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OFFICE OF THE PROVOST AND EXECUTIVE VICE CHANCELLOR
ONE SHIELDS AVENUE
DAVIS, CA 95616
TEL: (530) 752-4964
FAX: (530) 752-2400
INTERNET: http://provost.ucdavis.edu

March 28, 2019

TO: Chancellor Gary May
           Provost Ralph Hexter
           Davis Division of the Academic Senate

FROM: Carolyn Thomas, Vice Provost and Dean for Undergraduate Education (Chair)

RE: Final report of the Working Group on Closing the Preparation Gap

In April 2018, you formed the *Working Group on Closing the Preparation Gap*. As noted in your charge letter (Appendix A), UC Davis admits a diverse cohort of talented freshman and transfer students from the state, the nation, and the world. And while Undergraduate Admissions evaluates our applicants via a holistic review system, the vast discrepancies in local resources among K-12 school districts translate into preparation gaps that impact academic placement and achievement for many UC Davis students. The working group was thus charged with assessing, in a comprehensive and campus-wide manner, where we are and how we can improve program-based and course-based methods of reducing gaps. The working group was further charged with evaluating how these methods can be appropriately designed, scaled, and coordinated so that all students cross the finish line with meaningful degrees at a similar pace.

The working group convened in April 2018, and has engaged continuously through winter quarter 2019 and the completion of this report. In order to address the questions posed in the charge letter (see Appendix A), the working group established three sub-committees, each chaired by an Associate Dean for Undergraduate Education from one of the colleges. The sub-committees were topically based, covering pre-matriculation, workload & preparatory courses, and academic and curricular supports. The committee worked, as a whole, to draft the final report and its recommendations. We are pleased to present these to the administration as the best means of decreasing the academic performance gap that exists at UC Davis for our first-generation, limited income, and underrepresented students. It is our strong belief that improving these areas will improve educational outcomes for all UC Davis students. For that reason, we urge the administration to begin the work of moving these recommendations into actions.

Membership was as follows:

Arnette Bates, Director, Educational Opportunity Program, Advising and Retention Services
Kevin Blue, Director, Athletics
Kayton Carter, Director, Strategic African American Retention Initiatives
Sue Ebeler, Associate Dean, College of Agricultural and Environmental Sciences
Danica Tisdale Fisher, Director, Summer Sessions
Beth Floyd, Director, Undergraduate Education and Advising
Annaliese Franz, Director, Undergraduate Research Center, Chemistry
Simona Ghetti, Psychology
Michele Igo, Associate Dean, College of Biological Sciences
Katrina Jessoe, Undergraduate Council Member, Agricultural and Resource Economics
Ari Kelman, Associate Dean, College of Letters & Sciences
Ebony Lewis, Director, Admissions
Tim Lewis, Mathematics
Dan Potter, Undergraduate Council Chair, Plant Sciences
Jim Schaaf, Associate Dean, College of Engineering
Matthew Stratton, Preparatory Education Committee Member, English
Carolyn Thomas, Dean and Vice Provost for Undergraduate Education (Chair)
With administrative support and guidance provided by:
Erika Jackson, Assistant Director, Student Success, Budget & Institutional Analysis
Helen Frasier, Assistant Vice Provost, Undergraduate Education

Recommendations:

1. **PRE-MATRICULATION:** Significantly increase capacity of summer in-person and online opportunities so all students who need pre-matriculation support have it prior to fall quarter.
   - Ensure that STEP and Transfer Edge (new summer 2019) programs are extended to six weeks and incorporate Summer Session II courses, enhanced academic advising, and strategic course options; and
   - Expand the existing Online Math Jumpstart program to enhance entry into college-level math courses.

2. **PRE-MATRICULATION, WORKLOAD & PREPARATORY:** Improve current placement mechanisms for identifying students who need additional core math, chemistry, and writing academic support in order to ensure that students get into the appropriate bridge programs and fall courses. Explore the replacement of workload courses with credit-bearing alternatives.

3. **WORKLOAD & PREPARATORY:** Discontinue use of the Analytical Writing Placement Exam (AWPE) as a placement mechanism for evaluation of the Entry-Level Writing requirement (ELWR) and/or assignment into courses and abolish Workload 57.

4. **WORKLOAD & PREPARATORY:** Establish a robust, centralized, and well-resourced campus writing center to mitigate the current disparate outcomes with regard to writing at UC Davis.

5. **ACADEMIC & CURRICULAR AND PRE-MATRICULATION:** Improve academic support for courses that integrate psychosocial elements such as peer-led supplemental instruction aligned with courses, mandatory tutoring sessions aligned with courses, multi-quarter learning communities, stretch classes offered over two quarters, and enhanced STEM co-classes.
   - Given the committee's assessment that current support in this area is inadequate, we urge campus to pilot several of these programs, assess them rigorously, involve students in the process, and invest sufficiently in programs with positive outcomes.

6. **ACADEMIC & CURRICULAR:** All students should complete a GE transition class that combines a small course experience with 'Navigating the Research University' content. This is happening for roughly half of UC Davis's students now, though the courses do not receive GE credit.

7. **ACADEMIC & CURRICULAR:** Improve academic advising delivery through the consistent use of a campus-wide advising portal across all campus units.
   - Incentivize faculty to collaborate with advising units to pilot an "early alert" partnership that is informed by advising and course-level data; and
   - Create robust and effective peer-advising, perhaps with graduate student "peers" as well, that continues peer-training and support provided previously by the RHAT program in student housing and improves upon it.

8. **ACADEMIC & CURRICULAR:** Place UC Davis' pre- and post-matriculation support programs on a cycle of assessment similar to the Special Academic Program Review, whereby programs are reviewed for impact at multi-year intervals along with annual reports on usage.

RECOMMENDATION BACKGROUND

1. **Significantly increase capacity of summer in-person and online opportunities so all students who need pre-matriculation support have it prior to fall quarter.**

   - **Ensure that STEP and Transfer Edge (new summer 2019) programs are extended to six weeks and incorporate Summer Session II courses, enhanced academic advising, and strategic course options; and**

   - **Expand the existing successful Online Math Jumpstart program to enhance entry into college-level math courses.**

The working group on pre-matriculation programs began with a review of best practices in higher education. In the committee's assessment, long bridge programs offering course credit, social belonging activities, culturally relevant programming and co-curricular learning are the most effective programs, especially for students from low-income, first-generation and underrepresented minority backgrounds. The greatest impact on learning and personal development in college are policies and practices that generate high levels of student engagement in various activities. Engagement is required of the institution and the student, that is, colleges must adapt to and affirm students who in the past were solely responsible for adjusting to college in order to succeed (Kuh, 2009).

We offer a variety of pre-matriculation programs, some of which are designed to transition students into communities and others to close academic preparation gaps. The bulleted list below captures our current programs for entering UC Davis students. There are also a number of outreach programs that seek early interactions with potential UC Davis students in order to enhance academic success and introduce them to campus life. See Appendix B for more information.

Current/Existing Pre-matriculation & Bridge Programs at UC Davis:
- Area 3 Writing Project/University Writing Program (UWP)
- Online Math JumpStart
- Summer Start
- LEADR Summer Bridge in Engineering
- Avenue^E Transfer Bridge in Engineering
- Linda Francis Alexander (LFA) Bridge Program (has bridge and continues for 1st year)
- Special Transitional Enrichment Program (STEP)
- UC Davis Mathematics, Engineering, and Science Achievement (MESA)

Discussion

From the extensive list of program opportunities available to students, the working group chose to focus more deeply on several that are established and offer academic content along with transition support. These are LEADR Summer Bridge, Avenue^E Transfer Bridge, Summer Start, and the Linda Frances Alexander Program.

LEADR Summer Bridge

The Leadership in Engineering Advancement, Diversity, and Retention (LEADR) Program's mission is to recruit, retain and graduate a diverse population of students from the College of Engineering (CoE). Since September 2016, the LEADR Program has implemented LEADR Summer Bridge (LSB), a 5-day transition program held the week before the academic quarter begins, to help first-generation, including historically-underrepresented, engineering students prepare for their first year and build community as undergraduates at UC Davis, specifically in CoE. In addition to this summer bridge, students are offered several other programs post-matriculation by participating in LEADR (e.g., a learning living community, First-Year Aggie Connections, two seminar courses, quarterly advising, tutoring, etc.).

With sponsorship from Chevron, in September 2018, LSB hosted 43 engineering students from counties throughout the state. For three days, students participated in professional development and essential interpersonal skills-building workshops, hosted by Chevron and AT&T recruiters and engineers. These workshops included information on their companies, professional etiquette practice, problem solving and teambuilding exercises, as well as panels of professional engineers, who shared background on their roles at the companies and advice on how best to prepare for the workforce during their undergraduate years. An alumnus, who was from a similar background as the students, hosted a tour of the Gallo Winery in Modesto, which gave the students an opportunity to see "engineers at work." Students heard from summer college interns and recent graduates who were closer to having transitioned from being a student to entering the workforce. For encouragement, students were treated to an inspirational talk by another first-generation alumnus who shared how he ascended through the ranks at AT&T and the important leadership skills to build as undergraduates. Other days, students attended "professor office hours", learned time and stress management skills, participated in a Physics overview, and bonded with their Resident Mentors—Junior & Senior LEADR students, who provided their perspectives and advice on navigating college. These relationships led to strong ties that continued through their first quarter classes and new living arrangements away from home.

The cost for this LSB was $29,000 which included housing, welcome lunch for students' families and guests, student supplies, field trip transportation, resident mentor stipends, etc. Two staff who support LEADR (its director and an academic advisor) are funded by the College of Engineering Undergraduate Office. Future goals include increasing the number of student participants and adding an additional week as, each year, student feedback includes comments that the program should be longer than one week.

Avenue^E Transfer Bridge

Avenue^E is a program designed to recruit and retain transfer students who come either from families in which neither parent holds a bachelor's degree, or from underrepresented groups in Engineering and Computer Science (women, student of color, etc.). They are also high-achieving and possess a potential for leadership. The aim of the program is to positively impact and eliminate barriers that prevent full participation of first-generation and underrepresented students in these fields.

Transfer Bridge is the beginning of the program: a two-week intensive residential transition experience prior to the start of the academic year. It is designed to welcome these community

college transfer students to UC Davis, to help them transition smoothly to the campus, and ultimately to prepare them for a career in Engineering or Computer Science. Transfer Bridge has four main components: campus orientation, community-building, professional development, and engineering design projects. After the start of the academic year the students remain together as a cohort and continue to meet weekly with the Avenue[E] academic advisor though First-Year Aggie Connections. These seminars provide academic and career support as well as a learning and social community.

Avenue[E] was developed by UC Davis and founding corporate partner, Chevron, in collaboration with Los Rios, Peralta, San Joaquin Delta, and Contra Costa Community College districts. The Transfer Bridge portion has been funded for the first five years by the Koret Foundation. In its first year (2017) 20 students were served and, with the help of Chevron, that number increased to 30 students in year two. The program's efficacy is being evaluated by: the probability of students graduating in two years or fewer, the probability of having a 3.0 or higher grade point average (GPA) with 13 units in their fourth quarter, and GPA at graduation. Since our first cohort (entering fall 2017) has not yet completed their second year, the success of the program is still under evaluation; we will have more information after spring 2019. However, as of now, 18 of the 20 original students from the 2017 cohort remain in the program (the other two left the College of Engineering by changing major and leaving the university) and half maintained a 3.0 GPA or higher. From the 2018 cohort, 24 of the 30 (80%) earned a 3.0 or higher in their first quarter at UCD. The majority of the 2018 group had a very positive assessment of their experience in Transfer Bridge. Most of their positive comments surrounded two main themes: knowledge about campus resources and development of social capital. The overall program cost in 2018 was approximately $105,000, excluding the student stipends. The cost included career staff salaries, three student program assistants, room and board for all students to live on campus for two weeks, events and catering, outings and activities, Avenue[E] swag, plus materials and supplies.

