education science for university transfer. NPC faculty in Biology have investigated different modalities and utilization of various tools to deliver lab sciences in a distance learning format. While the didactic portion is not a concern, none of the modalities or tools explored provide an instructor-guided, authentic, hands-on experience. Instead, the suggested hands-on components require the individual students to conduct laboratory assignments on their own, often as a homework piece, without the oversight and input of the classroom instructor. While we recognize that distance-learning lab science classes with hands-on elements like these are being offered at rural colleges, NPC science faculty feel strongly that they do not have the academic rigor to meet the desired course outcomes. Our overall goal is that students receive the same lab experience in a distance course as they would in a live lab.

Two years ago, in their search for solutions to the science-through-distance-learning problem, NPC Biology faculty discovered two companies that manufactured anatomy visualization products. These revolutionary teaching tools enabled students to virtually dissect, examine, manipulate and explore human cadavers. Because they operated on a virtual plane, students could interact with them, then use and reuse the virtual cadavers. This technology made hands-on anatomy and physiology labs possible in rural locales like the NPC service area. The implications for offering these learning tools at our campuses and centers are exciting, because they have the potential to place our rural students' lab experiences on par with those of students at urban colleges and universities where access to cadavers is commonplace. The prospect of being able to advance this virtual technology to our most rural locations using distance learning technology has even greater positive ramifications.

The faculty explored two virtual anatomy visualization products: The Sectra table and the Anatomage table. The Sectra Table has an ergonomic, multi-touch display workstation that lets teachers and students access the Sectra Education Portal and its content to engage in group lessons. Students can interact with Sectra using exploratory and tactile approaches, interacting with anatomical images throughout the learning process. Sectra Terminals operate just like a smartphone—users simply touch the screen and can interact with images intuitively. Functionality includes the ability to swipe, scroll, zoom, rotate, and navigate inside the images, as well as remove layers of skin and muscle and dissect the body with a virtual knife. Sectra presents these virtual experiences using common radiology scans of patients and 2D data over a 55" television screen. Sectra has great potential as a tool for providing students at remote sites with equitable, hands-on lab experiences.

Anatomage, which was released in 2011 by the Stanford Department of Clinical Anatomy, goes beyond simulated virtual reality. Anatomage tables house head-to-toe, life-size virtual human cadavers, created from actual human cadavers that have been sliced into images that are only 0.2mm thick. This enables students and instructors to conduct true 3D, layer-by-layer dissection, isolating and manipulating particular body systems, organs and tissues. Unlike Sectra, the Anatomage table includes a full anatomy curriculum. Anatomage specialists assist college faculty with integrating this curriculum into the program of each purchaser, and this service is included in the cost of the table.

The Anatomage Table is the most technologically advanced anatomy visualization system for anatomy education and is being adopted by many of the world's leading medical schools. It is the only fully-segmented real human 3D anatomy system. Users can visualize anatomy exactly as they would on an actual cadaver. Individual structures are reconstructed in accurate 3D, resulting in an unmatched level of real accurate anatomy, dissectible in 3D. Anatomage Table-based education vaunts a growing body of publications showing improved test scores, more efficient class and lab sessions, and student acceptance. Moreover, Anatomage makes its growing family of users part of an interactive, online community via online forums, user group meetings and seminars.

What began as a search to offer an equitable, hands-on lab experience at our remote locations morphed into the potential to provide NPC students in Anatomy and Physiology, as well as Nursing and Allied Health programs with the opportunity to have the same kind of cadaver-based laboratory experience as their counterparts at urban schools. Anatomage provides that potential, because of its superior hi-def, 3D resolution, and life-size imaging of actual cadavers. What really sets it apart however, is that unlike Sectra, it is PACS-integrated, meaning images can be shared across multiple sites within a network.

Prior to the advent of TALON and its CISCO-driven distance learning system, NPC would not have had the technological ability to integrate a tool like Anatomage for teaching lab sciences at remote sites. Phillip "PJ" Way, NPC's Chief Information Officer and his staff researched the potential for Anatomage functionality to be shared outside of an internal network and found themselves on the cutting edge of Anatomage's evolution. Anatomage is developing software applications that will enable it to function across networks, thereby making hands-on, distance learning lab classes a reality by using the TALON system. CIO Way consulted CISCO to assure their capacity to support Anatomage technology, and the framework for an exciting partnership was laid.

In early May, CIO Way and two of his IS team members met with two representatives of Anatomage at their company headquarters in San Jose, CA. During the two-hour meeting, the IS team was able to discuss NPC's goals and vision for delivery in educational environments and the technical challenges

and concerns that exist. Anatomage is willing to support this cutting-edge effort, and suggested third-party tools that may be used to establish distance-learning connectivity until a native solution is developed. Newer versions of Anatomage's existing software are already in the pipeline for future release.

