Distinguished School Report
California High School

Taking the Right Pathway: CHS Biomedical Science

Model Program and Practices:
The Biomedical Pathway at California High School is a three-course sequence of CTE classes that engages students in an inquiry and project-based curriculum to prepare students for college and careers in the medical field. The pathway model at California High School is unique in the SRVUSD, providing students with three separate courses: Principles of the Biomedical Sciences (PBS), Human Body Systems (HBS), and Medical Interventions (MI), and the opportunity to pursue an internship in the medical field through the iQuest program their senior year. Each course in the Biomedical Pathway is designed to engage students in an Honors level academic class that meets UC and CSU “d” level laboratory science requirements, incorporating curriculum from Project Lead the Way (PLTW) and Next Generation Science Standards (NGSS) into a comprehensive and compelling curriculum.

Each pathway class builds student knowledge and experience in the skills and knowledge of the medical field. Principles of Biomedical Sciences guides students to investigate human body systems and various health conditions, including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. PBS provides an overview of all the courses in the Biomedical Pathway and lays the foundation for subsequent courses. In Human Body Systems, students examine the processes, structures, and interactions of the human body systems to learn how they work together to maintain homeostasis and good health. Using real-world cases, HBS students take the role of biomedical professionals and work together to solve medical mysteries. They build models of all the body systems, analyzing interdependence of the systems. They detect potential disorders using diagnostic probes and trace disease progression through the body. In Medical Interventions, students investigate the prevention, diagnosis and treatment of disease as they follow the lives of a fictitious family. The course is a “How-To” manual for maintaining overall health and homeostasis. Students explore how to prevent infection, how to screen and evaluate the code in human DNA, how to prevent, diagnose and treat cancer, and how to prevail when the body begins to fail. Students are exposed to interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics. They learn the important roles scientific thinking and engineering design play in interventions.

Real-world experiences through guest speakers, field trips, internships, and mentorships enrich students’ learning. Students learn through project-based curriculum,

labs, research, and inquiry, and access online web site links through the Project Lead The Way curriculum. Direct instruction is minimalized. Students complete volunteer hours in the healthcare industry and have volunteered at San Ramon Regional, Kaiser, and Valley Care Hospitals, dental and physical therapy offices, assisted living centers, and dialysis centers. Students have participated in San Ramon C.E.R.T. disaster drills and have worked with nonprofits that package and distribute medical supplies to developing countries. Community partnerships include CSU East Bay, The Contra Costa Council, John Muir Health, and the San Ramon Regional Medical Center. Career speakers address the classes and participate in CHS's Medical Speaker Series, including a cardiologist, an occupational therapist, an OBGYN, a trauma nurse, a forensic scientist, a plastic surgeon, a biomedical engineer, and a materials scientist. Students have had presentations on job skills, including resume writing, workplace etiquette, and interviewing. They build a resume and present it to potential employers at the Medical Career Fair and at the medical facility where they volunteer.

Many students in the Biomedical Pathway are also actively engaged in Health Occupation Students of America (HOSA), with over 70 CHS students in the club. Members prepare for state and national HOSA competitions in over 50 skill category events, including biomedical debate, extemporaneous health poster, forensic medicine, medical reading, national service project, parliamentary procedure, public service announcement, public health, and researched persuasive speaking. Biomedical Pathway students are encouraged to take additional classes to build a solid base of knowledge for continued study and careers in the medical field. Many Biomedical Pathway students take Cal High's iQuest class their senior year and are placed in internships in the medical field; 27 students from the Biomedical Pathway are in an iQuest medical field internship this year.

California High School's Biomedical Pathway began in 2010-2011, with CHS science teachers and administrators identifying the need to educate students about the array of careers available in the healthcare industry while preparing them for post-secondary opportunities. Another identified need at the school was increasing course offerings to involve underrepresented students, and females in particular, in STEM classes, and offering options for students beyond the traditional AP science courses.

