State of California
Awards for Innovation in Higher Education
Laney College's Complete Application

SECTION A. COVER PAGE

Contact Information for Application Coordinator:
Elñora T. Webb, Ph.D., Executive Vice Chancellor (former President, Laney College)
Peralta Community College District; ewebb@peralta.edu; (510) 587 – 7876
333 East 8th Street, Oakland, California 94606

List of Participants: Rebecca Bailey & Amy Borohquez, Co-chairs, Biology Department

Abstract:

ENSURING EQUITY AND SUCCESS IN THE STEM/BIOLOGY DISCIPLINE,
Employing a scalable 24/7 accessible, technology-enabled learning (ATEL) framework

Laney College is at the forefront of providing affordable, accessible education to Oakland/East Bay at a time when rapid economic changes to the region are widening the gap between rich and poor. However, many of the industries currently expanding in Oakland/the Bay Area—especially technology and biotechnology—have recognized the need for their workforce to more closely reflect the diversity of the region. With training and education provided, Laney's diverse students have the potential to step in and take advantage of these career opportunities. To accomplish this, Laney must address the student equity issues in the science, technology, engineering and math disciplines and use technology on campus to bridge the digital divide, especially among low income i.e., Black, Latino, veteran and disabled students.

Laney College proposes to employ a new *24/7 accessible SMART technology-enabled learning* framework to achieve 100% student equity and success in the STEM disciplines, beginning with the gateway discipline biology. This bold and innovative three-phase proposal by the Biology Department, entails bridging the digital divide via high quality technology in a high-touch cyber-learning environment. It is designed to 1) reduce the cost of books and supplies to students, (2) redesign curriculum, (3) enable faculty use to use their creative genius, and (4) enable students to make progress toward completion of degrees and credentials in order to (5) achieve equity in student outcomes while accelerating the pace of student achievement/success overall.

Contact Information for Representative of Fiscal Agent
Denise Richardson, Dean, Division of Mathematics and Science, Laney College
drichardson@peralta.edu; (510) 464 – 3224; 900 Fallon Street, Oakland, CA 94607

Assurance and Signature:
I assure that I have read and support this application. I understand that, if this application is chosen for an award, Laney College will serve as the fiscal agent for the award and that the responsibility of the fiscal agent includes distribution of funds to any other participants in the application pursuant to any agreement between the participants. I also understand that, if this application is chosen for an award, the Committee on Awards for Innovation in Higher Education may request submittal of reports or other information.

Dr. Audre Levy, President (Interim), Laney College

February 3, 2017
Date

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SECTION B. NARRATIVE RESPONSES TO APPLICATION ITEMS

1. From the perspective of students, what is the problem you are trying to solve?

Using innovative technology, including e-learning tools, to enhance learning, Laney College will increase students' expectations for enrolling in and completing STEM curricula, beginning with biology, to ensure their successful completion of degrees and certificates, transfer to 4-year accredited colleges and universities and entry into high technology industry.

At least 900 students per semester enroll in the biology courses at Laney College. Biology courses are prerequisites for students who must meet the requirements of two AS degrees and two certificates. This discipline student outcomes ranges from the 70s – 80s in terms of retention, course success rates and persistence. However, when disaggregating the student outcomes by ethnicity we find significant gaps for Black and Latino students, between the high 50s and low 60s, respectively. Given anecdotal data, objective findings would likely reveal that veterans and students with disabilities experience lower enrollments and performance outcomes primarily due to insufficient tools and support resources to to meet their needs. From the perspective of these students, the college must strengthen its offerings in order to improve their outcomes.

