

**Response to UC Campus and UC Academic Council Comments Regarding
Proposed Revisions to Senate Regulation 424.A.3 (Area “d”)
1/25/2018**

Thank you very much for the invaluable feedback on the proposed changes to area “d” (See Appendix A: Summary of UC Campus Comments Regarding Proposed Revisions to Senate Regulation 424.A.3 (Area “d”)). We will address each of the main concerns in the following narrative and underscore the positive impact of sending the proposed area “d” policy revisions to the Academic Senate Assembly for approval and implementation.

Access & Equity

The vast majority of UC applicants (California residents) come from comprehensive high schools (Grades 9-12), high schools (e.g., Grades 9-11 or 10-12), or K-12 schools. These different high school types are increasing their offerings of 3 or more science disciplines, while the remaining high schools with only 1 or 2 science disciplines are declining (See below and Appendix B).

Number of Science Disciplines Offered by High School Type

- 2015-2016 3+ Science Disciplines 90.7% (1713/1888)
 1 or 2 Science Disciplines 9.3% (175/1888)
- 2016-2017 3+ Science Disciplines 92.7% (1772/1912)
 1 or 2 Science Disciplines 7.3% (140/1912)
- 2017-2018 3+ Science Disciplines 93.3% (1803/1932)
 1 or 2 Science Disciplines 6.7% (129/1932)

As previously presented, recent data show that 95% of UC undergraduate applicants already take 3 or more area “d” courses (63% take four or more). Of these applicants who complete only 2 area “d” courses 5% (n = 5,032), about 60% are underrepresented minorities, which raises questions about potential differential access to area “d” course offerings.

A major concern focused on the 5% of students who might become “UC-ineligible” because they have completed only 2 years of science; the California State University's APEP (Academic Preparation and Education Programs Committee) shared this concern as well. In response, UCOP Undergraduate Admissions conducted additional data analyses to examine whether students’ completion of 2 courses is primarily due to an access issue (i.e., high schools are offering no more than 1 or 2 science disciplines), or whether students are taking 2 courses because UC currently requires only 2 science disciplines to fulfill the area “d” subject requirement.

The summary data below and Appendix C highlights the science course offerings at the schools where students took only 2 area “d” courses and took no science elective courses. Of the high schools where this cohort of UC applicants come from (n = ~1,600-1,800 students), 96-97% of the schools actually offer 3 or more science disciplines and only 3-4% currently offer 1 or 2 science disciplines. This evidence suggests that the UC applicants with just 2 science courses completed are aiming to meet the minimum required science

courses for area “d.” Furthermore, the large number of high schools associated with students in this cohort represents approximately 39% (753/1932) of all high schools with registered “a-g” course lists for 2017-18 and reflects a wide spectrum of high school types (less-resourced and well-resourced).

High Schools with UC Applicants Completing Only 2 Area “d” Course

- 2015-2016 3+ Science Disciplines 96.3% (754/783)
 1 or 2 Science Disciplines 3.7% (29/783)
- 2016-2017 3+ Science Disciplines 97.2% (697/717)
 1 or 2 Science Disciplines 2.8% (20/717)
- 2017-2018 3+ Science Disciplines 96.8% (728/752)
 1 or 2 Science Disciplines 3.2% (24/752)

The data analyses point out that the applicants who are “only” taking 2 science courses now are simply following UC requirements; if UC increases the area “d” requirement to 3, 96-97% of California high schools will be able to offer a third science discipline/course for their students. The letter from Jill Grace, President of the California Science Teachers Association (CSTA) (see Appendix D), includes further statistics on the trend of California districts/schools moving in the direction of offering 3-4 science courses aligned to Next Generation Science Standards (NGSS). The implementation of 3-course or 4-course models will very likely continue to grow as more high schools fully align to NGSS, given the number of school districts that have already set their local high school graduation requirements to 3 science courses (see CSTA letter).