The Biomedical Academy began at California High School in 2011-2012. A team attended the California Health Capacity Building Project conference and received funding through its grants. Several sources of funding were used to provide training, and purchase technology and instructional materials to initiate the program. Hands-on classroom materials purchased include science lab kits for ABO/RH Blood Type, DNA Chips: Genes to Disease, and Detection of Cancer. Vernier software and probes were

purchased to allow students hands-on experience. California Health Capacity Building Project Grants, site and district grants, Education Foundation grants, Perkins funds and Common Core monies have sustained and grown the program, purchasing technology, laptops, and probeware, and providing busing to Medical Career Fairs and HOSA competitions. .

The goals and anticipated outcomes for students are reliant upon well-trained committed instructors. The teaching team works as a collaborative PLC and has challenged themselves to achieve the training and certification necessary to provide CHS students with an engaging and relevant instruction. Each teacher in the Biomedical Pathway is committed to professional learning and collaboration. The team attended California Health Capacity Building Project conferences. Each teacher has completed training through Project Lead the Way, an intensive training program to learn cutting edge biomedical science and inquiry based instruction. In addition to the teachers being trained by PLTW, three of them have already earned their CTE credentials. NGSS professional development training contributed to meeting the goals of the program and to the implementation of a comprehensive and academically rich curriculum.

Long-term goals and anticipated outcomes of the biomedical pathway are to provide the community with future medical providers. The pathway creates students with realistic expectations of their future, the knowledge to attain those goals, and the skills to be successful in that career. Each course introduces over thirty different career options in medicine and allows exploration into each career to provide a means for students to find the right fit before they finish high school. Parents and students have embraced the program as a well-defined path that prepares students for college and career goals.

The pathway model has grown from offering one course its first year to offering multiple sections of three courses to allow students of multiple grade levels and ability levels greater access. As student interest grew, CHS now offers six sections of PBS, four of HBS, and three of MI. The Biomedical Pathway classes have benefitted all students by enriching Cal High's science program through CTE classes that reach beyond the courses offered through the traditional science program and the AP science offerings. The Biomedical Pathway offers both general education students and advanced students classes specific to careers in bioscience; on-track students not planning to take an AP intensive course load as well as AP students are enriched by the challenging and relevant coursework. Students in the program demonstrate high levels of academic achievement and engagement. Cal High has 690 students in CTE classes. The Biomedical Pathway alone has 390 individuals and is the largest CTE program at California High School. California High is the only school in the district to have a Project Lead the Way Biomedical Science Pathway.

As a hands-on program that is inquiry-based, the pathway presents challenging and relevant curriculum to all students, especially those unsuccessful in direct instruction. Traditionally, female students have been underrepresented in STEM classes. At Cal High, there is an almost even balance of males to females in the CTE Program which in 2018-2019 has 51.5% male enrollment and 48.4% female enrollment. In the Biomedical Pathways classes, females are enrolled at a much greater rate. This year, PBS has an enrollment of 206 students, with 60 males (29%) and 146 females (71%), HBS has an enrollment of 112 students, with 26 males (32%) and 86 females (77%), and MI has an enrollment of 80 students, with 18 males (23%) and 62 females (78%). Discovery learning allows unique populations of student to be successful. There are five resource students and one English Language Learner in the pathway and they are equally successful as the other students in the pathway.

Cal High puts student's social-emotional health as a priority. Student and parent surveys identify social-emotional health as a pressing need in our school. Professional development has occurred to address this concern. Teachers learned ways to minimize stress on the student. The Biomedical Pathway was created to maximize student health and well-being. PLTW curriculum is designed to be executed during class time. It requires less work outside of class time and frees students of emotional stress due to excessive homework. The course is self-paced with the teacher guiding students as necessary. Some students require more assistance than others and this model allows the teacher to accommodate all student needs. All PLTW curriculum is accessible online so students missing class can stay up to date on their work and not get behind. Many of the assignments are skill-based and students work until they gain mastery of the skill. Skills accrued during class are added to the students' resumes, giving a sense of accomplishment to their overall goal of a career in medicine. Intrinsic motivation is driven by autonomy, mastery, and purpose. Student who are intrinsically motivated have more self-worth and fewer behavioral concerns.