Many students enter the biology discipline without direct experiences in the sciences at their high schools. Their biology labs were either ill-fitted or nonexistent. As a result, most of these students lack the schema (or baseline of knowledge) that would prepare them for college success. At the same time, most of these same students have been exposed to technology, and some are proficient in the use of tablets, smart phones, the Internet, on-line media and much more for social networking purposes. In fact, more students are being born into homes replete with technology, regardless of household income.. While some have not had (and do not have) direct access to the Internet in their homes, such technology has affected them in remarkable ways socially, emotionally and physically. In and outside of class hours, they spend a lot of time on their phones and other handheld devices. Many are most comfortable interacting with others through technology than with traditional methods. They friend hundreds if not thousands of people via Facebook and participate in online gaming. Most work at least part-time, and use technology on the job and to communicate with employers. Laney College must be at the forefront of preparing a diverse community to use the new tools effectively.

New technology requires innovative teaching tools and methodologies. Traditional lectures fail to hold the attention spans of students who are conversant with the new technologies. Therefore, faculty need training and tools in order to incorporate multimedia technology into their lectures in order to make the sciences accessible and engaging. Highly trained faculty using innovative tools can help students overcome negative feelings and experiences with science courses. Instead of seeing math and science as areas where others have a natural advantage, students of color and other members of Laney's community will develop multigenerational experiences of success and raised expectations.

2. What is the innovation?

The innovation entails greater use of iPads, laptops and related on-line (cyber) learning tools and support resources to reduce the time it takes for students to complete degrees and certificates (credentials), reduce the total cost of attendance for students, bridge the digital divide and markedly increase the overall competence and confidence of students so that they are best prepared to secure advanced degrees and successfully pursue careers and leads within the technology, biotechnology and healthcare industries.

More specifically, the innovation consists of a three-phased approach to closing the achievement gap and ensuring greater outcomes among all college students, beginning with biology students.

Phase One unfolds in three parts, A-C. Part A outfits our classrooms with technology to increase student engagement and empower faculty to innovate in the classroom. Part B distributes iPads loaded with e-textbooks; educational applications, including learning support software and content to selected cohorts; and provides in class laptops for use by students. Part C provides training in the use of this technology for faculty.

Part A: In all biology labs and classrooms. All labs and classrooms will be equipped with technology allowing for multimedia presentations and hands-on demonstrations by both faculty and students. The technology shall include: smart board monitors, a computer work station with high quality LCD projector, sound systems connected to smart boards and computer workstations, microscope projectors, and projection screens.

Intentionally, the technology is SMART with self-monitoring analysis and reporting technology for more interconnected, collaborative and, thus, meaningful teaching and learning experiences for educators, the faculty and instructional support staff, and students.

Part B: This component entails pilot cohorts. These three cohort groups within the Biology department are (1) biology majors enrolled in biology 1A/B), (2) pre-allied health majors enrolled in bBiology 2 & 4, and bio-manufacturing students enrolled in Biology 75, combined, serving approximately 200 students per semester. Each student will check out an iPad. On it will include: online materials for use at home and in class; access to the lab manual via online support service (Moodle, future Canvas); digital textbook including customization; and data collection outside of lab (field experiments). All students will have laptops for classroom and lab use, and access software/programs and collect data inside the lab. Further, licensing software for online classroom support will provide (a) iPad applications for histology and model use, (b) digital lab simulations and experiments, (c) online video demonstrations/podcasts (d) digital atlas, and the new analytical software that provides intelligence to students to facilitate their learning.

Part C: All faculty will receive professional development/training to become familiar with (and local experts in using) the wide array of technology and e-tools available. All faculty involved in Part B (the initial pilot) will require training on use of software and technology, and will become local experts facilitating learning among all STEM colleagues in addition to the students. Their learning will provide the basis of the expanded professional development program for faculty

college-wide as the successful components of this effort are replicated. As well, these new skills and knowledge will inform curricular updates and redesigns.