Each student receives a stipend of $2,500 for Transfer Bridge to off-set the cost of lost employment opportunities. This stipend is a big incentive to the students, particularly for the transfer student population, who are typically older and usually employed during the summer. In addition, many are eager to participate in order to meet others who are studying the same subjects prior to the quarter starting. Social isolation is one of the barriers to transfer student success, thus having a social learning community is another incentive and benefit for students.

Summer Start

Summer Start was established in 2013 as an elective academic, social and cultural immersion program for incoming pre-matriculated international first-year students. The program provides a strong foundation in U.S. academic culture, UC Davis history and values, advanced English language skills and a cultural awareness that gives students a strong start in their degree programs at UC Davis. Summer Start students are required to take a course on "How to Succeed at a US Research University." This course covers traditional orientation topics as well as topics specific to international student needs, but it does so in a format that is highly interactive and communicative in order to foster confidence and academic discussion skills.

In its sixth year, Summer Start continues to be the largest credit-bearing international first-year preparation program in the UC system, serving 167 students in 2018. The program is self-supporting. Students pay a fee of $975 that provides for extensive programming, including workshops, field trips and weekly family style meals. In 2018, students identified their top reasons for joining the program in the following order: to make friends and adjust to UC Davis, to earn academic credit, and to build intercultural language skills. In addition, in post-program surveys 97% of survey respondents recommend Summer Start to incoming students.

The Linda Frances Alexander Scholars Program (LFA)

The LFA program provides academic, social and cultural enrichment for African, African American, and multiracial students that empowers them to achieve educational excellence and prepare for our competitive global society. Students enroll as new freshmen or transfers and may participate through their first year at UC Davis. A week-long residential program kicks off the first year with a culturally supportive introduction to university life that includes goal-setting, leadership training, academic advising and an introduction to university expectations. The summer program is followed by an academic seminar offered in Fall quarter and LFA specific programs and services throughout the academic year. Through coordinated and/or collaborative efforts with Student Housing, many of the LFA freshman also live on the African American & African (AAA) Theme floor, and enroll in the CADSS cultural seminars. The young men, for example, enroll in the Black male seminar in the winter, while the young ladies enroll in the Sister To Sister seminar. Both cultural seminars are co-facilitated by CADSS staff and counselors from Student Health and Counseling Services (SHCS). It is the program's goal that Linda Frances Alexander Scholars become campus and community leaders who exemplify successful scholarship within the Black tradition of educational achievement. LFA is funded through Student Affairs which is funded through student fees.

LFA Desired Outcomes
- Introduce students to the University of California Davis campus layout, academic culture, and university expectations.
- Inform students of the unique characteristics and academic advantages of a research institution.
- Expose students to a basic understanding of racial identity development within the context of a university setting.
- Define and describe students' responsibility and personal accountability in the learning and development process.
- Identify campus resources that aid students in achieving their academic goals.
- Educate students about the critical role an academic adviser plays in their academic success.
- Provide tools for navigating university life within and outside the classroom.
- Create a cohort of first year freshman and transfer students to actively build community.

The only incentives offered by LFA are the services and activities available to students. Students are not compensated for loss of employment opportunities.

LFA offerings include
- Individualized academic advising and support
- Success coaching and mentoring

- Quarterly seminars devoted to academic achievement and cultural exploration
- Check-ins (year-round) with program staff
- Comprehensive referrals to campus and community resources
- Meaningful social events
- Advising towards post-graduate study and career exploration

Recommendation

After reviewing multiple existing campus programs, the committee has chosen to endorse enhancing and expanding STEP, beginning Transfer Edge, and expanding the Online Math Jumpstart program as the best means of closing the preparation gap for UC Davis students. It is the committee's assessment that these three programs are best equipped to scale, for all groups of incoming UC Davis students, a combined pre-matriculation and academic support experience.

Special Transitional Enrichment Program (STEP)

The Special Transitional Enrichment Program (STEP) helps first year students develop skills to enhance their performance and enrich their experience at the university. STEP begins with a summer residential program and continues for the first two years of enrollment. Students invited to participate in STEP include all new Educational Opportunity Program (EOP) students (low-income and first-generation students), former foster youth and students previously served by UC-recognized outreach programs. Program goals are to: prepare students for the academic rigor at UC Davis; provide opportunities for students to make meaningful academic and social connections; introduce students to university expectations, campus resources and campus culture; and help students develop critical college skills, build academic confidence and develop metacognitive strategies.

STEP has been a transformative experience for thousands of students for more than 40 years. The academic, social and personal support offered not only builds skills and confidence, but also offers students the support of a community throughout college and beyond. STEP graduates have gone on to great professional success—as teachers, lawyers, presidents of global corporations and more—and their Aggie pride inspires them to give back and stay connected to STEP and the campus in various ways.

The STEP curriculum supports student success through a focus on five key areas: skill development and leadership opportunities, academic preparation and support, community building, health and wellness, and peer mentoring and coaching (see Figure 1; see Appendix C for full detail).

Figure 1: Five Key Supports of STEP
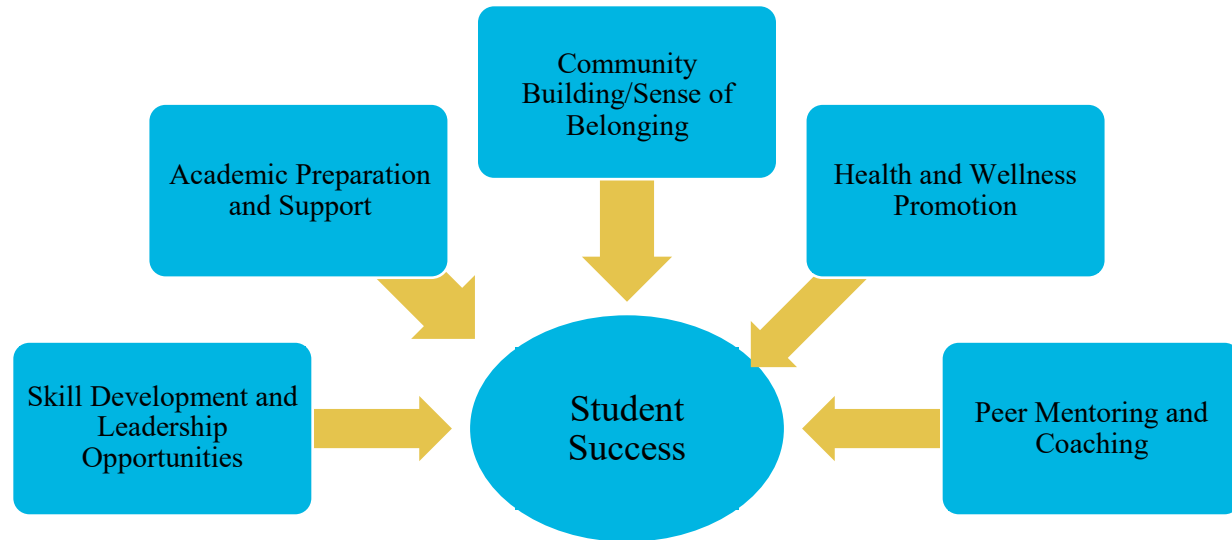
After the STEP summer program, participating students' progress is monitored by retention advisors while peer advising counselors provide personal and social support. Services include holistic advising to help students develop advocacy and problem-solving skills; supplemental instruction and tutoring in math, writing and science; priority registration; social support; and co-curricular activities.

Proposed enhancements to STEP
- Extend the summer residential portion of STEP from 3 to 6 weeks to further support the successful transition of students to the academic rigor and campus environment at UC Davis. The proposed model allows enrollment in summer session courses which are credit-bearing and taught by UC Davis faculty. One-hundred fifty students will complete 6-units chosen from one of three course groupings: (1) UWP 7 (Practices in College Reading and Writing) and a 2-unit seminar; (2) Math 12 (Pre-calculus); or (3) 6 units of course work based on the student's interest and motivation. Culturally relevant coursework, one possible choice, can provide space for students to build a sense of community and develop academic identity that bridges home and college (Marrun, 2018). Additionally, completing coursework before fall enrollment allows students to begin fall quarter with greater academic confidence and better prepared to complete university level work (Strayhorn, 2010).
- Continue STEP cohort-based learning communities during the academic year (see recommendation #5). This may include UWP 1 (Introduction to Academic Literacies) and Calculus sections specifically for STEP students in fall quarter or stretch courses where content is taught over multiple quarters. Studies show high impact practices (HIP) such as learning communities have positive impact on retention, persistence and academic performance. They foster peer-faculty interactions and affinity community building.
- Offer summer stipends to offset the financial challenge of not working during the summer, since students are not allowed to work while participating in STEP.

The STEP staff, with support from BIA, will administer pre- and post-program assessments to measure student satisfaction, academic and social adjustment, fulfillment of the entry level

writing requirement or placement into the first quarter of calculus upon completion of Summer Session II.

Transfer Edge

Transfer Edge is a new program launching this year. It is designed to introduce transfer students to the academic rigor of the university, and the myriad of academic and community supports available on the Davis campus. Transfer Edge will be an important opportunity for transfer students, particularly those who are first generation, low income, and underrepresented, to earn course credit, establish relationships with faculty and staff, learn more about research and co-curricular opportunities, acclimate to the physical campus and its culture, and build community with transfer and other transfer and non-transfer students.

The summer 2019 pilot will enroll up to 30 students with outreach to students at Northern California community colleges that participate with the Undergraduate Admission Transfer Opportunity Program (TOP), and students across the state who participate with the UMOJA Community. We hope that many students for this pilot can use trailing financial aid to cover the cost of summer sessions. In the future, Undergraduate Education hopes to fundraise to provide stipends for students in order to mitigate the loss of summer income participants may experience.

During Summer Session I, Transfer Edge participants will have access to the ALEKS online adaptive learning tool with advising and peer-to-peer support offered through the Academic Assistance and Tutoring Centers. During Summer Session II, participants will enroll in select lower-division math courses, and participate in a culturally-inclusive, writing-intensive, cohort-based First Year Seminar. Further, students will have access to ongoing drop-in tutoring advising, participate in a weekly math review workshop led by Math Specialists, and learn more about the Aggie experience through a series of workshops with partnering campus units. The Edge team anticipates that they will continue to support Edge students, during the academic year, as needed. The main source of support, however, will likely be the Transfer/Reentry Center.