The goals outlined in the San Ramon Valley Unified School District LCAP specifically identify several areas that the design of the Biomedical Pathways program addresses: providing professional development for teachers, providing standards-based instructional materials for all students, increasing the percentage of students who are college and career ready, increasing the percentage of students who feel connected at school, and expanding course offerings to increase opportunities for all students.

Attendance is a priority in the Biomedical Pathway. County ROP supports three sections of Human Body Systems. The county liaison explains to the students that attendance in

class is their job for the year and that they will only receive a certificate of completion if they have 95% attendance and a positive job attitude.

At California High School, the general population target groups for chronic absenteeism are African American students who have a chronic absenteeism rate of 16.5% and Latino students who have a chronic absenteeism rate of 11.6%. In the combined Biomedical Pathway, only 3.4% of African American students and 7.6% of Latino student have demonstrated chronic absenteeism, displaying a better rate of attendance than the general CHS population. The biomedical pathway is relevant to the students' career goals and encourages students to attend class.

Goal oriented classes that directly affect a student's future are inspirational to students. Students engaged in school are less inclined to make decisions that jeopardize their future goals, and the data supports that they are less likely to get suspended. As shown on the California School Dashboard report, California High School is the highest rated high school in the district with a low rate of suspensions, matched only by San Ramon Valley High. Furthermore, the health related subject matter in the Biomedical Pathway teaches students respect for their body systems. Students study the respiratory systems and carryout spirometry to determine lung size and learn the vital nature of proper lung function. They study diseases related to smoking, like chronic bronchitis, emphysema, and chronic obstructive pulmonary disease and cancer. They also are shown smokers' lungs compared to healthy lungs. Deep inquiry into lung function deters student from smoking and vaping. Other units have similar education models regarding alcohol consumption. Educated students are less likely to partake in substance abuse and other detrimental activities and behaviors that get them suspended.

Implementation and Monitoring:
There are many ways for parent involvement in the Biomedical Pathway. CHS students and staff host Middle School Nights and Medical Career Nights to highlight our Biomedical Pathways and HOSA to incoming families and students. Parents are encouraged to come with their children to 8th grade night to learn about the Biomedical Pathway curriculum, enrollment, and CTSOs (Career and Technical Student Organizations) like HOSA. The Biomedical Pathway is highlighted on 9th and 10th grade nights to CHS students and families. Information about the three courses are displayed on tables. Students who have completed the courses share their experience with interested students and families. Tours of the biomedical classrooms occur and medical probes and lab equipment are demonstrated. The CHS website devotes a section to the Biomedical Pathway, and CHS has developed a brochure spotlighting the program.

In addition, parents are invited to contribute to our pathway. Many of our medical career speakers are parents. Students are taught to network in the medical community and these parents with connections to medical facilities also assist in securing volunteer positions, job shadowing, and internship opportunities for students, and act as mentors. The school and district collect climate survey and LCAP survey parent and student information that is analyzed and used to improve student health and direct CTE offerings. Analysis of LCAP surveys and parent participation in LCAP meetings allow parental input in regards to the number and types of pathways in the school and has led to an increase in sections and funding for CTE classes. Parents are a large part of the SRVUSD LCAP committee, the CHS School Site Council, and the CHS PTSA.