Phase Two expands the implementation of the technology in Phase 1 and looks to further improve classrooms and labs by replacing furniture or other essential learning amenities. First this entails removing and replacing the current substandard and antiquated lab furnishings, including the benches with modern, modular, ADA-compliant lab benches. Secondly, it entails expanding Phase I - Part B (iPads and laptops) to include more courses/increase student access to BIOL 3, 10, 20A/B, 24, 72A-D, 79, thus serving the remaining 700 of the 800 total biology students, the remaining 600. Third, consists of developing the advisory team of partners to ensure readiness for Phase 3. This readiness consists of programming of the new STEM Center, identifying the major donors and other source/s of the necessary capital to fund this project, and formalizing the launch with the necessary appropriate processes.

Phase Three brings the technology and lessons gleaned from Phases 1 and 2 into the construction of a STEM Center designed to foster a communal environment that communicates an investment on the part of the college in the potential of our students to contribute to society, the economy, and their communities. This includes all equipment from phases 1 and 2 being incorporated into a new LEED-certified, state-of-the-art facility, where all STEM faculty are stationed to collaborate effectively and students have maximum access to faculty, industry professionals, innovative equipment and facilities for the greatest possible success.

This phased approach is modeled after "21st Century Learning Community – Digital Ecosystem" where the 1) innovation continuum consists of enhancing learning outcomes via technology, re-designing of the curricula to embed foundation skills, critical thinking and active inquiry, developing faculty's capacity and expertise in using technology and digital content all while enhancing the college – the teaching and learning culture, 2) creation continuum consists of project and problem-based learning with active learning, student creativity and expanded learning environment as integral to implementing the redesigned curricula and advancing learning communities. Both 1) and 2) are succeeded by 3) program assessment continuum, including on-going research and evaluation to inform improvements to the innovations.

Intentionally, this innovation seeks to address the "limited resources and limited academic backgrounds" of many students, eliminating many of the barriers to academic advancement to ensure greater opportunities

3. **How will you implement this innovation?**

Led by the college president (and supported by the district chancellor and service centers), beginning Spring 2017, the college will establish the balance of the conditions and complete the plan to achieve great success. This will entail the Office of Instruction, lead by the Vice President of Instruction and the division dean, carrying out a host of tasks, including: re-verifying course offerings; acting on the timeline to improve the classroom and lab conditions during 2017, in part, by expediting the purchasing of the technology, software, equipment and pertinent supplies in line with the district's technology plan; ensuring that the prerequisite infrastructure supports the successful implementation and expansion of this innovation; working with the faculty to set up the professional development schedule and honor all engaged in the innovation; and build the research base of resources that will collaborate on the assessment and evaluation plan, collect and analyze data and ensure that reports and other documents are disseminated based on the action plan.

Concurrent with the actions of the administrators, and through fall 2017, the Biology faculty shall complete the necessary due diligence, in part by:

- Working with the college administrative leads and technology vendors to ensure the appropriate technology is purchased efficiently and the classroom/lab conditions are appropriately outfitted;
- Confirming the professional development requirements and training schedules;
- Establishing standing collaborative meetings (a) among the faculty, initially the Biology department, and expanded to all science faculty by Fall 2017, (b) with lead administrators and (c) with the expanding advisory team of industry and 4-year higher education institution partners; and, also importantly,
- Systematically working to develop the collaborative meeting topics and the deliverables, which include curricula changes and enhancements, new syllabi, and the formative assessment and summative evaluation practices and schedules

While the Biology Department chair assumes the lead, she is complemented by her team of full- and part-time colleagues – all equally invested in the success of all students, and mindful of the equity and success gaps, especially experienced by the Black and Latino students. These faculty share a basic knowledge of the adult learning literature, yet seek to expand their knowledge and technical skills to more fully engage these and all other students so that their performance outcomes are at least close to 100%; rendering great success for all students.

By summer 2017, the balance of the action plans for implementing Phases One and Two will be mapped out, with implementation of parts A and C of Phase One by Fall 2017, and the start of Phase Two no later than Spring 2018. While the Laney team is working towards full technology upgrades in the classes and labs by Summer 2017, and commencing both part B and C by Fall 2017, members are mindful of institutional challenges that may make this timeline risky. Thus, the "by" timeline is established to ensure that the foundation being developed is sound and is sufficiently strong to support success.