To evaluate the program, Summer Sessions will engage in pre- and post-program assessments of student satisfaction, and will work with the Center for Educational Excellence to develop instruments to measure retention, academic outcomes, student progress, and time to degree. The table below outlines the developing components of Transfer Edge:

Table 1: Transfer Edge (program components are not final and subject to change)

Pre-program	Transfer Edge—Summer Session II	Post-program
Pre-program support from Transfer Edge Staff (Summer Sessions—SS)	6 units- lower division math course, First Year Seminar, and 1-unit course	Post-program assessment (SS)
Access to ALEKS- online adaptive learning tool	Weekly required just-in-time math skills review workshops w/Math Specialists (Academic Assistance and Tutoring Center, AATC)	As needed, continued support/advising through the first academic year (SS)
Initial individual check-ins with students (AATC)	Academic success workshops and other drop-in tutoring (AATC)	
Peer-to-peer online content support (AATC)	"Intro to Aggie Life" workshop series (potential partnerships with URC, ICC, CSI,CLL, TRC)	
24-hour access to math content videos (AATC)	Optional Friday study halls (TRC)	
Online office hours (AATC)	Optional residential experience	
Pre-program assessment (SS)	Community building/social activities	
	Orientation	

Online Math Jumpstart

The committee also recommends expanding the Online Math Jumpstart piloted in summer of 2018. This program invited first-year students to a 6-week online summer math program starting in August using ALEKS PPL (Placement, Preparation and Learning) to help prepare for fall mathematics courses as well as the Math Placement Exam. The program is for motivated incoming first year and transfer students who want to connect with a supportive group of peers and mentors to get a jumpstart on skills that are essential to thriving in calculus at UC Davis and get a preview of why math and quantitative reasoning skills are valuable for every student in every major. Because it is entirely online, students can prepare for the expectations and rigors of studying math intensive courses at UC Davis without leaving home or giving up valuable time with family, summer work, or internship experiences.

2018 Jumpstart Intervention Components
Participants worked toward mastery level completion of one of two ALEKS PPL courses: Prep for Precalculus or Prep for Calculus, based on the initial ALEKS pre-assessment. While participating in the 6-week intervention Jumpstart students also had access to:
1) An initial 15-30 minute one-on-one check in with a Math Specialist
2) Direct support from Academic Assistance and Tutoring Center Math Specialists via video conferencing for office hours
3) Instructional videos with content aimed at each of the core area of ALEKS-PPL
4) Communication tools through the Canvas shell to work with fellow participants

Jumpstart Assessment
The Math Department invited students to participate via an email about the Math Placement Exam. Incoming freshman and transfer students who were URM, low-income, and first generation were sent an additional invitation by Academic Assistance and Tutoring Center (AATC) to apply specifically for the Online Math Jumpstart. These invitations were also sent to all students who applied for but were not accepted to participate in STEP. Working with CEE, all Jumpstart applicants were randomly placed into one of two intervention levels: standard treatment from the Math Department or additional support through Jumpstart. Assessment is still in progress but initial results indicate that students who complete the program were more likely to pass the ALEKS exam (which is different than the Math department's placement exam). Jumpstart students working on the ALEKS-PPL for pre-calculus increased their mastery score by 20% vs the control group who only increased their score by 15%. This difference between treatment and control for those in the ALEKS-PPL for Calculus was not statistically significant but the pre-calculus results provide evidence that ALEKS-PPL may be a promising approach to support mastery of pre-calculus content prior to matriculation.

Jumpstart Costs
The $20 ALEKS fee was waived for almost all participants using leftover LCFF+ funds. That total cost was approximately $5,000. The Academic Assistance and Tutoring Center (AATC) used existing staff resources to run the program and could continue to do so if the enrollment was 150 or fewer students. If enrollment were to significantly increase, AATC would need more resources to staff the office hours and initial check-ins.

2. **Improve current placement mechanisms for identifying students who need additional core math, chemistry, and writing academic support in order to ensure that students get into the appropriate bridge programs and fall courses. Explore the replacement of workload courses with credit-bearing alternatives.**

As noted by the pre-matriculation working group, the timing and accuracy of placement exams significantly impacts the path to success for incoming first-year students. There is no best model we can look at for remediation nationally. This is due, in part, to the fact that many of the programs that address developmental education in higher education are serving a very different student body than ours. Research on intensive summer programs and co-requisite courses are largely focused on community colleges and broader access institutions. We likely need to pilot a few options ourselves and carefully evaluate them in order to understand what it takes to prepare our students for UC Davis courses.

The timing, role, and path of current preparatory or remediation courses, known as Workload courses, must be addressed by the UC Davis campus community. Incoming students are placed into Mathematics, Writing, and Chemistry via very different paths. Each is described in Appendix D. The working group on preparatory courses provides the following summaries of the current practices in mathematics and chemistry.

The committee notes that a separate working group is concurrently reviewing the placement into and the outcomes associated with preparatory writing courses. Current practices and proposed changes as related to writing are described in the detail for recommendation #3.

Mathematics Placement and Workload

Before considering the literature on math remediation/workload courses and best practices, we should recognize the differences between the student body at UC Davis and the student bodies of most other universities and colleges in the nation.

Most campuses around the country, including the City University of New York (CUNY), University of Tennessee, University of North Carolina, Cuyamaca College (i.e., campuses known for innovation in remediation), require "college-level math" for graduation but not for admission. Whether an admission or graduation requirement, the pathway for students to succeed in gateway math courses is a challenge that must still be addressed. Our CSU partners have recently discontinued non-credit bearing and remedial courses, opting instead to provide additional academic support and stretch courses in order to enable students to pass the for-credit entry math course at a higher rate. Preliminary results suggest that the policy has been successful but a more rigorous analysis should be undertaken. According to a recent CSU report, "last fall nearly 7,800 students passed a college-level math course, compared with 950 the previous year. In both years, about 17,400 first-year students were determined to be unprepared for college-level math. Two-thirds of those who went ahead anyway, under the new system, and took a college-level class with supports, ultimately succeeded. The pass rate for the gateway math course was the same as in the fall of 2017" (Mangan, 2019).

UCs have the A-G requirements for admission. These requirements include the "college-level math" that other schools require for graduation. Almost all of the national concerns surrounding remedial math courses are about difficulty for students to graduate in *any* major because of minimal math requirements. This is not an issue at UC Davis. Many majors don't require any math courses, and there are many ways for students to fulfill our quantitative literacy GE.

Table 2: UC A-G requirements—Mathematics ("C")

Three units (equivalent to three years or six semesters) of college-preparatory mathematics are required (four units are strongly recommended) including or integrating topics covered in:	Also acceptable are courses that address the above content areas, and include or integrate:
• Elementary algebra • Advanced algebra • Two- and three-dimensional geometry	• Trigonometry • Statistics

The primary goal of our developmental math courses is to ensure the long-term success of our students in our calculus sequences (MAT 16A, 17A, 21A) and beyond. Note that some majors require Statistics (STA) 13 Elementary Statistics. The prerequisites for STA 13 are "two years of high school algebra or MAT D", but given the A-G requirements, most students are prepped for this.

Workload/Developmental/Remedial/Pre-Calculus Mathematics Courses at UC Davis include[1]:
- MAT B - Elementary Algebra (only offered in Fall, typically to very few students, ~10)
- MAT C - Trigonometry (rarely offered)
- MAT D - Intermediate Algebra (offered in Fall and Winter; 100-200 students)
- WLD 55M - Intermediate Algebra (offered at Sacramento City College) (Fall 2018 - 180 students)
- WLD 910 (pre-16A), WLD 920 (pre-21A) (Fall 2018 - 80 students)
- WLD 911, 912, 913 (co-16A, co-16B, co-16C)
- WLD 921, 922, 923 (co-21A, co-21B, co-21C)
- MAT 12 Pre-calculus (*credit bearing*) [offered by the Math Department] ~700 seats/year

Unless indicated, courses are offered by the Academic Assistance and Tutoring Center (AATC). The AATC also offers a MAT12 content review twice/week, and other workshops, but student attendance is not always consistent.

Therefore, the questions that we should be/were asking are:
- *Do workload math courses create the same barriers to graduation at UCs?*
- *Does the research that suggests workload math courses are detrimental to students apply to UC Davis?*
- *What are the real issues with remedial math courses at UC Davis?*

In response to the working group's questions, the remedial math courses at UC Davis (i.e., the workload courses and MAT 12) appear not to prevent students from making progress toward degree because there are multiple pathways available to them. However, for students who plan to go into STEM fields, the remedial math courses do add additional work and can delay the successful completion of STEM course series. Given that a disproportionate number of students in workload math are low-income, underrepresented, and first-generation, this presents problems for equitable academic outcomes within STEM majors.

Here, we face a dilemma. On the one hand, workload courses delay graduation and can have negative psychological consequences. On the other, math workload does appear to be helping students acquire skills that lead to success in subsequent courses. We do not want to recommend discontinuing workload math without knowing that there are viable options that will work as well or better in place. Thus, our recommendation is that math continue to explore alternatives to non-credit bearing developmental math courses. Summer programs like Jumpstart may provide a more student-friendly pathway for developing critical math skills. Workload math should be re-examined within the next two years.

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[1] Please note: MAT B, MAT C, MAT D/WLD 9X0, MAT 12 are not really meant to be a remediation course sequence.

Chemistry Placement and Workload

Prior to Fall Quarter 2019, the Department of Chemistry explored a number of different pathways as Chemistry Placement Requirement waivers. These pathways are listed below:

Table 3: Chemistry Placement Approach BEFORE Fall 2019

CHE 2A (General Chemistry)	CHE 2AH (Honors General Chemistry)
● SAT Math score of 600+ ● ACT Math score of 27+ ● AP Chemistry score of 3+ ● SAT Chemistry score of 700+ ● Pass WLD 41C with a "P" or "C or better" ● Mastery score of 100% on the ALEKS Preparatory Chemistry course	● SAT Math score of 670+ ● ACT Math score of 30+ ● AP Chemistry exam score of 4+ ● SAT Chemistry subject test score of 700+ ● Pass WLD 41C with a "P" or "C or better" ● Mastery score of 100% on the ALEKS Preparatory Chemistry course

Beginning Fall Quarter 2019, these alternative pathways are ***no longer an option***.

To assure enrollment in general chemistry, all students must earn a qualifying score from the Chemistry Placement Exam (24+ for CHE 2A; 33+ for CHE 2AH). Students who do not earn the qualifying score will be encouraged to register in WLD 41C or take the ALEKS Preparatory Chemistry course in preparation to retake the Chemistry Placement Exam.

The Center for Educational Effectiveness (CEE) performed an analysis that compared the grades in CHE 2A for students who took the Chemistry workload course (WLD 41C) versus those who did the online prep program for Chemistry (ALEKS). They found that the ALEKS students, the workload students, and students who went straight into CHE 2A performed approximately the same in CHE 2A. This effect remained after controlling for student demographics. These findings could support either of two scenarios: (1) students placed into ALEKS and/or workload would have been fine in CHE 2A without having the additional preparation, or (2) that they needed the additional prep and ALEKS and WLD 41C provided it sufficiently. We have no data at this point to help us adjudicate between the two scenarios, but the Chemistry department strongly believes that the skills tested in the Chemistry placement exam are necessary to be successful in CHE 2A, making both WLD 41C and ALEKS appear to them to be effective means of bringing students up to speed before entering CHE 2A.

The Chemistry department has changed the pathway for students to enter CHE 2A and CHE 2AH; all students must now earn a qualifying score from the Chemistry Placement Exam. This new process will begin in Fall Quarter 2019. The Chemistry department will need time to determine if students who do not earn qualifying scores are successful in their retake of the placement exam after completion of WLD 41C or the ALEKS Preparatory Chemistry course.