Online Science Laboratories

Another concern was that allowing online science labs (synchronous and/or asynchronous) would potentially dilute the science experience. Currently, there are no UC-approved online science labs, as all online science courses are expected to be implemented with non-online lab activities. There is very little educational research literature regarding the failure or success of online labs. If high school online science labs were to be designed, submitted, and approved by UC, they must meet the goals and criteria of area “d” – as with all other subject areas offering online versions of “a-g” courses. Allowing online science labs, even if in a pilot, would provide a golden opportunity for UC to conduct its own educational research on the effectiveness of such a delivery mode in supporting the success of UC undergraduates.

Summary

The proposed revisions to area “d” were presented to ICAS, the Intersegmental Committee of Academic Senates from California Community Colleges (CCC), California State University (CSU), and University of California, on December 6, 2017. Except for the concern from CSU, as referenced earlier, there was no opposition. The impact of changes to area “d” would help improve the student populations/applicant pools to CCC and CSU as well, due to increased science literacy. In turn, transfers from CCC to UC should improve the preparation to science and non-science majors as well. Finally, as several of the UC campuses noted (e.g., Merced), the proposed policy change formalizes an existing status and holds all UC applicants accountable to more solid academic preparation through evidence-based inquiry that is the foundation of NGSS.

With any type of educational policy change like the proposed changes to area “d,” BOARS and UCOP will closely monitor and evaluate its effects on access, equity, opportunity, and fairness.

Prepared by:

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APPENDICES

Appendix A Summary of UC Campus Comments Regarding Proposed Revisions to Senate Regulation 424.A.3 (Area “d”)

Appendix B Number of Science Disciplines Offered by High School Type 2015-2017

Appendix C High Schools with UC Applicants Completing Only 2 Area “d” Courses 2015-2017

Appendix D Endorsement Letter from the President of the California Science Teachers Association (CSTA)

Appendix E 2016-2017 Science Course Enrollment in Grades 10-12

APPENDIX A

**Summary of Campus Comments RE
Proposed Revisions to Senate Regulation 424.A.3 (Area D)**

Overall Summary

Campus	Status
Berkeley	Opposed
Davis	Mixed
Irvine	Mixed
Los Angeles	Mixed
Merced	In favor
Riverside	In favor
San Diego	Mixed
Santa Barbara	In favor
Santa Cruz	In favor

Detailed Summary

Campus	Review Committee	Status	Key Comments
Berkeley	Divisional Council (DIVCO)	Opposed	<ul style="list-style-type: none"> 95% of UC undergraduate applicants already complete 3 years of science (“solution in search of a problem”) Not supported by analysis of the 5% of applicants not currently completing more than the required 2 years
	Admissions, Enrollment, and Preparatory Education (AEPE)	Opposed	<ul style="list-style-type: none"> What purpose is served by increasing to 100% completing 3 years? Insufficient discussion of the 5% that would be “UC ineligible”
	Lawrence Hall of Science	In favor	<ul style="list-style-type: none"> Supports the name change Concerns RE access for underserved populations & greater specificity about full alignment with NGSS
Davis	Davis Division of the Academic Senate	Mixed reviews (see below)	
	Admissions and Enrollment (A&E)	Opposed	<ul style="list-style-type: none"> Not clear how UC’s alignment of admissions requirements is promoted by strictly requiring 3 years & how failure to adopt the proposed change would undermine the goals of area “d” Impact on students from lower SES status high schools Alignment with the CSU system
	Undergraduate Council (UGC)	Opposed	<ul style="list-style-type: none"> Similar comments as above A minority in favor argue the new requirement would ensure better educational preparedness of all incoming UC students & requiring 3 years would not represent an unfair burden for students because sufficient accessible alternatives are available if the high school does not offer enough courses
	Committee on Courses of Instruction (COCI)	In favor (unanimously supports)	<ul style="list-style-type: none"> Aggressively publicize the policy change Supports the name change