Following the completion of this initial Part B by spring 2018, the resulting assessments and evaluation will be studied and used during Summer 2018 to prepare for the expansion to all biology courses, Phase Two, for a Fall 2018 launch. As a result, the balance of the students enrolled in biology will be exposed to the SMART technology-enabled learning environment.

Throughout the term-by-term assessment, planning and implementation cycles, the faculty and administrative team will: (a) assess risks, including identifying challenges with the new technology interventions, and taking actions to mitigate them; (b) confirm opportunities with the new technology-enabled learning conditions so that they can be appropriately replicated and institutionalized; (c) reflect on observations and other findings in terms of student engagement, learning and progress to determine how best to leverage such information; (d) study the implementation timelines to determine how best to improve them in order to achieve the greatest efficiencies and effectiveness; (e) determine the sound mean(s) to assess access to ensure equity in access in the biology courses, to evaluate students' responses to the new technology-enabled practices, and to ensure the effectiveness of the innovations – introduction of iPads, laptops, support software and other technological tools; and (f) clarify the best method(s) for carrying out on-going research to ensure both internal or external validity and powerful uses for other STEMS disciplines throughout community colleges.

While this innovation is sound, learnings are expected throughout the implementation process and will likely lead to changes, including enhancements to the curriculum and the implementation plans. For many students, this new way of learning with technology will reveal to them for the first time *how to learn.* Given the faculty's expertise, they will learn about the importance of critically evaluating on-line content, sources and the importance of integrity as well as collaboration. With this new learning will likely come missteps by students, which will be important learning to advance new content for preparing students for increasing levels of success. The types of "new learning" for students will be structured to facilitate *momentum* – which may seem slow initially, yet will ratchet up significantly once students understand their individual power to learn and self-initiate their own learning. As this occurs, faculty who have had less exposure to a team of highly accelerated students will learn new techniques too that will lead to redesigning of curricula and instructional labs. The iPads alone will illuminate in multi-media and 3-D format just how proteins, lipids, diseases like diabetes and much more—all biology content—can and do affect lives. Learners experience the content relevance, meaningful content, that engages their senses and increased their hunger for more. The college is also mindful that external factors could produce financial or other pressures that could unintentionally thwart such basic, yet forward progress; thus, the action plan outlined in response to question #8.

When developing the assessment and evaluation plan, the college will ensure a rigorous research design that relies on effective and efficient collection and analyses of the data in order to honor and learn from this *innovation*, the strengths and weaknesses discovered via implementation. In doing so, we will: establish baseline data on student performance, cost of textbooks/lab manuals, digital/online upgrades and related learning materials; and analyze institutional research data on student pre- and post-use of this innovation in order to determine what changes occurred that will inform subsequent practices. Learning what worked, ensures meeting the continuous improvement priority to advance sound solutions throughout the implementation to accelerate student success.

4. How does this innovation align with other efforts you are undertaking, and how does it relate to other efforts in higher education in California?

Consistent with State priorities, Laney College is committed 100% to student success and student equity in addition to providing career and technical education and integrating foundations (basic) skills across the curriculum and leveraging learning community models to improve students' readiness and performance at the pre-collegiate and college levels. The college leverages its funding from these multiple State sources i.e., Student Success and Support Programs, Student Equity, Career and Technical Education (CTE) and Foundation "Basic" Skills to enhance the practices of counselors, instructors, librarians and support staff as they work cooperatively with administrators to strengthen all matriculation functions, instructional support services, and educational (instructional) programs.