While we recognize Chemistry's work to on this process, there remain concerns among committee members. The first concerns the use of non-credit bearing workload courses, for reasons stated previously. The second is the reliance on a single method of placement in the CHE series, as studies indicate that this can lead to the over-placement of underrepresented, first-generation and low-income students in developmental courses. We recommend re-evaluating the department's progress in this area within the next two years.

3. Discontinue use of the Analytical Writing Placement Exam (AWPE) for evaluation of the Entry-Level Writing requirement (ELWR) and/or assignment into courses and abolish Workload 57.

The AWPE is invalid as a predictor of college writing success, and, at $110 per sitting, inequitable for students from under-resourced school districts and/or lower-income households. National data indicate significant over-placement in developmental classes and inconsistent benefits and/or frequently no benefits of placement into developmental classes. All data seem to suggest that WLD 57 is not an effective intervention to support student achievement and success.

Writing Placement and Workload

As noted in a recent program review of the Entry-Level Writing (ELW) course:

> *The 4.5 workload unit course known as Workload 57 (WLD 57) is taught by Sacramento City College (SCC) faculty via a contractual partnership with UCD. WLD 57 was chartered as UC Davis' only Entry Level Writing Requirement (ELWR) 1 fulfilling course in 1993 after the UC Davis Academic Senate decided to move ELWR courses out of UCD's English department to SCC. The founding documents of the ELWR fulfilling course at SCC asserted that the UC Davis Academic Senate should retain oversight of the new course and that a collaborative team of SCC and UCD faculty, led by the Director of Entry Level Writing at UCD, would conduct a program review every five years. This 2018 Self-Study of WLD 57 (spanning Fall 2012-Fall 2017) conducted by the current Director of Entry Level Writing at UCD (Assistant Professor Trish Serviss) is the first full program review of WLD 57; archival data suggests that minor program reviews were conducted in 1998 and 2004. Annual reports written by the former UCD Director of Entry Level Writing (Continuing Lecturer Cynthia Bates from 1993-2017) document pass/fail rates, section counts, Analytical Writing Placement Exam (AWPE) passage rates, and budget totals to describe rather than assess the WLD 57 program.*
>
> *There are many ways a student can fulfill ELWR before entering UCD (SAT/ACT/AP/IB/AWPE scores or transferable community college course), but there are currently few options for successful completion of ELWR after students enter UCD. As of spring 2018, students can fulfill ELWR three different ways after entering UCD: 1) earn a C or better in WLD 57; 2) receive a passing score on the Analytical Writing Placement Exam (AWPE) locally administered every quarter; 3) earn a C or better in Writing 39A offered through UC Online and taught by UC Irvine faculty. The majority of UC Davis students who enter without ELWR fulfilled (~35% of incoming first-year students) satisfy the requirement by passing WLD 57. Thus, this report focuses on the students, faculty, and curriculum of WLD 57 between Fall 2012-Fall 2017 to better understand and further improve student learning experiences in the program* (Writing Task Force Report, 2019).

Davis is the only UC campus that outsources the teaching of our Entry-Level Writing (ELWR) course to our local community college, something that happens with WLD 55M (Math Workload), for instance, as well as WLD 41C (Chemistry Workload). The Davis representatives on the University Committee on Preparatory Education (UCOPE) have reported negative outcomes and experiences for students who did not pass the Analytical Writing Placement Exam (AWPE) after taking the community college course, and this has led to some anti-AWPE sentiments at the campus.

These outsourced courses are only given Workload credit rather than baccalaureate credit, despite the revision to Academic Senate regulation 761 twenty years ago specifying that only remedial courses should receive workload credit (ELWR courses are generally seen as going far beyond remedial coursework). Based on the findings from the program review by the University Writing Program and analyses completed by the Center for Educational Effectiveness (CEE), timed writing tests like the AWPE lead to over placement of students—particularly students of color, non-native speakers of English, first-generation college students, and international students into "remedial" writing courses (Writing Task Force Report, 2019).

Some students do not meet the Academic Senate requirement to satisfy ELWR in their first year at UC, and are not allowed to continue at UC. Senate Regulation 636.D stipulates that if a student has not satisfied ELWR within their first year of attendance they will not be eligible to enroll for their second year, although the regulation also states exceptions can be made by an appropriate agency of the Academic Senate Division of the student's campus. The UC Davis University of California systemwide Committee on Preparatory Education UCOPE representative last year wanted the ELWR time limit eliminated or extended, and did not know the campus could make exceptions.

Pilot courses to replace the current ELWR course with a university course are underway in the University Writing Program, English, and Native American Studies:

- **WR 39A** (Introduction to Writing and Rhetoric) is an online Cross-Campus course taught out of UC Irvine. Students in the Intro to Writing & Rhetoric course will develop their writing through language-intensive exercises, participation in community-based writing in blogs and forums, and completion of a writing portfolio. Students will also have the opportunity to experiment with various writing forms, ranging from the personal narrative to a thesis-driven essay project.
- **UWP 7** (Practices in Reading and Writing) is a face-to-face, 4-unit credit-bearing course taught by writing faculty at UC Davis. The small class size of 18 students allows for intense mentorship and collaboration as students focus on academic literacy strategies including understanding scholarly texts, contextualizing information, developing source-based academic writing projects, and learning how to implement feedback and revision plans. Currently, a version of UWP 7 for multi-lingual students (UWP 7M) is working its way through the course approval process, and should improve the current experience of multi-lingual students fulfilling ELWR without Workload 57.
- **UWP 1A** (Writer's Workshop) is a face-to-face 2-unit credit-bearing course taught by writing faculty at UC Davis that fulfills ELWR. Concurrent enrollment in UWP 1 (a 4-unit credit-bearing course that fulfills the lower division writing requirement) is required for

UWP 1A students. The course uses a writing studio approach; each section of UWP 1A enrolls 14 students who work intensively on analyzing writing tasks, developing drafts of writing, providing and implementing feedback, and identifying useful strategies for academic writing across the curriculum.

- **ENL 3A** (Introduction to Literature) is a face-to-face 2-unit credit-bearing course that fulfills ELWR, taught by English department faculty at UC Davis. Concurrent enrollment in ENL 3 (a 4-unit credit-bearing course that fulfills the lower division writing requirement) is required for ENL 3A students. The course uses a writing studio approach; each section of ENL 3A enrolls 14 students who work in small groups and an instructor mentor who supports them as they complete disciplinary writing tasks assigned in ENL3, including literary analysis of poetry, drama, and fiction.
- **NAS 5A** (Writer's Workshop) is a face-to-face 2-unit credit bearing course that fulfills ELWR, taught by Native American Studies instructors at UC Davis. Concurrent enrollment in NAS 5 (Introduction to Native American Literature) is required for NAS 5A students. The course uses a writing studio approach; each section of NAS 5A enrolls 14 students who work in small groups and an instructor mentor who supports them as they complete disciplinary writing tasks assigned in NAS 5, including literary analysis of poetry, drama, and fiction.

4. **Establish a robust, centralized, and well-resourced campus writing center to mitigate the current disparate outcomes with regard to writing at UC Davis.**

UC Davis is one of only two campuses in the UC system that locates writing tutoring under Student Affairs rather than within an academic unit. In doing so, our campus assigns the responsibility for ongoing writing support solely to staff and students rather than to research faculty. Our campus is also unusual in that it limits writing support to undergraduate students only. These facts distinguish our campus not only from other UC campuses, but from most of our peer institutions. Not wanting to duplicate the efforts of the UC Davis Writing Task Force, a group that has been working parallel to ours, we looked to their report findings, completed February 1, 2019. Of eight universities known for their writing instruction, including Michigan State University, the University of Michigan at Ann Arbor, the University of Minnesota, the University of Texas at Austin, Arizona State University, Syracuse University, George Mason University, and North Carolina State University, all have a Writing Center led by academic units. It may be of value for readers of this report to consult their report more fully (Writing Task Force Report, 2019).

UC Davis should have a writing center. That center should gather together the existing constellation of disparate services offered across campus and bring together staff, faculty, and students to support our campus community's needs. In other words, such a center would improve writing across the campus by centralizing and coordinating existing writing services and by adding new services for undergraduates, graduate students, and faculty who want to improve their writing and their ability to teach writing to diverse populations.

On the campuses of our peer institutions, such centers serve as a physical and intellectual hubs where students—especially students not well-versed in the art of navigating inconsistent academic services and cultures—can find the kinds of writing support that are vital for educational and professional success. Our students deserve the same opportunities.

5. **Improve academic support for courses that integrate psychosocial elements such as peer-led supplemental instruction aligned with courses, mandatory tutoring sessions aligned with courses, multi-quarter learning communities, stretch classes offered over two quarters/from summer to fall, and enhanced STEM co-classes.**

   - **Given the committee's assessment that current support in this area is inadequate, we urge campus to pilot several of these, assess rigorously, involve students in the process, and invest sufficiently in programs with positive outcomes.**

The subcommittee exploring this topic began with the assumption that non-credit bearing developmental courses should be phased out and replaced with the curricular supports recommended here. At the same time, they noted the necessity of developing alternative placement mechanisms to the ones currently used for workload determinations, given that research suggests those mechanisms over-place students in developmental courses. Further, even with robust summer bridge programs, some students will require additional academic supports throughout their first year.

In determining which curricular supports to recommend, the working group took as a guiding principle the best practices articulated by the National Academies regarding competencies that support student success, specifically—Cognitive, Intrapersonal, and Interpersonal competencies (National Academies of Sciences, Engineering, and Medicine, 2017). Cognitive competencies are those that support thinking, reasoning, and related skills. Intrapersonal competencies equip students with skills related to self-management, and regulating one's behavior and emotions to reach goals. And Interpersonal competencies are those that allow individuals to express information to others and to interpret information or messages from others and to respond appropriately. The working group was invested in identifying innovative, successful programs that take an inclusive approach to student support, rather than starting from a deficit lens which is the case with our current practices for placement and workload.

Programs at Other UC Campuses

To establish a reference point, the working group reviewed reportedly successful programs at our sister UC campuses through the lenses of competencies and inclusivity:

- UCLA's Center for Education Innovation and Learning in the Sciences Program (https://ceils.ucla.edu/stem-programs-initiatives/ug/) for Excellence in Education and Research in the Sciences (PEERS, https://ceils.ucla.edu/peers/#toggle-id-4) is a two-year cohort program that serves newly admitted STEM majors during their freshman and sophomore years. PEERS is designed to facilitate the transition to UCLA, prepare students to excel as science majors and promote undergraduate research and has demonstrated that their students have a very high retention rate in the sciences and do better in STEM classes than non-PEERS students.
- UC Santa Cruz (UCSC) reached Hispanic Serving Institution (HSI) status in 2012 and subsequently received two Title V grants and a third in September 2016 focused on reducing attrition for low-income and Latinx students in STEM-based degrees. The grants will help UCSC increase achievement of Latinx students and formalize partnerships with local community colleges supporting transfer students. More information can be found here:

https://studentsuccess.ucsc.edu/. Additionally, the Koret Undergraduate Research Initiative—https://sserc.ucsc.edu/koret-scholars-initiative—funded by the Koret Foundation aims to increase meaningful undergraduate research opportunities for UC Santa Cruz students.