	University Committee on Educational Policy (UCEP)	Expressed concerns	<ul style="list-style-type: none"> Concerns RE asynchronous lab activities Access to courses may have negative impact on students
Irvine	Irvine Division of the Academic Senate (Council on Educational Policy; Council on Undergraduate Admissions and Relations with Schools)	Recommends continued examination of the potential impact of the proposed changes	<ul style="list-style-type: none"> Unclear how the proposed revisions would better prepare students for a UC undergraduate education Lower resourced public high schools could be unfairly disadvantaged Humanities/Arts applicants could see a decrease in their admissions-competitiveness
Los Angeles	UCLA Academic Senate	In favor (recommends strong evaluation plan to assess the impact of proposed changes and impact)	<ul style="list-style-type: none"> Potential disadvantages for ethnic minority students Expand the meaning of the term “laboratory” rather than removing it Concerns about quality/effectiveness of online courses
	Committee on Undergraduate Admissions and Relations with Schools (CUARS)	Opposes	<ul style="list-style-type: none"> Unclear definitions of fundamental core disciplines in science Courses should require evidence-based learning activities where students make observations by gathering data themselves in order to arrive at reproducible conclusions through systematic inquiry Access to three or more science courses is an equity and access issue
	Undergraduate Council (UgC)	In favor (generally supportive, but request more information before formally endorsing)	<ul style="list-style-type: none"> Timeline and equity concerns Concerns RE removal of the term “laboratory” from the name Impact on student matriculation to each campus No clear plans for assessment of the policy change
	College of Letters and Science Faculty Executive Committee (College FEC)	In favor	<ul style="list-style-type: none"> Concerns about ensuring approved courses satisfy in substance the requirements that are set Concerns RE removal of the term “laboratory” Misalignment of “fundamental disciplines” in proposed policy vs. NGSS
	Henry Samueli School of Engineering & Applied Science (HSSEAS) Faculty Executive Committee (FEC)	In favor	<ul style="list-style-type: none"> Very supportive of proposed revisions; no comments/concerns

Merced	Divisional Council	In favor	<ul style="list-style-type: none"> Supports the recommendation from Undergraduate Council
	Undergraduate Council (UGC)	In favor	<ul style="list-style-type: none"> Proposed revision formalizes an existing status, with the majority of UC applicants already completing 3-4 years of science
	School of Natural Sciences Executive Committee	In favor	
Riverside	Riverside Division of the Academic Senate	In favor	<ul style="list-style-type: none"> Confusion over the reference to “every science every year”
	Committee on Undergraduate	In favor	<ul style="list-style-type: none"> Reservations RE online courses

	Admissions		
	School of Business Executive Committee	No opinion	
	College of Natural and Agricultural Sciences (CNAS) Executive Committee	In favor	<ul style="list-style-type: none"> Consensus that the proposed change would better preparing incoming students
	College of Humanities, Arts, and Social Sciences (CHASS) Executive Committee	In favor	<ul style="list-style-type: none"> The fact that 95% of UC applicants already meet the revised standard provides significant reassurance that the change will not have ill effects Supports the name change
San Diego	San Diego Division of the Academic Senate	Expressed concerns	<ul style="list-style-type: none"> Questioned the need for the policy change given that 95% of UC applicants already complete 3 years Concerns RE disparate impact on underrepresented minority students, how the policy change will be communicated, access to courses, and potential negative impact on non-STEM applicants
Santa Barbara	Santa Barbara Division of the Academic Senate	In favor	
	Undergraduate Council (UgC)	In favor (with reservations)	<ul style="list-style-type: none"> Need to ensure expanded course options meet the goals/criteria of area "d" Some favored a move toward a 4-year requirement, with a minimum of 3 courses from the core disciplines
	Committee on Admissions, Enrollment and Relations with Schools (CAERS)	In favor (with reservations)	<ul style="list-style-type: none"> Concerns about the impact on underrepresented minority students, particularly those from under-resourced schools, who may not have access to 3 years of science courses Recommends BOARS track applicants who do not meet the new requirement and develop measures to ensure these students do not fall through the cracks
	College of Creative Studies Faculty Executive Committee (FEC)	In favor (full support)	
	College of Engineering Faculty Executive Committee (FEC)	In favor (full support)	
	College of Letters & Science (L&S) Faculty Executive Committee (FEC)	In favor (with reservations)	<ul style="list-style-type: none"> Concerns about the admissions eligibility of underrepresented minority students who may not have access to 3 years and quality of online courses as one mechanism to bridge the access gap
Santa Cruz	Santa Cruz Division of the Academic Senate	In favor	
	Committee on Admissions and Financial Aid (CAFA)	In favor	<ul style="list-style-type: none"> Extended science options reflect current integration of these fields (computer science, engineering, applied sciences, etc.) into the scientific process Supported the institution of online labs; extant traditional labs should not be replaced by online ones Supports the name change
	Committee on Courses of	In favor	<ul style="list-style-type: none"> Supports the name change