Already, Biology students access academic counselors, develop education plans, leverage tutors (increased training and the number of tutors), instructional aides and special workshops as well as on-reserve library books made possible because of resources secured via SSSP and Student Equity funding. CTE funding from the State support the Biomanufacturing, Medical Device Technology and other bio-tech and healthcare-related initiatives that make preparedness for entry- and mid-level career positions possible for Laney students. The foundation "basic" skills initiative helps to strengthen the tutorial resources while providing additional means to evaluate the efficacy of the impact of English, ESL, mathematics and learning resources pre-collegiate courses as stand alone courses, learning community-centered (i.e., Umoja-UBAKA African American Student Success, Asi Se Puede, Restoring Our Communities Initiative-prison re-entry program, and Community Engagement Center), and embedded content and learning practices within CTE and other educational offerings. Already, the college has experienced the power of embedding mathematics, English, and critical thinking within CTE curriculum given improvements in student performance. Over three-year period, 1-10 percent increases in student outcomes are evidence of this improvement. And, more recently, the district has launched its Peralta Promise initiative in collaboration with the City of Oakland in order to assure residence free access to at least the first semester of classes.

Collectively, these efforts have helped ensure equal access for all groups of students to Biology classes, while the introduction of this new innovation, the technology-enabled learning framework, including the support tools, will assure greater equity in learning experiences and outcomes. For with 24/7 access, this *technology-enabled learning framework levels the field for learning* for Black, Latino and all other students. At their fingertips and convenience, they will have access to Biology concepts, principles, applications, self-assessments and practice materials via the iPAD and learning tools, including e-textbooks. Already, the college has invested over $4M in technology infrastructure upgrades i.e., new wireless campus, fiber optic upgrades, voice over internet protocol (VOIP) and computer refresh for faculty, and which is foundational for this *technology-enabled learning environment.* Independent of time and place, students will be able to learn collaboratively and independently while applying, testing and assessing their knowledge and skills.

5. How could this innovation be scaled up within the setting in which you work and replicated in other areas in California?

This innovation is significant proof of the college leadership's commitment to student equity and student success. The phased in approach that is briefly summarized below was developed to ensure expansion and replication.

Year 1: (a) upgrade existing infrastructure; (b) train faculty and staff; (c) pilot for three cohorts (200 students, introducing iPADs and e-tools; (d) assess and evaluate for findings and make improvements; and (e) complete action plan for programming of the new STEM Center, including selecting an architect to design, program and confirm construction requirements

Year 2: (a) ensure completion of the additional enhancements to the existing infrastructure (if unable to complete in year one); (b) continue with professional development; (c) expand the innovation to all Biology cohorts (additional 600 students), introducing any upgrade (or redesign) to the curricula; (d) vet the architects recommendations with the Laney team, including the STEM advisory team; (e) leverage the STEM advisory team to identify prospective donors to fund the new STEM Center (~$50M) and the balance of the funding to provide students with the digital tools, iPADs and software and outfit the STEM classrooms, estimated at $2.76M; and (f) assess and evaluate to determine progress and make improvement/s that may be required

Year 3: (a) extend use of the technology innovations, including iPADs and SMART classroom tech (yet omit the laptops), throughout all STEM courses – geography, anthropology, chemistry, physics and astronomy, mathematics, and engineering and the other CTE programs, thus representing well over 50% of the total student population—while continuing with (b) and (e) from year 2 while securing the formal commitment(s) to fund the new building from a private donor(s) early on and complete the paperwork to break ground on the STEM Center building

Year 4: Continue efforts from years 2-3, being transparent with assessment/evaluation results via reports, presentations and on-line articles revealing student outcomes and related findings

Year 5 and beyond: administratively with additional administrative support, working closely with the faculty, (a) expand the technology innovations in systematic ways to other educational programs at the college; (b) lead professional development Statewide as part of disseminating the blueprints, "lessons learned" reports, videos, articles and other resources to encourage replication; and (c) advance efforts from years 2-4, including completing preparing for the exceptional opening of the new STEM Center, including the greater community's high demand for the educational and training opportunities.

Laney educators are committed to the success of this innovation. We will share the *blueprint for success* widely to ensure knowledge of the processes, practices and resources that led to the successes, and offer help for effective replication. With the achievable goal of student equity and student success among biology students within six years, this phased in approach allows for a steady scaling up within Laney College and could be replicated widely in California to resolve the equity and success gap problems experienced by Black and Latino and other students in the STEMs disciplines.