During the meeting, the NPC IS team was also able to see and evaluate all the available products: Standing Table, Table Classic, Table Clinical and Table Alpha. The two which had the most relevance for this project were the Table Classic and the Table Clinical. Based on design, intent, application, pedagogy, potential success for adoption and technical success for implementation, the IS team agreed that the Table Clinical was the best option. This is a stand-alone, complete unit which can be easily moved, shares the same screen scales as the developing NPC environment and seems more intuitive in design for use. CIO Way presented his IS team's findings and recommendations to the project task force, including TALON Director Renell Heister; NPC Dean of Arts and Sciences Rickey Jackson; Dr. Eleanore Hempsey, NPC Professor of Biology and Anatomy and Physiology and Mark Vest, NPC Vice President for Learning and Student Services. Based on the rationale CIO Way presented, and on their own exploration of the comparative features of each of the Anatomage products, they concurred that the Table Clinical was the best choice for the project.

It is our project goal to be fully prepared to deploy a distance-learning-enabled laboratory science class, complete with compulsory hands-on lab component that meets college general education requirements to high school students in remote areas via the TALON system by December 2019. To accomplish this, we will bring together CISCO, Anatomage, and NPC's Information Services team to procure and install equipment and ancillary applications and establish the network functionality, while training NPC's faculty in biology and allied health programs to become fully proficient in the use and application of Anatomage as a hands-on learning tool. We will adopt a train-the-trainer approach for both IS staff and faculty to assure sustainability and to ensure we can disseminate project activities and outcomes within TALON and with other institutions who wish to implement similar projects. We will pilot BIO 160 using the Anatomage Table Clinical at two NPC campuses, the White Mountain Campus in Show Low and the Little Colorado Campus in Winslow, and evaluate the outcomes of the pilot based on feedback from students, faculty and IS staff, then prepare to deploy BIO 160 at two TALON partner high schools in Spring 2020. This innovative demonstration project has the potential to change the way lab sciences are taught using distance learning applications, by rendering equitable learning experiences for students regardless of the constraints of time and place. Beyond the one-year scope of supplemental funding, and based on the success of the proposed pilot, we will expand remote lab science course offerings to all partner TALON high schools and serve as a model for other rural colleges who could benefit from the same innovations.

In order to assure the project is developed, implemented, evaluated, and sustainable, we will follow the operational chart on the pages that follow:

III. Methodology/Work Plan

Project Goal: To be fully prepared to deploy a distance learning enabled laboratory science class, complete with compulsory hands-on lab component that meets college general education requirements to high school students in remote areas via the TALON system by December 2019.

Outcome Objective 1:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Acquire and operationalize two Anatomage tables to use as teaching tools for NPC's BIO 160 – Introduction to Human Anatomy and Physiology	**1.** Purchase two Anatomage tables and all ancillary supplies and applications required to pilot it as a tool for teaching BIO 160 at NPC's Little Colorado Campus in Winslow, and at the White Mountain Campus in Show Low.	CIO and Staff	December 2018	Anatomage is fully functional at NPC's Little Colorado Campus in Winslow and White Mountain Campus in Show Low by March 2019.
	2. Install Anatomage and ancillary components at the Little Colorado Campus in Winslow and the White Mountain Campus in Show Low.	CIO and Staff	March 2019	
Outcome Objective 2:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Assure IS staff at NPC can operate Anatomage and its ancillary applications to support instruction using the tool.	**1.** Designate not less than three NPC IT techs to serve as Anatomage Tech Specialists.	CIO	January 2019	Designated NPC IS staff are proficient with the operation of Anatomage on the "back end" so they can support instructional use.
	2. Train designated IS techs in the "back end" operation of Anatomage functionality.	CIO supported by Anatomage software engineer	April 2019	
Outcome Objective 3:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Partner with two remote TALON high schools that will serve as pilot sites, offering BIO 160	**1.** Superintendents at prospective TALON schools are contacted regarding plausibility of participating in pilot project, based on potential number of students who can take	TALON Director	**1.** November 2018	Two remote TALON high schools are preparing to pilot BIO 160 for dual enrollment in Spring 2020.
			2. March 2019	