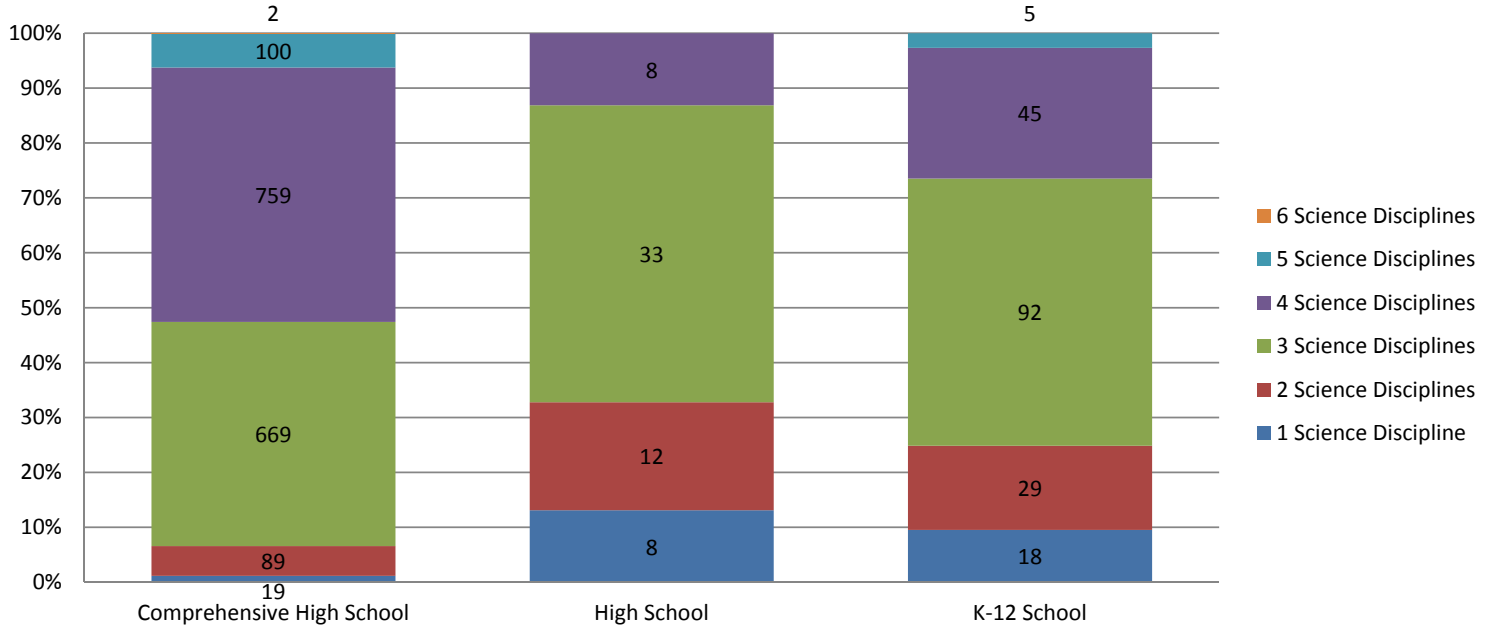
	Instruction (CCI)		
	Committee on Educational Policy (CEP)	In favor	<ul style="list-style-type: none"> ▪ Supports the name change ▪ Concerns RE allowing for entirely virtual learning environments & access to courses
	Committee on Preparatory Education (CPE)	In favor (with reservations)	<ul style="list-style-type: none"> ▪ Supports the name change ▪ Requests data showing how many students matriculate from schools that offer only 2 years of science
	Committee on Teaching (COT)	In favor (with reservations)	<ul style="list-style-type: none"> ▪ Concerns RE possible detrimental impact on students who do not plan on pursuing a science degree ▪ Alignment with the CSU system