- UC Riverside's College of Natural and Agricultural Sciences offers freshman and sophomore learning communities and transfer success programs for their students: https://cnasscholars.ucr.edu/ and https://cnas.ucr.edu/stempathway/. The programs differ from one another and support different clientele, but commonalities include early, undergraduate research engagement, faculty mentorship, and peer mentoring. Goals are to build community and support. Freshman receive enhanced advising/orientation via their NASC 93 course. These two major initiatives are coupled with advising initiatives which together help students start strong and stay on track. The College of Natural and Agricultural Sciences also has a robust transition advising program to assist students who choose to transitioning to majors in the other colleges. In addition, there is a summer bridge program that new freshman may join—Highlander Early Start Academy—and is facilitated by the Academic Resource Center: http://arc.ucr.edu/cohort/early-start/index.html.

UC Davis offers numerous post-matriculation support programs to assist students with their academic challenges and pursuits. The working group highlights several types of post-matriculation programs:

Tutoring and Success Workshops
All students at UC Davis can participate—as capacity permits—in tutoring or success workshops offered by the Academic Assistance and Tutoring Centers (AATC) and Office of Educational Opportunity and Enrichment Services (OEOES). Tutoring is available in Math, Chemistry, Biology, Physics, Writing, Economics, Engineering, and Statistics. Tutoring is also offered departmentally by some programs utilizing peer and/or graduate student tutors. Whether offered through the AATC or the major, several departments have noted that greater coordination with existing classes and faculty would benefit tutors and allow students to more fully engage with actual course content covered in the quarter. Another model for consideration and scaling is that offered through the Athletics Department where all student athletes have access to tutoring for one course each quarter.

General Support Programs
These programs provide academic support (tutoring, study skills, etc.) as well as psychosocial supports and community building activities; different programs typically have target populations for services, e.g., first generation, URM, low income, etc. Two of these programs, Aggie Connections and TRiO, have either learning goals and outcomes or reporting requirements on program impact. Most of the programs indicate they would like to support more students and/or enhance services provided, but scaling is resource dependent. These programs include:
- STEP (discussed earlier in report);
- Educational Opportunity Program (EOP): Serves socially or economically disadvantaged, first generation, low income students. Provides academic support during the academic year primarily for first year and second year (sophomore) students; https://www.ucdavis.edu/admissions/undergraduate/educational-opportunity-program;
- Guardian Scholars Program: Serves foster youth and former foster youth; https://opportunity.ucdavis.edu/programs/guardian-scholars;

- Transfer and Reentry Center/Veteran's Success Center programming: Offers workshops, success coaching, help finding campus resources, community building events https://opportunity.ucdavis.edu/centers/trc and https://opportunity.ucdavis.edu/centers/vsc;
- TRiO Scholars: Serves first generation & low income undergraduates from entry to graduation. Provides study support, peer led activities, and community building support. Partners with AATC and OEOES to provide support https://opportunity.ucdavis.edu/programs/trio-scholars; and
- First Year Aggie Connections: Serves all first-year students who choose to participate. Provides small group cohort experiences, focused on a theme and led by staff and/or faculty as well as peer mentors for each Connection. Some Connections may be connected to a credit bearing class. Aggie Connections "aims to foster opportunities that will empower students as they navigate their first-year at Davis" https://opportunity.ucdavis.edu/programs/aggie-connect.

Academic Support Programs Aligned with Curriculum and/or Specific Classes
The working group also sought to understand what academic support programs are offered at UC Davis that align with specific classes. Appendix E includes definitions of various program models. Several approaches were identified including:
- Co-classes:
  o Department specific co-classes in Math, Physics, and Chemistry offered through AATC (Academic Assistance and Tutoring Center);
  o BIS 2 (Introduction to Biology) and CHE 2 (General Chemistry) co-classes to provide additional advising/psychosocial support each week; piloted in 2016-17 and fall 2017. Outcomes assessment is currently in progress; initial data indicate that LCFF+ students show gains in performance in the main class and students indicate that participation in the co-class was a key to their success. The challenge was ensuring that students who most need the co-classes enroll; and
  o UWP pilots are taking place in Winter 2019 (see also Recommendation #3; Writer's Workshop classes UWP 1A, ENL 3A and NAS 5A). Assessment will follow after term completion.
- Modified Supplemental Instruction:
  o There are some individual pilots of Modified Supplemental Instruction in various courses (upper division MCB and NPB classes; presented at UC Davis Scholarship of Teaching and Learning Conference (SOTL) in 2017); and
  o Most of these appear to be opt-in programs offered to all students in a class.

While many of the above programs appear promising, current capacity is not adequate to address student needs and not all programs have been rigorously assessed for impact. Therefore, the committee recommends an intentional selection of several pilot programs for further evaluation. Pilots should consider promising approaches based on literature and/or existing campus pilots, as well as factors that impact implementation such as faculty buy-in and instructor training (e.g., see also Daugherty et al. 2018). Attention must also be paid to how students will partake of these supports: are they to self-select? Are they to be assigned to various options? Ultimately, given the success of these programs on other campuses and preliminary positive indications at UC Davis, we recommend piloting and assessing pilot programs in the following areas:

1) peer-led supplemental instruction aligned with courses;
2) mandatory tutoring sessions aligned with courses;
3) multi-quarter learning communities;
4) stretch classes offered over two quarters; and
5) enhanced STEM co-classes.

Based on outcomes from the pilot programs, the campus should make investments in the most effective models in order to bring support to our students at scale.

6. All students should complete a GE transition class that combines a small course experience with 'Navigating the Research University' content. This is happening for roughly half of UC Davis's students now, though the courses do not receive GE credit.

First Year seminars and courses that support student transitions to the university have been shown to increase student retention and student engagement (Kuh, 2008). At UC Davis a number of transition classes are offered to students. Some, but not all, have been assessed for impact on student outcomes. In 2015-16, the Academic Senate Undergraduate Council Special Academic Programs Committee reviewed the First Year Seminar program and recommended some type of 'navigating the research university' course for all first-year students as a GE class.

The following first year seminars and courses are currently offered at UC Davis:

- Career Discovery Groups—Offered to first year (three quarter sequence) and transfer students (1 quarter class) in CA&ES, https://caes.ucdavis.edu/students/cdg;
- Foundations for University Success (EDU 65)—A 2-unit class offered to International students, https://siss.ucdavis.edu/foundations-for-success;
- First Year Seminars—Open to all first-year students, some seminars are focused specifically on navigating the transition to the research university;
- LEADR—Offered to College of Engineering students who meet one or more criteria (First Generation, EOP, STEP, participation in other pre-college/Community College programs). Provides a 1-unit seminar for students in Fall and Winter quarters within their Living-Learning Community, http://engineering.ucdavis.edu/undergraduate/leadr-advising/;
- Cohorts Program (BioLaunch) (BIS 005/198)—A 1-unit seminar-style class offered to students in the College of Biological Sciences and designed to familiarize students with the Biological Sciences coursework and faculty, https://biology.ucdavis.edu/biolaunch;
- Letters & Science Programs—StaR Program—L&S Cohort Program Pilot: Seminars offered through the First Year Seminar Program, co-led by advisors, focusing specifically on college success skills through the lens of first generation and URM students; and
- First-Year Aggie Connections—Some 1-2 unit courses are offered thru EDU 65 Foundations for University Success classes.

As a result of these offerings, most UC Davis undergraduate colleges now offer academic classes that provide support for student transition to campus (Career Discovery Groups, LEADR, College of Biological Sciences Cohorts program, and Letters & Science First Year Seminar Pilot) and several additional First Year Seminar courses provide this content. We estimate that ⅓ to ½ of incoming students are already in such courses. The next step is to determine the

approximate number of seats needed to accommodate all students and to discuss the feasibility of making these courses part of GE requirements as opposed to "extras." We recommend collaboration/integration with programs piloted in the section above to minimize duplication of resources and to ensure intentional and seamless overlap in content and student support when appropriate.

7. **Improve academic advising delivery through the consistent use of a campus-wide advising portal across all campus units.**

   - **Incentivize faculty to collaborate with advising units to pilot an "early alert" partnership that is informed by advising and course-level data; and**

   - **Create robust and effective peer-advising, perhaps with graduate student "peers" as well, that continues peer-training and support provided previously by the RHAT program in housing and improves upon it.**

In recent years, a common advising portal (OASIS) has been developed that is now shared across all four undergraduate colleges and some Student Affairs units. This system is the key to ensuring that students receive informed advising, regardless of whether they change a major, visit a retention center vs. a college advisor, or move across colleges. All advisors working within the colleges should be using the common portal and it is essential that this is viewed as mandatory within each department of the colleges. Additionally, retention centers and student success centers should also be using the common portal. This enables students to receive accurate information when they are seen, regardless of location, because appointments can be based on the last advice given by other points of advising contact on campus.

A second step could be piloted with faculty willing to participate, perhaps through a "fellows" model. This would involve combining advising data with course-level data in order to know which students are struggling early enough during the quarter that proactive advising and/or faculty engagement can make a positive difference. Such early alerts can allow the opportunity for faculty and staff to reach out to these students prior to a point of being placed on academic probation. Other technology aided approaches for academic and/or psychosocial supports should also be explored (e.g., expanded features in Canvas; on-line tutoring programs; the current campus pilot of Live Health Online). Additional discussion is provided in Appendix F.

This is also the moment to improve the peer-advising model we have been using on campus. The Residence Hall Advising Team (RHAT) program, which historically has provided peer advisors within housing, is being discontinued. This leaves an opportunity for college advising leadership to consider how peer-advisors should be trained and funded, and what ratio of them should be placed in Deans Offices or departments vs. the residence halls. Research demonstrates that Residence halls can be powerful locations to provide integrated and 'developmentally oriented' programs for community building, advising, academic (tutoring/ success workshops) support, and psychosocial supports [5] At the same time, UC Davis has several 'Living-Learning Communities' (LLC)—some of these include credit-bearing seminar classes associated with the Community's theme. These may provide opportunities for enhanced advising, focusing on academic and psychosocial support. Ultimately, the sub-committee feels that there could be

greater integration of housing-based advising and programming with academic advising in the colleges. The discontinuation of RHAT requires us to explore how we can achieve the related but distinct aims of having the highest quality peer-advisor program for all students (not only those living in campus housing) and how our residence hall programs can integrate the best practices that advisors have to offer.

8. **Place UC Davis' pre- and post-matriculation support programs for students on a cycle of assessment similar to the Special Academic Program Review, whereby programs are reviewed at multi-year intervals for impact along with annual reports on usage.**

Currently it is difficult to identify the most successful of UC Davis's several pre- and post-matriculation supports for students because assessment of these programs has varied over time. These range from programs that support all students (tutoring) to programs for specific demographic groups (EOP). To ensure continuous program improvement, we recommend a defined assessment cycle for all student support programs. Program learning outcomes/goals would be defined by the program/leadership and used for assessment, review/evaluation, improvement, and budgeting if appropriate. Reports would be reviewed by Undergraduate Council, Student Affairs and Undergraduate Education with information available to campus stakeholders (e.g., administrative units, faculty, advisors). New programs would be added into the assessment cycle as the programs are implemented. This would require a review sequence to be created and relevant data identified. The review would be carried out by BIA or CEE, depending on the degree to which the program was geared towards particular courses/majors.

Including student perspectives in evaluation, assessment, and improvement is advised as it has been found to be an effective mechanism of inducing organizational change (Warren and Goodman, 2018, "Lift Us Up. Don't Push Us Out"). A program at UC Santa Cruz, the Koret Student Success Scholars (https://sserc.ucsc.edu/koret-student-success-scholars), involves students in the research of practices that support student success and could be a model for similar programs at UC Davis. This may require stipends for students and faculty research sponsors.