for dual enrollment in the spring semester of 2020.	BIO 160, percentage of Native American enrollment, and geographic location.		**3.** April 2019	
	2. NPC has a signed Memorandum of Agreement with the administration of both pilot high schools to offer BIO 160 for dual enrollment in Spring 2020.	TALON Director		
	3. Ensure academic readiness of students at targeted partner high schools to succeed in the spring 2020 BIO 160 course by working with high school counselors between October 2018 and April 2019 to assure the students complete high school Advanced Biology or Human Anatomy and Physiology by December 2019, if they have not already done so.			
Outcome Objective 4:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Assure NPC faculty and staff in lab sciences and nursing (including lab aides) are proficient with use of the Anatomage table as a hands-on lab tool by June 2019.	**1.** Schedule two Anatomage training sessions for faculty and staff: One at the Little Colorado campus; one at the White Mountain campus, to be taught by Anatomage staff.	TALON Director	**1.** April 2019	**1.** All NPC BIO faculty and lab aides, and at least one nursing faculty at each site are scheduled to be trained in use of the Anatomage table.
	2. Implement both training sessions, incorporating hands-on use of Anatomage tables.	TALON Director with Anatomage staff	**2.** June 2019	**2.** NPC BIO faculty and support staff (lab aides) are prepared to pilot BIO 160 in the Fall 2019 semester at the Little Colorado and White Mountain campuses, using the Anatomage tables for hands-on laboratory applications.

	4. Send designated NPC BIO faculty to annual Anatomage User's Group Forum.	TALON Director	**4.** June 2019	**4.** One designated NPC faculty in BIO serves as a contact liaison with Anatomage to assure continued updates to knowledge base of project faculty, educational staff and IS staff.
Outcome Objective 5:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Develop curriculum specific to BIO 160, incorporating Anatomage as hands-on lab component.	**1.** Designate NPC BIO faculty member to work with Anatomage staff to develop curriculum specific to BIO 160, incorporating Anatomage as hands-on lab component.	NPC Dean of Arts and Sciences	**1.** August 2019	Curriculum for BIO 160 with Anatomage is developed and shared with all project faculty and staff.
Outcome Objective 6:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Pilot BIO 160 at NPC's Little Colorado and White Mountain Campuses, using Anatomage as hands-on lab component.	**1.** Place BIO 160 on the Fall 2019 schedule of classes at NPC Little Colorado and White Mountain Campuses and market it to students.	NPC Dean of Arts and Sciences; NPC Marketing Director	February 2019	**1.** NPC course schedule reflects BIO 160 pilot; NPC Marketing department advertises pilot in local media.
	2. Recruit/Enroll not less than twelve students at each pilot location.	NPC Dean of Arts and Sciences with Academic Advisors	June 2019	**2.** Not less than 90% of students at each pilot location complete BIO 160 using Anatomage as hands-on lab component.
Outcome Objective 7:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**

Evaluate pilot of BIO 160 from both student and instructor perspectives and make modifications as necessary to assure its efficacy.	**1.** Develop and administer Qualtrics survey to students following completion of BIO 160 pilot.	TALON Director with input from BIO 160 faculty	**December 2019**	**1.** Survey results are compiled and analyzed to share with project task force.
	2. Convene project task force with BIO 160 pilot faculty for the purpose of analyzing pilot from student and instructor perspectives.	TALON with BIO 160 faculty and project task force	**December 2019**	**2.** Modifications to the pilot are made as necessary to deem it ready for deployment at two remote high school locations.
Outcome Objective 8:	**Related Process Objectives:**	**Responsible Person**	**Completion Date**	**Outcome Measures**
Equip two partner high schools with software necessary to deploy Anatomage applications to support BIO 160 to be offered as dual enrollment in Spring 2020.	**1.** Purchase all software necessary to deploy Anatomage component at two identified partner TALON high schools.	CIO	**April 2019**	Equipment, software and curriculum are in place and ready for pilot of BIO 160 at two identified partner TALON high schools by December 2019.
	2. Software is installed and tested at two identified partner TALON high schools.	CIO and staff	**October 2019**	

IV. Staffing/Capacity to Carry Out the Project

Mrs. Renell Heister, Director of NPC's current, NASNTI-funded TALON project will provide administrative oversight of this extension of TALON. Outcomes for the TALON project are on-schedule and under budget for project year four, with a total of fourteen of the proposed sixteen high schools on board with TALON classes for academic year 2018-19. Most importantly, because each partner high school acknowledges the benefit of TALON, not only in making dual enrollment classes available to their students, but also in enhancing the likelihood that TALON students will pursue post-secondary education, negotiations are proceeding with all partner school districts to sustain TALON equipment and staffing beyond the sunset of grant funds.

NPC Biology faculty, Eleanor Hempsey, PhD, will work with Anatomage staff to customize Anatomage curriculum to integrate seamlessly with BIO 160 and coordinate the training of her peers in NPC's biology, nursing and allied health programs to become fully proficient with the use and applications of the Anatomage table. Dr. Hempsey has a BS from the University of Redlands, with a major in Biology. She received her Master's in Biological Anthropology from the University of Cambridge – Great Britain. Her PhD was earned at the University of Ulster in 2008. She has taught Biology and Anatomy and Physiology at NPC since 2013. It was Dr. Hempsey who initiated exploration of the technology that would enable NPC to offer equitable lab science experiences at remote sites. Dr. Hempsey has championed outreach to all students, regardless of location, being the first instructor to place an introductory Biology class (hands-on lab component not a requirement) in an online format to extend offerings to students at NPC's most remote sites.