Appendix B

Number of Science Disciplines Offered by School Type 2015-2016

School Type	1 Science Discipline	2 Science Disciplines	3 Science Disciplines	4 Science Disciplines	5 Science Disciplines	6 Science Disciplines	Total
Comprehensive High School	19	89	669	759	100	2	1638
High School	8	12	33	8			61
K-12 School	18	29	92	45	5		189
Total	45	130	794	812	105	2	1888

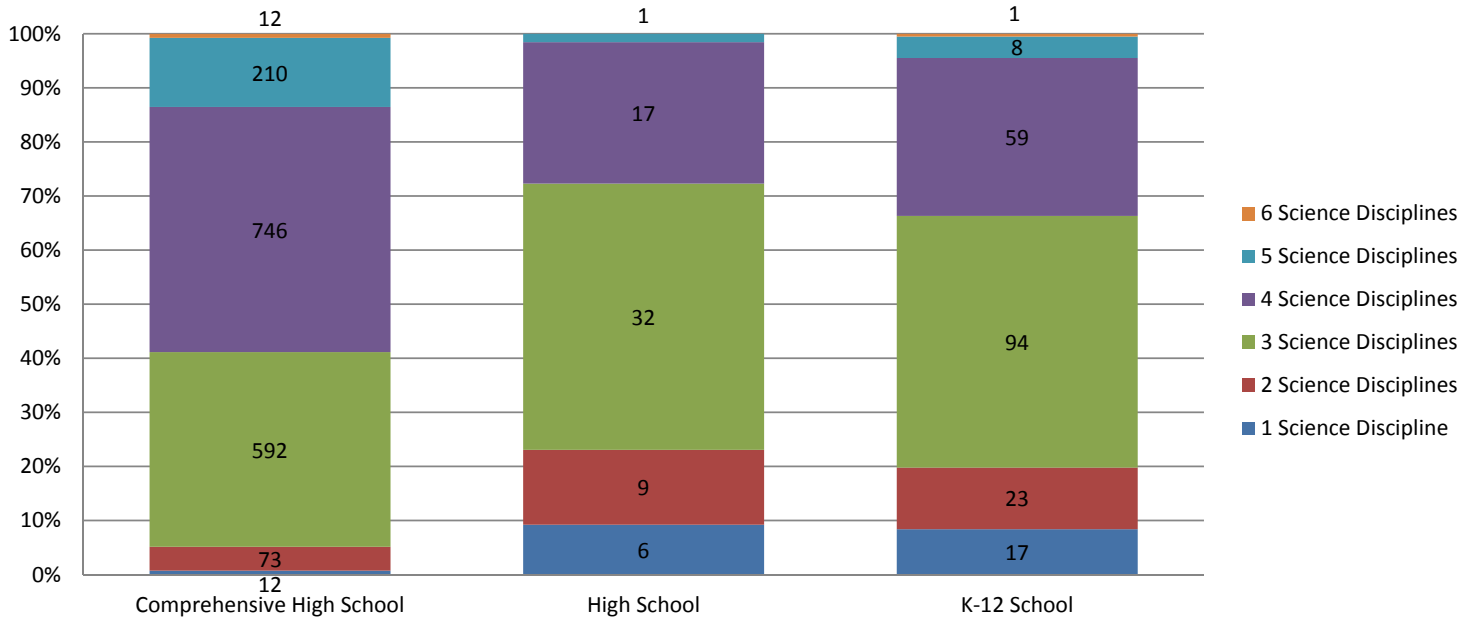
Number of Science Disciplines Offered by School Type
2015-2016