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Appendix A - Charge Letter for the Working Group

UNIVERSITY OF CALIFORNIA, DAVIS

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GARY S. MAY
Chancellor

OFFICE OF THE CHANCELLOR
ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8558
TELEPHONE: (530) 754-7237

April 12, 2018

Arnette Bates, Director, Educational Opportunity Program, Advising and Retention Services
Kevin Blue, Director, Athletics
Sue Ebeler, Associate Dean, College of Agricultural and Environmental Sciences
Danica Tisdale Fisher, Director, Summer Sessions
Beth Floyd, Director, Undergraduate Education and Advising
Annaliese Franz, Director, Undergraduate Research Center, Chemistry
Simona Ghetti, Psychology
Erika Jackson, Assistant Director, Student Success, Budget & Institutional Analysis
Katrina Jessoe, Agricultural and Resource Economics, Undergraduate Council Member
Susan Keen, Associate Dean, College of Biological Sciences
Ari Kelman, Associate Dean, College of Letters & Science
Ebony Lewis, Director, Admissions
Tim Lewis, Mathematics
Dan Potter, Undergraduate Council Chair, Plant Sciences
Jim Schaaf, Associate Dean, College of Engineering
Matthew Stratton, Preparatory Education Committee Member, English
Carolyn Thomas, Dean and Vice Provost for Undergraduate Education (Chair)

Re: Working Group: Closing the Preparation Gap

Dear Colleagues:

UC Davis admits a diverse cohort of talented freshman and transfer students from the state, the nation, and the world. Through our holistic review admissions system we are committed to enrolling students who have excelled within their local contexts. In holistic review, high school GPA, SAT, and personal factors all come into play in assessing a student's achievements and potential. As a result, each of our first-year Aggies is always someone who has been successful academically in their high school or community college. Yet not all schools offer the same level of academic preparation due to vast discrepancies in resources among districts. These discrepancies often translate into lower levels of preparation, even for the same grades, between schools. Once students enroll at Davis, their disparate backgrounds can lead to differences in academic placement and achievement. Admitted students take placement examinations in writing and, for those students pursuing STEM degrees, in chemistry and mathematics. Scores result in placement into introductory UC Davis classes or into a range of remedial options. The most common are "workload" classes. Currently, about 40% of new freshmen place into at least one workload course.

Recently, the Council of Associate Deans and the Preparatory Education subcommittee of Undergraduate Council have identified concerns with workload courses and outcomes, including

workload-taking students' tendency to have lower graduation rates and higher achievement gaps in GPA and academic standing than students who do not take workload courses. In this scenario, it is often the low-income, first-generation, and underrepresented minority students (many of whom attended lower-resourced schools) who struggle in gateway STEM and first-year writing courses.

In addition to the workload mechanism, we currently have a number of programs designed to narrow the gap in preparation. These programs provide important services and are designed by skilled and caring professionals. Nevertheless, our student attainment gaps in GPA, credit hours, second-year persistence, and four- and six-year-graduation rates persist. The time has come to assess, in a comprehensive, campus-wide manner, where we are and how we can improve. Further, programs that are successful on other campuses have not yet been implemented or implemented fully here at UC Davis. I charge this working group to look at how our program-based and course-based methods of reducing these gaps can be appropriately designed, scaled, and coordinated so that all students cross the finish line with meaningful degrees at a similar pace.

We would like you to serve on this working group in order to provide global recommendations to the Chancellor, Provost and Academic Senate. Next steps, if any, will be taken in partnership with the Senate.

The working group should respond to the following questions:

1. What current pre-matriculation programs are designed to close the preparation gap among undergraduate students across all colleges and units? How are these programs funded and what are their outcomes and efficacies? What incentives are possible to compel student participation and, if students participate prior to enrollment, how do we compensate for lost employment opportunities?

2. How do we determine who is directed to workload courses? What are our workload course outcomes?

3. What programs are available throughout the academic year to assist students in their academic transition to campus and in the following years? How are these programs funded? Are tutoring and academic support options sufficient in style and scale to meet the needs of our students? How effective are the programs in closing preparation and achievement gaps?

4. What programs are available throughout the academic year to assist students in their emotional and social transition to campus? How are these programs funded and how effective are they at supporting student achievement and retention?

5. In each of the above areas, what are the most effective/successful national programs that reach students unprepared in multiple areas?

6. Are there other emerging efforts throughout the university that seek to address these gaps? Are any of these programs especially promising?

7. Based on the above analyses and considerations, are their existing programs that should be enhanced and/or are there alternative approaches that we should be employing? What would it take to enhance or pilot these approaches?

We would like the committee to begin work in Spring 2018 and have completed recommendations no later than Winter 2019. Thank you for undertaking this important effort to ensure that our campus follows through on the implicit promise we make to offer all UC Davis students an equal opportunity to achieve the very best academic outcomes.

Best regards,

Gary S. May
Chancellor

Ralph J. Hexter
Provost and Executive Vice Chancellor

/am

Appendix B

Outreach and Research/Academic Programs at UC Davis with indirect connection to High School Students or Transfer Students (during recruiting or once on campus):

- UC Davis Educational Talent Search UC Davis Upward Bound
- UC Davis Sacramento Area Youth Speaks (UA's powerful Spoken Word outreach program housed at Urban League
- UC Davis Early Academic Outreach Program (EAOP)
- UC Davis School of Education/ Resourcing Excellence in Education
- UC Davis History Project
- UC Davis Sacramento Area Science Project
- American Chemical Society (ACS) Project SEED (Department of Chemistry)
- UC COSMOS (High School student program)
- UC Davis Young Scholars Program (High School student program)
- UC Davis Campus Recreation Youth Programs
- UC Davis School of Medicine Office of Admissions and Outreach (Summer SCRUBS, Saturday Academy)
- UC Davis School of Veterinary Medicine (EAOP collaboration for the Veterinary Medicine Exploration Academy, VMEA)
- UC Davis School of Veterinary Medicine Veterinary Student Outreach Program (VSOP)
- UC Davis School of Veterinary Medicine Extension, Martin Smith
- GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) Grant
- Student Recruitment and Retention Center (SRRC) and all of its student-initiated culturally based retention and outreach initiatives
- Office of Educational Opportunity and Enrichment Services (OEOES) including STEP, Guardian Scholars Program, Educational Opportunity Program, TRiO Scholars Program, Transfer Center, Mentorships for Undergraduate Research in Agriculture, Letters, and Science (MURALS)
- LEADR Program (in Engineering)
- Avenue^E Program (in Engineering)
- UC Davis Biology Undergraduate Scholars Program (BUSP)
- Mentorships for Undergraduate Research Participants in the Physical and Mathematical Sciences (MURPPS) Program (funded by the College of L&S)
- California Louis Stokes Alliance for Minority Participation (CAMP) Program (funded by National Science Foundation, NSF)
- McNair Scholars Program (funded by the U.S. Department of Education)
- UC LEADS (funded by UCOP)
- SMASH pipeline
- Student Community Center – LGBTQIA Resource Center, Cross Cultural Center, AB 540 & Undocumented Student Center, (these and similar centers serve beyond low income but serve many low-income students).
- Puente – Helps to prepare educationally disadvantaged high school and California Community College students for college admission. UCD has a newly established "Puente Club" which consists of students who participated in Puente at their high school or community college. The club has been established for a year and is designed to connect with

Puentistas as they transition to UCD and support student success and persistence in a culturally validating space.

- UMOJA – UMOJA community dedicated to enhancing the cultural and educational experiences of California Community College students with a focus on students from the African Diaspora. UC has an established MOU with UOMJA to support successful transfer. UCD is exploring the opportunity to establish an UMOJA Club to support UMOJA students matriculating to UCD in their transition to campus, persistence, and academic success.

Appendix C – Five Key Supports of STEP
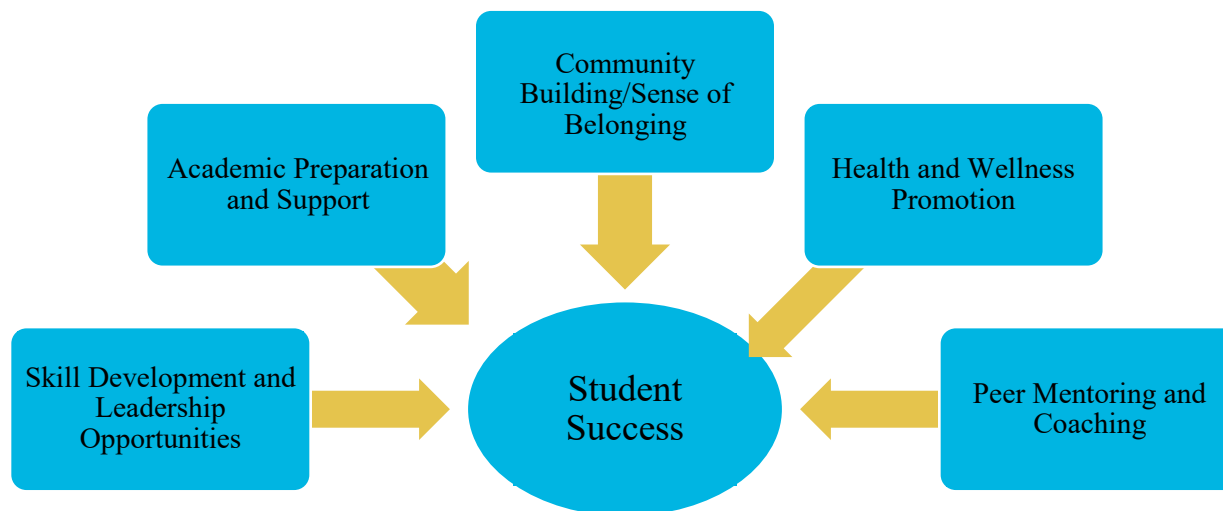
Skill Development and Leadership Opportunities
- The Understanding University Expectations seminars focus on the differences between high school and college and provide practical strategies to help students adjust and transition successfully.
- Workshops and seminars are offered on topics such as financial literacy, time management, study skills, metacognitive skills, success strategies and various leadership topics.
- Internships, student employment and volunteer opportunities are available to STEP students during the academic year.

Academic Preparation and Support
- Academic advisors provide guidance about college and major course requirements.
- Library tours include an overview of services as well as an introduction to conducting library research.
- Writing classes prepare students to meet University writing standards, with a particular focus on satisfying the entry level writing requirement (ELWR).
- Mathematics classes prepare students to place into calculus for fall quarter.
- Critical Analysis of Contemporary Issues classes help students practice and strengthen their critical reading and thinking skills.
- Faculty lecture series allows students to experience class lecture in a large lecture hall. In addition, the series allows students to develop note-taking skills and practice class participation.
- Tutoring is offered in math and writing.
- Faculty Chat encourages students to interact with UC Davis faculty in an informal setting and gain comfort in communicating with faculty.

Community Building
- Diversity workshops and activities explore the similarities and differences in the lived experiences of STEP participants and the value in appreciating and respecting one another.

- Students are introduced to the UC Davis Principles of Community and the campus book project.
- Community networking is facilitated through various activities. Students are introduced to resources available in the ethnic communities and other identity-based resources. Students interact with program and center staff and learn about the multitude of student organizations available to support their interests.
- A resource fair brings representatives from departments across campus to share information about their services and co-curricular opportunities.