6. What evidence suggests that this innovation would be effective in addressing the problem identified in your response to Item 1 and implemented successfully?

The six full-time and four part-time Laney Biology faculty and staff have specialized expertise, use a diverse range of cyber-learning tools: they have experienced challenges and many rewards of integrating technology into the learning process to facilitate content area and higher order skills achievement. Providing all students with such access will ensure that all have the capacity to experience the same benefits.

Referred to as "blended learning" in the education field, integrating technology in the learning process and leveraging cyber-learning tools has transformative potential in education, at all levels, and profoundly so in higher education when addressing the digital divide and learning needs of students with limited history of academic success, yet with years of reliance on technology for commerce, trade and social engagement (see below for a select set of reference sources). Use of technology in education, to develop an understanding of (and to apply) concepts, solve problems, critical analyze conditions, and share ideas 24/7 is powerful for individuals who historically had to rely on their limited knowledge to capture lecture notes and determine how to study while wait for another to test their knowledge and otherwise help facilitate their progress. With the iPADs and e-learning tools, students will have access to study skills tools in addition to analytical software that provides them with instant feedback about their performance in the privacy of their own setting. Faculty, also, has this information and can use it effectively and efficiently to customize feedback, ensuring solutions and support resources are shared and used. As well, faculty can leverage students value for social interaction, engaging them in project- and collaborative-based learning. For they can efficiently connect with each student and connect the students to one another, learn about the needs that affect engagement and learning, and further customize responses to provide valued help. Continuously, faculty and students gain greater access to valuable tools that enable all to enhance their critical faculties.

References:

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2. Blended Learning, "*Measuring the impact of technology-enhanced, student-centered learning on the academic engagement, skills acquisition, and achievement of underserved students":* Nellie Mae Education Foundation, April 2015 (This report is focused on K12, but the impacts are relevant for 1st and 2nd year college students.)
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5. Garrison, Randy, "*Blended learning: Uncovering its transformative potential in higher education*" The Internet and Higher Education: 2004
6. *"How Does Technology Influence Student Learning?":* Learning and Leading with Technology, International Society for Technology in Education
7. Green, van Gyn, Moehr, Lao, Coward, "Introducing a technology-enabled problem-based learning approach into a health informatics curriculum" International Journal of Medical Informatics, 2004

7. What information will you use to assess the success of this innovation in addressing the program's goals, and how will that assessment be used to inform future efforts?

By emphasizing student equity, permanently ensuring that Blacks and Latino students as well as students identified as veterans and disabled are achieving at high success rates on all key performance measures, the college has developed the 24/7 *technology-enabled learning success framework* to assure success among all students. To measure the impact of this access-enhancing technology on student success, the college will formalize a robust assessment, evaluation and research design, and secure a research team to lead this effort. Below is a quick overview of key data to be collected for analyses.

Data to be Gathered for Analyses : *By discipline*: Departmental mission and program goals/objectives; course and program student learning outcomes i.e., knowledge – scientific concepts; skills, attitudes and values; and behavioral outcomes; demographic data i.e. age, ethnicity, gender, veterans and DSPS status; student educational and career goals; enrollment, retention, persistence and course success data; course evaluations and program reviews; degree and certificate data; transfer and job placement data; quantitative and qualitative data from students and educators via surveys, interviews and observations, using both locally developed and externally developed tools e.g., climate, engagement, professional development, cyber learning, institution/resource quality-related; instruments, including metrics used to measure student learning; and actions taken based on assessment results e.g., revision of a syllabi, modification of a course. *Across disciplines:* baseline data reflecting the above data, aggregated and disaggregated by discipline. *At the college level:* college's mission, vision and values and institutional learning outcomes; demographic data i.e. age, ethnicity, gender, veterans and DSPS status; student educational and career goals; enrollment, retention, persistence and course success data; degree and certificate data; transfer and job placement data; cost of technology, e-learning resources and support resources; quantitative and qualitative data from students and educators via surveys, focus groups, interviews and observations, using both locally developed and externally developed tools e.g., climate, engagement, professional development, cyber learning, institution/resource quality-related; quantitative and qualitative data from STEM Advisory Council, employer and alumni surveys – knowledge transfer and responsive to industry, the community and greater society; tools used to assess institutional the college's progress; and actions taken informed by assessment results e.g., revision of the strategic plan