Number of Science Disciplines Offered by School Type 2016-2017

School Type	1 Science Discipline	2 Science Disciplines	3 Science Disciplines	4 Science Disciplines	5 Science Disciplines	6 Science Disciplines	Total
Comprehensive High School	12	73	592	746	210	12	1645
High School	6	9	32	17	1		65
K-12 School	17	23	94	59	8	1	202
Total	35	105	718	822	219	13	1912

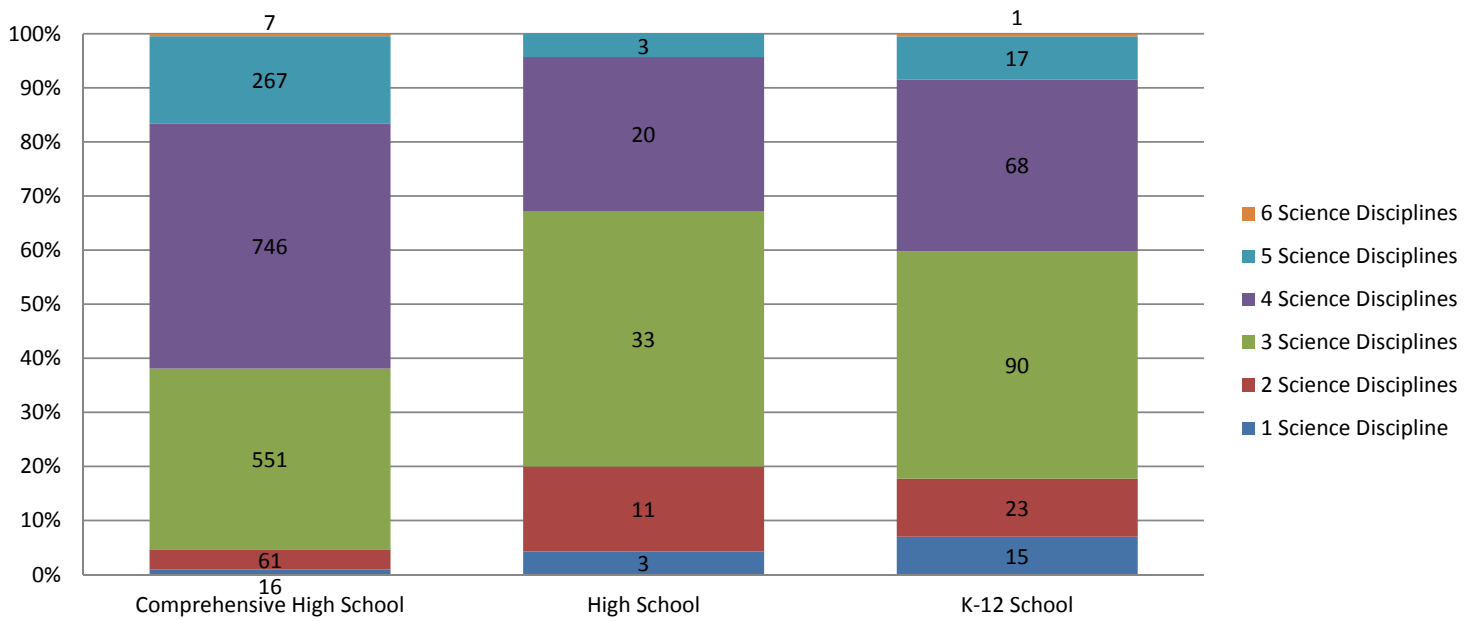
**Number of Science Disciplines Offered by School Type
2016-2017**