California High School's Biomedical Pathway has built capacity through the outstanding training our teachers have received, particularly at PLTW. CHS Biomedical Pathway teacher Dina Anderson was recognized as PLTW Biomedical Teacher of the Year for 2013. CHS teachers are involved in the Biomedical Pathways program and HOSA as resources, chaperones, and coaches. Sports Medicine and Digital Photography teachers have worked with HOSA students in preparation for state and national competitions. The expertise of the CHS Biomedical Pathway team has supported collaboration and articulation between our science teachers and middle school science teachers to align instruction and increase the exposure of incoming students and parents to the richness of our program. The PLTW rigorous curriculum and training have prepared our science teachers to meet the goals of the pathway program, to address our site goals, meet district LCAP goals, and to present a successful replicable model. California High School is the only high school in the San Ramon Valley to offer the Biomedical Pathway. Our district is working to expand CTE Pathways though a Career Tech Education Incentive Grant (CTEIG) and the Strong Workforce Program (SWP) to provide students with career pathway programs designed to lead to postsecondary degrees or certification and career paths in high-skill, high-wage, and high-growth fields. The CHS Biomedical Pathways team is involved in the committee and hopes to see our successful program expand to other high school sites.

Furthermore, the CHS Biomedical Pathway teachers are all members of a Biomedical Advisory Committee and have partnerships with medical providers and postsecondary schools in the area. Teachers work both with the district and the county advisory boards. By partnering with local business, it assures that the students are prepared for the careers that are available in their area. Medical Facilities and businesses also offer internship and volunteer positions to students and collaboration with teachers.

Yearend assessments of each student are completed electronically and scored on a scale of 1-9 through the PLTW organization. Scores are monitored by the teacher and

results guide teachers in making the program more effective. In addition, Biomedical Pathway students complete an assessment survey each year. Results are used to review practices, assess student achievement, identify needs, and modify instruction. The teaching team reviews the student assessments and the surveys and analyzes their findings. The SRVUSD has a CTE Teacher on Special Assignment who also reviews student assessments and achievement, and prepares written reports and data analysis that is shared with the district, the site, and the Pathways team.

Student achievement in the Biomedical Pathway program and HOSA are evidenced by classroom engagement and assessments and are used to evaluate the effectiveness of instructional learning activities. Biomedical Pathway signups and enrollment, attendance at Middle School Nights, attendance at the Medical Career Speakers Series, signups for HOSA, and student participation and achievement at state and national HOSA competitions offer evidence of high levels of student engagement. Student achievement of college and career readiness is demonstrated by students applying to and being admitted to colleges and pursuing careers in Biomedical and Health careers.

The LCAP includes goals and action steps that will continue to increase the percentage of students who demonstrate college and career readiness by adding resources and supports to our CTE programs. PLTW training, CTE credentialing, financial support for CTE programs and equipment as well as community and TSA support all facilitate a successful Biomedical Pathway. This is confirmed by the school's high designation for College and Career Readiness as evidenced on the California School Dashboard reports.

Results and Outcomes:
Student outcomes are demonstrated through multiple measures and findings. Qualitative (student enrollment, survey results, student engagement in internships and competitions, etc.) and quantitative (assessment results, GPAs, attendance, successful completion of all three courses, competition results, etc.) data show the growth and success of the program and the engagement and achievement of the students.

The Biomedical Pathway program has grown from the initial offering of one course to a three course pathway, demonstrating an increase in student interest and engagement. Currently, in the 2018-19 school year, there are six sections of Principles of Biomedical Sciences, four sections of Human Body Systems, and three sections of Medical Interventions. This was an increase of 5 sections from the previous year. The pathway currently serves 391 students. There are 44 students this year who have completed all three biomedical classes, 34 of whom are seniors and will graduate with distinction from the pathway. The GPA of Biomedical Pathway students is 3.63 (unweighted) compared

to the average school population GPA of 3.39. The weighted GPA for the Pathway is 3.79 and 3.47 for the entire school.

The Biomedical Pathway includes strong representation from students in all subgroups: 7.6% Hispanic/Latino, 0.3% Alaska Native or American Indian, 51% Asian, 2% Black or African American, 0.6% Native Hawaiian or Other Pacific Islander, 32% White, and 6.4% Two or More Races; compared to the Cal High population of 11.7% Hispanic/Latino, 1% Alaska Native or American Indian, 34.5% Asian, 2.1% Black or African American, 4.3% Native Hawaiian or Other Pacific Islander, 44% White, and 7.1% two or more races.