Health and Wellness
- Self-Management workshops provide information on self-care, stress management and building a support network. Community psychologists offer group and one-on-one counseling.
- Alcohol and Drug Awareness educates students about the issues and consequences related to alcohol and drug use.
- Sex Jeopardy and Violence, Intervention and Prevention educates students about safe sex, healthy dating and responsible sexual behavior.
- Activities and Recreation Center and other scheduled physical activities promote health and wellness.

Peer Mentoring and Coaching
- Residential Life – During summer STEP, students live in the residence halls and are assigned to an EOP peer advising counselor (PAC). PACs offer mentorship and organize social activities to help students make social connections and form relationships.

Appendix D – Placement and Workload Charts

Writing Placement for all UC Davis freshmen

- Obtain passing score on ACT/SAT/AP/IB Exams to satisfy ELWR (~50% of Freshmen)
- Do NOT obtain passing score on ACT/SAT/AI/IB Exams (~50% of Freshmen)

Take AWPE[1] Exam in May of senior year (CA only) OR on UCD campus before Fall Quarter (Nationals, some CA, some Internationals)

- Score a 8 or greater on AWPE to satisfy ELWR (~30% of examinees)
- Score a 6 or less on AWPE w/out E-code [3] (~70% of examinees score <= 6)
- Score a 6 or below on AWPE + E-Code [3] (~70% of examinees score <= 6)

Enroll in a UC transferrable first-year college writing course at a CCC in summer before freshman year
- Pass with a "C" or better to satisfy ELWR
- Get a C- or worse

Enroll in Workload 57 or WR 39A [5] (~30% of Freshmen)
- Pass with a "C" or better to satisfy ELWR (~80% of enrollees)
- Get a C- or worse (~20% of enrollees)

Take English Language Testing Questionnaire [2]

ELPE Exam [4] (mostly Int'l students)

- ELPE<=69: Enroll in UWP 21[6]
- ELPE 70-79: Enroll in UWP 22[6]
- ELPE 80-89: Enroll in UWP 23[6]
- ELPE 90-100: Enroll in WLD 57S or WR 39A [5]
  - Pass with a "C" or better to satisfy ELWR
  - Get a C- or worse

AWPE[1] exam on Davis campus (see AWPE path above)

DRAFT 10-12-18

https://academicsenate.ucdavis.edu/bylaws-regulations/regulations#521-
http://elw.ucdavis.edu/
https://iae.ucdavis.edu/undergraduate/multilingual-elwr
https://iae.ucdavis.edu/undergraduate/elpe

UC Senate Regulation: "Remedial work in English is defined as work primarily focused on topics in spelling, punctuation and usage, and in the basic structures of sentences, paragraphs, and short essays. Policy regarding credit for English as a Second Language will be determined by individual Divisions.(Effective Fall 1984) (Am 23 May 96)"

1: The AWPE is a two-hour timed test offered to seniors in California public high schools every May. It is also at UCD. The AWPE may only be taken once per student. It is not required. Some students choose to start with Workload 57/WR 39A.

2: The questionnaire is UCD-specific and confirms the student's latest SAT/ACT/AP/IB scores, asks about languages spoken at home, etc.

3: An essay is e-coded by AWPE raters when English language errors contribute to a non-passing score.

4: ELPE=English Language Placement Exam. This is a UCD-specific exam which places students into UWP 21/22/23 or WLD57/WR39A.

5: WLD 57 is taught by Sac City and carries 4.5 workload units but not units towards graduation. The final used to be the AWPE exam but is now focused more on writing revision. UWP 39A is a 4 unit UC Online course and does count towards graduation.

6: UWP 21/22/23 are taught by UC Davis instructors and carry 4 units which counts towards graduation. UWP 21/22/23 placement extends the time on a student's 3-quarter clock to satisfy the ELWR. (e.g. placement into UWP 21 adds 3 quarters, UWP 22 adds 2, UWP 21 adds 1).
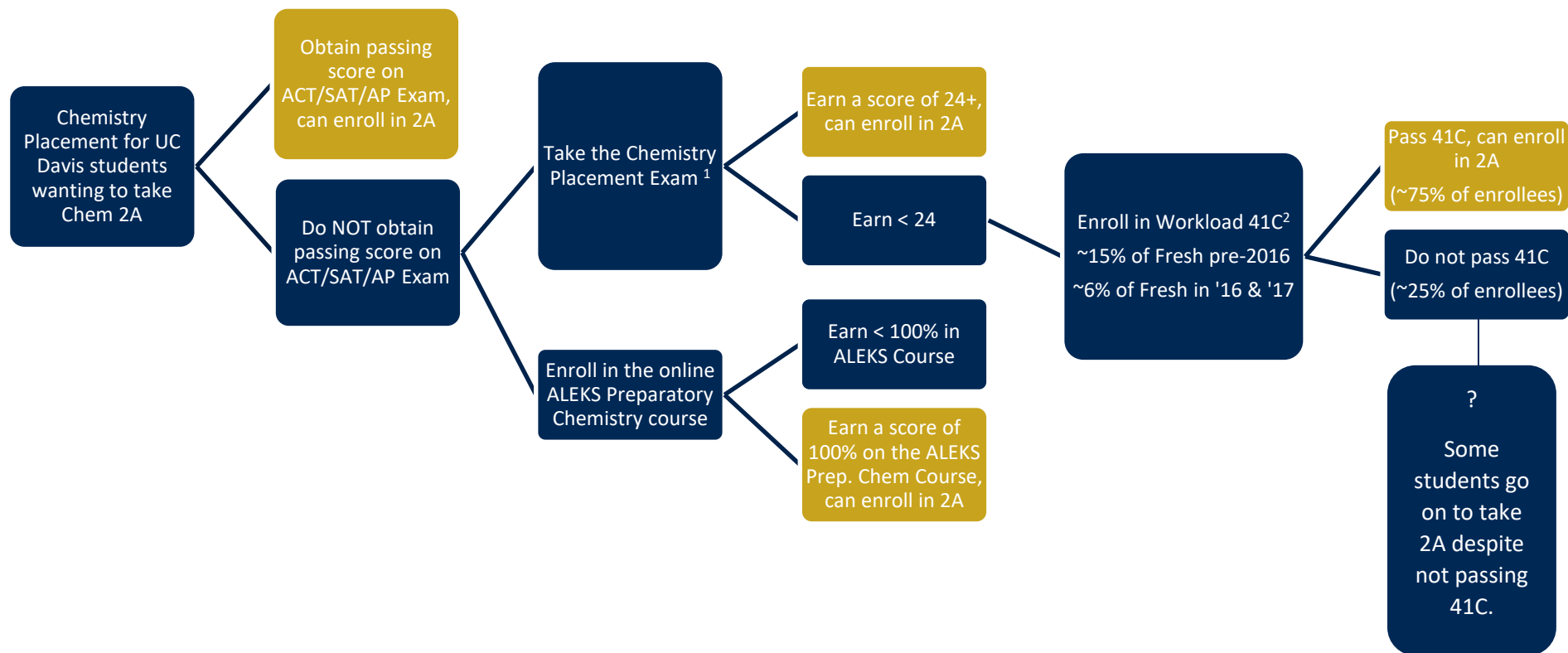
*New options starting in Winter 2018:
- UWP 7 (4 credit-bearing units): UWP 7 focuses on academic literacy strategies including understanding scholarly texts, contextualizing information, developing source-based academic writing projects, and learning how to implement feedback and revision plans. Two sections will be offered both Winter & Spring 19. Maximum enrollment will be 18 students/section. Ideal for students with between a B and C- in UWP 23, AWPE score of 4 or lower, ELPE score of 90-94; low SAT or ACT scores

- UWP 1A + UWP 1 (6 credit-bearing units): UWP 1A and UWP 1 must be taken concurrently as the course focuses on analyzing writing tasks, providing and implementing feedback, and identifying strategies for writing across the curriculum. Concurrent enrollment in UWP 1 is required. Two sections of each will be offered both Winter & Spring 19. Maximum enrollment will be 14 students/section. Ideal for students with a B+ or higher in UWP 23, AWPE score of 5 or 6, ELPE score of 95-100; borderline SAT or ACT scores that neared ELWR fulfillment.

- ENL 3A + ENL 3 (6 credit-bearing units): ENL 3A and ENL 3 must be taken concurrently as students complete disciplinary writing tasks, including literary analysis of poetry, drama, and fiction. Concurrent enrollment in ENL 3 is required. Two sections of each will be offered both Winter & Spring 19. Maximum enrollment will be 14 students/section. Ideal for students with a B+ or higher in UWP 23, AWPE score of 5 or 6, ELPE score of 95-100; borderline SAT or ACT scores that neared ELWR fulfillment.
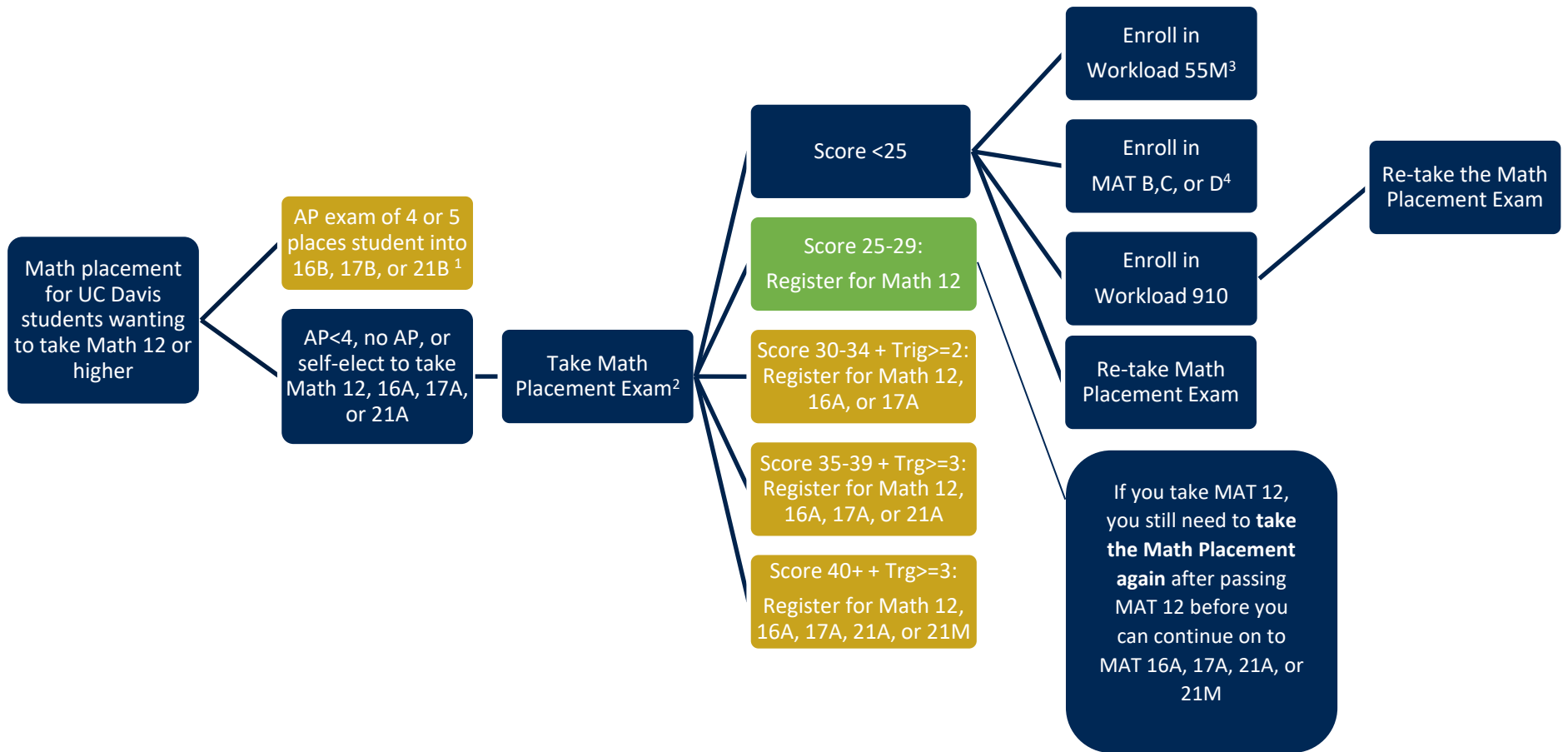
- WLD 57 and WR 39a will continue to be offered in winter and spring 2019 as part of the multiple pathways to fulfill ELWR at UC Davis.