Number of Science Disciplines Offered by School Type 2017-2018

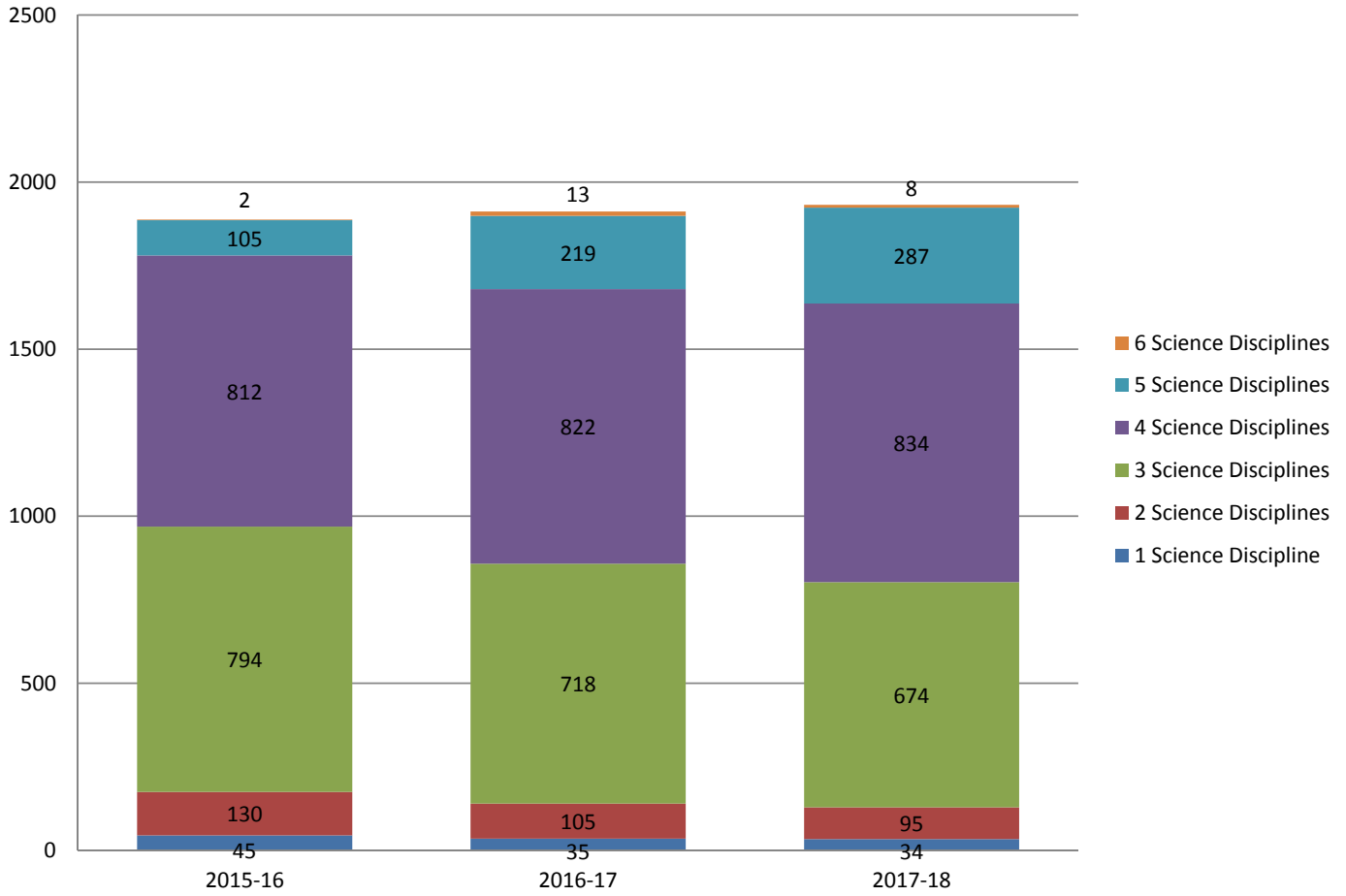
School Type	1 Science Discipline	2 Science Disciplines	3 Science Disciplines	4 Science Disciplines	5 Science Disciplines	6 Science Disciplines	Total
Comprehensive High School	16	61	551	746	267	7	1648
High School	3	11	33	20	3		70
K-12 School	15	23	90	68	17	1	214
Total	34	95	674	834	287	8	1932