The medical speaker series includes a minimum of six presenters each year. Students are polled in the beginning of the year to see which careers interest them the most. Those professionals are sought out in the community. This year the career speakers have included a cardiothoracic surgeon who owns a private practice, a dentist, a nurse, a career in the regulation of pharmaceuticals, and a diabetes specialist who works in research and development of new devices. Students also attended a presentation on interview skills by the ROP/CTE county liaison.

As an effort to increase female students in STEM, females in the Principles of Biomedical Science classes attended S.H.E. Leads by Junior Achievement of Northern California. Female students increased their career knowledge and confidence and built their professional network in the medical field by exposure to panelist speakers, table discussions and interactive student/mentor activities. As shown by enrollment data, GPA, completion of all three Pathways courses, placement in internships, and college admission, all students, and females in particular, show a high level of success in the Biomedical Pathway.

All Biomedical Pathway students are involved in medical work in the community. This includes internships, volunteer work, job shadowing and earning certifications in community emergency response. Students choose where they want to volunteer in the community. A sample of medical work from the 2017-18 school year from the Human Body Systems class included: 14 students volunteering at local hospitals, 29 volunteering and job shadowing in dental offices, 6 students packaging and sorting medical supplies at MedShare, 6 students earning Community Emergency Response Team C.E.R.T. training from the San Ramon Valley Fire Department, 5 students working in private practices, 3 students volunteering and job shadowing in Optometry, 2 students shadowing surgeons in veterinary hospitals, 4 student interning with a sports medicine trainer, 1 student volunteering in elder care, and 1 student interning in physical therapy.

Pathway students are integrally involved in the community. Local physicians and medical workers come to the school as career speakers and are involved in the medical career fair held at the end of each school year. Other partnerships in the community include biotech manufacturing and labs like ThermoFisher and BioRad, Hospitals and Medical Schools like Kaiser Permanente School of Allied Health Sciences, Kaiser Hospital, John Muir Hospital, San Ramon Regional Hospital, Valley Care a Stanford Hospital, and support from non-medical companies like Chevron.

The majority of HOSA members are students enrolled in the Biomedical Pathway. Currently there are 70 California High Students affiliated in HOSA. Of those, 62 are traveling to the State Leadership Conference to compete in the medical competition at the state capital. In the 2017-18 school year, not only did many students earn top 10 in the state, but there were seven students who earned top 3 in the state and competed in the International Leadership Conference. The topics in which they competed were one in Epidemiology, two in Biomedical Laboratory Science, and two pairs in Health Career Display. From 2016-2018 students have earned top ten in the State Leadership Conference in Community Emergency Response Team C.E.R.T., CPR and First Aid, Transcultural Health Care, Clinical Nursing, Pathophysiology, Pharmacology, Extemporaneous Writing, Public Health, Medical Innovations, Medical Innovations Advanced, and Biomedical Debate.

The monitoring and assessment results are used for continual program improvement. Last year, the Biomedical Pathways team made the decision to modify the course descriptions and offer all three courses as Honors, based on the level of the PLTW curriculum. Partially influenced by this change, enrollment in the Biomedical Pathways courses increased. The teaching team and the CTE Teacher on Special Assignment review student assessment and achievement data each year and work to continually improve the program to increase student achievement and to increase the community awareness of the CHS Biomedical Pathway. Additionally, the high level of attendance and interest in the Biomedical Pathway at Middle School Nights, Medical Career Nights, and the Speakers Series, and student involvement in state and national HOSA competitions are evidence of the success of the Biomedical Pathway. Feedback from students and classroom observations has contributed to the growth and success of the pathway. Shared professional development and dedicated collaboration at site have allowed the teaching team to continually assess and refine their curriculum and develop a powerful hands-on inquiry-based instructional program to offer to the California High School community.