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Chemistry
Placement for UC
Davis students
wanting to take
Chem 2A
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Obtain passing score on ACT/SAT/AP Exam, can enroll in 2A

Do NOT obtain passing score on ACT/SAT/AP Exam

Take the Chemistry Placement Exam [1]

Earn a score of 24+, can enroll in 2A

Earn < 24

Enroll in the online ALEKS Preparatory Chemistry course

Earn < 100% in ALEKS Course

Earn a score of 100% on the ALEKS Prep. Chem Course, can enroll in 2A

Enroll in Workload 41C [2]
~15% of Fresh pre-2016
~6% of Fresh in '16 & '17

Pass 41C, can enroll in 2A
(~75% of enrollees)

Do not pass 41C
(~25% of enrollees)

?
Some students go on to take 2A despite not passing 41C.

https://chemistry.ucdavis.edu/undergraduate/general-chemistry-series/chemistry-placement-requirements/fall2018

1: The Chemistry Placement Exam is only available online. The exam may be taken twice per quarter, but only once per testing session.

2: This is a standard course taught by Sacramento City College instructors on the UC Davis campus. Workload Chemistry (WLD 41C) is only offered during the Fall quarter.

Math placement for UC Davis students wanting to take Math 12 or higher

AP exam of 4 or 5 places student into 16B, 17B, or 21B [1]

AP<4, no AP, or self-elect to take Math 12, 16A, 17A, or 21A

Take Math Placement Exam [2]

Score <25

Score 25-29: Register for Math 12

Score 30-34 + Trig>=2: Register for Math 12, 16A, or 17A

Score 35-39 + Trg>=3: Register for Math 12, 16A, 17A, or 21A

Score 40+ + Trg>=3: Register for Math 12, 16A, 17A, 21A, or 21M

Enroll in Workload 55M [3]

Enroll in MAT B,C, or D [4]

Enroll in Workload 910

Re-take Math Placement Exam

Re-take the Math Placement Exam

If you take MAT 12, you still need to **take the Math Placement again** after passing MAT 12 before you can continue on to MAT 16A, 17A, 21A, or 21M

https://www.math.ucdavis.edu/undergrad/math_placement/

UC Senate Regulation: Remedial work in mathematics is defined as work in topics from arithmetic, beginning and intermediate algebra, plane geometry, and trigonometry. Trigonometry is considered remedial if taught as a separate course or taught in combination with more elementary subjects. A pre-calculus course, with intermediate algebra as a prerequisite, containing topics from advanced algebra, elementary functions (logarithmic, exponential, and trigonometric), and analytic geometry, is not considered remedial. (Effective Fall 1984)

1: https://www.ucdavis.edu/sites/default/files/upload/files/2018-tag-ap-chart.pdf

2: The Math Placement Examination is only available online and is 60 multiple choice questions. There will be two testing sessions per quarter (Fall, Winter, Spring), and a student may only take it once per testing session. It is free.

3: Workload 55M is offered through Sacramento City College on the UC Davis Campus. Comprehensive review of algebra (no trigonometry is covered in this course). Carries 3 workload units that do not count toward gradation but do count toward minimum progress and full-times status.

4:

MAT B - Elementary Algebra: Basic concepts of algebra, including polynomials, factoring, equations, graphs, and inequalities. Math B carries 3 workload units that do not count toward graduation, but do count toward minimum progress and full-time status.

MAT C - Trigonometry: Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Math C carries 2 workload units that do not count toward graduation, but do count toward minimum progress and full-time status.

MAT D - Intermediate Algebra: Basic concepts of algebra, prepares student for college work in mathematics, such as course 16A, 17A or 21A. Functions, equations, graphs, and systems of equations. Math D carries 3 workload units that do not count toward graduation, but do count toward minimum progress and full-time status. To enroll in Math D, you must contact the Student Academic Success Center.

Appendix E – Definitions and models for academic support

- Stretch classes—college level course with content from 1 quarter spread over 2 quarters/semesters; for credit; may contain remedial content;
- Co-requisite classes—college level (credit-bearing) course with separate (noncredit) co-requisite class or workshop that provides basic skills needed for success in college-level class;
- Developmental Course—a) a remedial course providing content needed for credit-bearing course; b) may also be a course that combines credit-bearing and remedial non-credit bearing instruction in a single course (e.g., a sequenced course with 5 weeks of accelerated remedial content followed by intensive 10 weeks version of gateway course);
    - for purposes of this report, developmental classes generally refer to the first definition (a);
- Compensatory Course—offers additional (may be required) excess hours to provide skills needed to succeed in the course (not considered remedial);
- (Modified) Supplemental Instruction—regularly scheduled, out of class group study sessions; facilitated by trained peer leaders, peer-to-peer interactions in small groups; offered to all students in a targeted course; voluntary; students acquire learning strategies—integrate how to learn with what to learn;
- Wrap-around services—meeting comprehensive student needs, e.g., financial support along with mental health, financial, legal support to students, advising, communication, coaching, moral support;
- Project Based Learning and Contextual Learning—blending academic competencies with information gained from working on a project and/or based on career pathways, e.g., linking developmental math competencies to health care competencies or linking mathematics skills to collecting data on social justice issues (see also Epper and Baker, 2009); and
- Learning Communities—cohorts of students enroll together in a cluster of different developmental classes that may be linked by career interests, experiences, etc.; learning is integrated across the courses in the cluster and may involve addressing questions/issues outside the classroom (https://www.centerforengagedlearning.org/doing-engaged-learning/learning-communities/) ; e.g., Cabrillo College developmental programs in math and English focused on social justice issues https://www.cabrillo.edu/services/stars/learning-communities.php.

Appendix References:

CUNY. 2018. *Guidance for Designing Corequisite Remediation at CUNY.* Retrieved from: http://www2.cuny.edu/wp-content/uploads/sites/4/page-e-assets/about/administration/offices/registrar/resources/Guidance-for-Creating-or-Redesigning-Co-requisite-Courses.final1_.pdf.

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Harvey Mudd Introductory Computer Science Course: https://www.cs.hmc.edu/goals-innovations-results/.

UC Santa Cruz. 2019. *Learning Support Services*. Retrieved from: https://lss.ucsc.edu/programs/modified-supplemental-instruction/index.html.

University of Missouri-Kansas City. 2019. *The International Center for Supplemental Instruction*. Retrieved from: https://info.umkc.edu/si/.

Appendix F – Discussion of the Challenges of Providing Advising and Counseling Services to Large Groups of Students

There are several units and programs on the UC Davis campus that are providing effective academic and psychosocial support services to various groups of students. The task of this subgroup is to figure out what support should be provided to students who are enrolled in workload courses to help enhance academic achievement and persistence towards graduation.

Since the number of these students is significantly larger than the groups of students who currently receive structured support (e.g., student-athletes), the problem requires consideration of scale and efficiency. In other words, the university knows how to deliver academic and psychosocial support to small or moderately sized groups of students, but how should it provide support to much larger groups?

Traditional approaches to solving this problem would involve scaling resources and investment in an approximately linear fashion, typically driven by the relatively linear growth in staffing costs as the number of students receiving support services increases. For example, if $275,000 is invested annually in tutoring services to support 650 students, it would cost approximately $2.75M to provide the same level of tutoring services to 6500 students. Approaches like these are perhaps easiest to implement, but they are resource-intensive, not likely to be sustainable, and double-down on current support models that do not scale efficiently.

An optimal solution, in theory, would be able to provide support to each incremental student at an increasingly efficient cost without a commensurate tradeoff in quality. Such an approach is likely to leverage technology in some fashion to do some combination of (a) helping efficiently identify students who need support, (b) delivering support services efficiently (which may mean some delivery is digital or remote), and (c) facilitating coordination of in-person support services in an efficient manner.

Not knowing the landscape at other schools, it is unclear if others have effectively used technology-aided solutions to deliver academic or psychosocial support at scale. The problem is complicated, so the optimal solution may not exist yet.

The short summary below summarizes a few initial learnings about the interaction between technology and student support services. Some of what follows may not be centrally relevant to our university context, but hopefully it helps think critically about the challenge of scale.

The relationship between technology and student support services

Some of the most interesting research comes from the Clayton Christensen Institute (https://www.christenseninstitute.org/results/?_sft_topics=higher-education), which is a think tank named after the Harvard Business School professor who pioneered the theory of disruptive innovation. Among other things, they study how technology is changing education.

Most relevant from the Christensen Institute is the writing of Julia Freeland Fisher, who writes about social capital (essentially, a student's network and support systems) as an underappreciated

factor in student persistence and outcomes (see https://www.christenseninstitute.org/blog/the-invisible-currency-in-education-reform-social-capital/). She wrote a book on this entitled "*Who You Know*" (see https://www.amazon.com/Who-You-Know-Unlocking-Innovations/dp/1119452929) that explores the link between social capital and student outcomes in significant detail. Importantly, the book also reviews technology-facilitated efforts to foster helpful support networks for students.

Julia Freeland Fisher also has a very comprehensive website that lists a number of organization and startup companies that are attempting to use technology-centric approaches to enhance student support (https://whoyouknow.org/).

Below are links to a few notable non-profit and for-profit organizations that use technology as a means to deliver services at scale.

- Fidelis – Makes software that helps to manage and scale out of classroom support services (https://www.fideliseducation.com/).
- Beyond12 – Oakland-based non-profit startup that uses a technology platform and coaches to "provide students with the academic, social, and emotional support they need to succeed in higher education and in life". ICA just hired someone from this company to fill an open student-athlete outcomes adviser role (https://beyond12.org/).
- Live Health Online – Used by several schools, including UC Davis, to schedule and deliver counseling appointments through Facetime. Worth considering if there is analogous model for student support (http://livehealthonline.com/psychology).
- Graduway – Software that helps connect alumni to each other and with students for networking and mentorship. Integrates with university CRM and data management systems (https://graduway.com/products/mentoring-software/).
- Brightside – Non-profit that connects mentees and mentors (https://brightside.org.uk/what-we-do/).

There are many others, but this subgroup hasn't had the opportunity to dig into them further. It is possible that some of these organizations may have operational models or underlying technology to help UC Davis think about how to provide support to workload students at scale. This would benefit from further consideration and comprehensive study.