Analyses to Determine Affect of the Innovation: *Within each discipline*: An annual comparative analysis of the above data for the participating cohorts compared to the last 3 years for enrollees who did not experience the *technology-enhanced educational innovation, and* an evaluation by SLOs to understand the nature of change in knowledge and application of the content with the introduction of the *technology-enabled* educational innovation. *Across disciplines*: A comparative analysis of the above data between the cohorts participating in the innovation and comparable groupings of students who are not involved. *At the college level:* A *like* term by term comparison of the quantitative and qualitative data; a comparative analysis by ethnicity and veterans and DSPS statuses; and a comprehensive review of progress – strengths and weakness of the effort and action plans to support improvements to the *technology-enabled* educational innovation with specific focus on "cyber learning" – student mobile technology, technology infused learning environment and coordinated curriculum

8. What resources or commitments, or both, do you currently have to support this innovation, and how will implementation of this innovation be sustainable over the long-term?

The district and college's commitment to this bold vision consists of implementing the plan, developing a revenue stream to fund construction of the STEM Center and the technology-related expenses, employing the right team of experts (human resources—internal and external), and rewarding the educational team for their innovative actions.

The initial funding from the State will enable this innovation to launch in 2017. The district has already expended in excess of $5M in district facilities bond and maintenance funds on college-wide infrastructure and to upgrade STEM classrooms and labs. Concurrently, the district and the college have developed STEM partnerships with industry leaders, including Apple Inc., the Kapor Center for Social Justice, Kaiser, Alameda Health System, Oakland Children's Hospital, Chamber of Commerce, Rotaries, and 4-year HEI partners, as well as a host of others, in order to receive major gifts that will support this innovation. Meantime, the college has ensured that its funding from all relevant State general and categorical sources are leveraged to address the support needs of biology students, as has been summarized in response to question #4. Fiscal resource needs are of foremost importance; thus, the decision to build a new STEM Advisory Council, leveraging key partners and relationships built by faculty and staff over the last 10-plus years to secure the right balance of the resources—fiscal, human, technology and physical - to advance all phases of this innovation, especially the new STEM center. Among the assets being considered are: all existing and anticipated funding from local, state and federal sources in addition to philanthropic gifts and the opportunity to establish other funding sources, i.e., other private grants. The one-time State funds will enable the college to launch Phases One and Two, especially with the textbook, classroom equipment, paper consumption and accessibility cost savings anticipated. And while cost neutrality is the goal, and there are efforts to develop an internal revenue structure; approximately $50M is required to design and construct the state-of-the-art STEM Center facilities reflected in Phase Three, and an endowment is needed to generate a sustainable base of annual funding to permit strategic investments to continue this innovation long-term. Yet, without initial from the State, the college will have to delay the launch of this innovation.

Now, the college has identified within its ranks and technology partners, some of the right people who can devote the time, expertise, leadership investment and STEM specialists, effective professional development and training support for educators; and competent instructional technology support for students. Outstanding is the need to add to its current base of research professionals to ensure adequate capacity to conduct longitudinal assessments, evaluate products, and assess student engagement, learning and achievement using quantitative and qualitative data.

With its connections, the college will broker, collaborate on research and knowledge sharing, and strategic grantmaking. Already, the preliminary discussions have taken place with one health care partner to purpose another National Science Foundation grant jointly used to advance STEM education.