Phillip J. (P.J.) Way, NPC's Associate Vice President and Chief Information Officer has led his Information Services staff in the development and implementation of all technical aspects of the TALON project since its inception in 2015. CIO Way has used his knowledge of networking and network systems to great effect in assuring that TALON activities were achieved according to timeline and budget. It is CIO Way who coordinated communication between CISCO and Anatomage representatives to explore the possibility of a partnership to make this innovative investigational project a reality. CIO Way earned his BS and MIS from the University of Phoenix.

NPC has managed numerous broad-spectrum, multi-year federal grants, including those from Fund for the Improvement of Postsecondary Education (FIPSE), Carl Perkins Vocational Education, Health Resources Services Administration (HRSA). Four successful projects for developing, implementing and deploying distance learning technology and applications, each one built on the success of the former, were funded by Title III.

V. Evaluation

To develop this proposal, NPC formed a project task force including Renell Heister, TALON Project Director; PJ Way, NPC Chief Information Officer; Rickey Jackson, Dean of Arts and Sciences; Dr. Eleanor Hempsey, Faculty in Biology; Cynthia Hutton, Faculty in Biology, and Dr. David Smith, Faculty in Biology and Anatomy and Physiology. All three faculty have extensive experience in teaching both Biology and Anatomy and Physiology and customizing curriculum

and teaching modalities to meet the needs of NPC students. This task force will meet each quarter throughout the one-year project to assure that outcome measures are being achieved according to plan.

Following the pilot of BIO 160 using Anatomage as the hands-on teaching tool at NPC's Little Colorado and White Mountain campuses in Fall 2019, the task force will meet to analyze the results of student surveys for determining the efficacy of course content, instruction, and Anatomage. The group will make modifications to curriculum and instruction as indicated by this analysis and feedback from BIO 160 instructors and students. This will assure the course structure and content is ready for deployment over the TALON system by Spring 2020.

Beyond the scope of the one-year supplemental project, the task force will continue to meet quarterly, and include input from IS staff and lab aides from TALON partner high schools. Essentially, this supplemental grant from the NASNTI program is seed money that allows NPC and its high school partners to establish this project as a component of TALON, responding to the unmet need for a laboratory science class that mirrors, as closely as possible, the experience the student would have in a face-to-face lab environment. The success of its outcomes, including more enrollment, retention and completion of students, and the ability to deliver high-quality post-secondary instruction in an efficient, cost-effective manner, will assure the project's continued dissemination across the TALON network, as well as its sustainability.

VI. Budget

The table that follows justifies each budget item requested as it is described in the Project Narrative. The Anatomage Table Clinical is manufactured and distributed exclusively from Anatomage, Inc. of San Jose, CA – www.anatomage.com. Anatomage is the sole and exclusive distributor in the United States. Hourly rates for faculty and travel costs, including lodging and per diem, are based on average rates as approved by the Northland Pioneer College District Governing Board.

NASNTI 2015 Part A Grantee's Supplemental Funding Opportunity - Budget

Category	Cost
EQUIPMENT - Two Anatomage Tables for science labs at LCC and WMC @ $57,150/ea (includes tax, shipping and handling).	$114,300.00
EQUIPMENT - Backend upgrades, peripherals, and additional equipment for high school and college classrooms.	$25,000.00
LICENSING for remote sites.	Licenses, warranties and software included in purchase of Anatomage Table
CONTRACTUAL/PROFESSIONAL SERVICES to assist with backend upgrades.	$5,000.00

TRAINING from Anatomage engineers for NPC IS Technicians on back end set up and operation of Anatomage Tables.	Tech Support included in purchase of Anatomage Table
TRAINING from Anatomage Application Specialists for NPC science & nursing faculty & staff at LCC and WMC to ensure proficiency in using table as a hands-on lab tool.	Onsite training included in purchase of Anatomage Table
TRAVEL for one NPC faculty member to attend Anatomage 2-Day Annual User's Group Meeting to assure continued updates to knowledge base. Costs include airfare, registration fee, lodging and per diem for 2 days/nights.	$2,500
CURRICULUM DEVELOPMENT - For up to three science faculty to develop curriculum for hands on laboratory component utilizing the Anatomage Table for a distance-learning delivered BIO 160 course at TALON-partner high schools. 30 hrs. @ $43/hr. X 3 faculty = $3,870.	$3,870.00
TOTAL FEDERAL REQUEST	**$150,670.00**