Number of Science Disciplines Offered by School Type 2017-2018



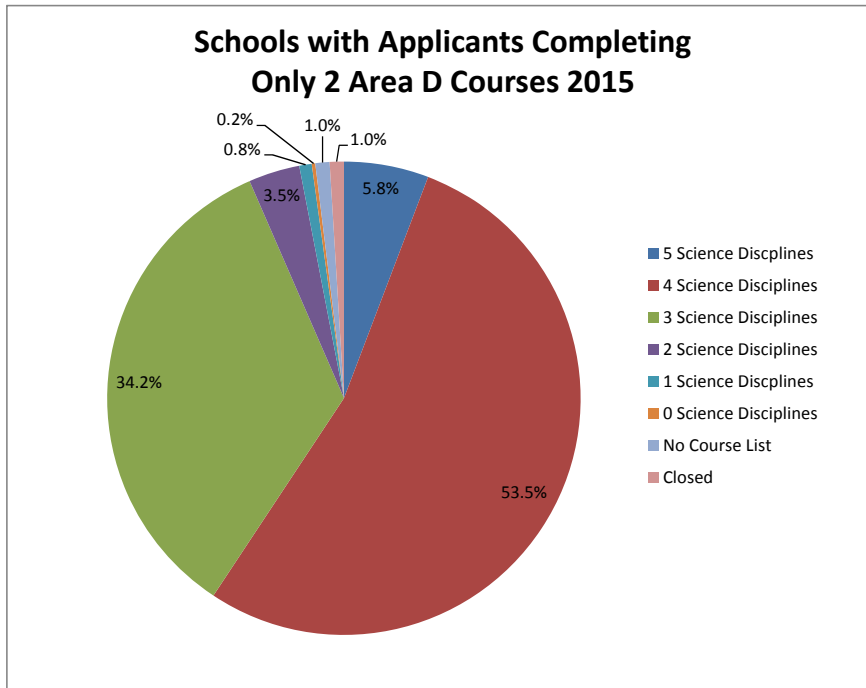
Appendix C

Number of Science Disciplines Offered Comprehensive High School, High School, K-12 School



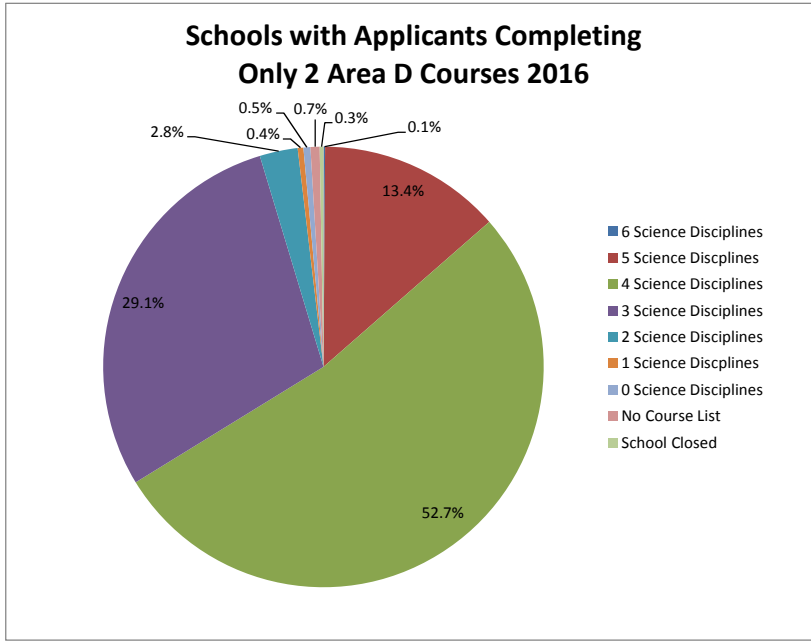
Schools with Applicants Completing Only 2 Area D Courses 2015

School Type	5 Science Disciplines	4 Science Disciplines	3 Science Disciplines	2 Science Disciplines	1 Science Disciplines	0 Science Disciplines	No Course List	School Closed	Total
Comprehensive High School	46	429	252	22	3	1		5	758
High School		2	6						8
K-12 School	2	5	13	2	2			2	26
Alternative High School of Choice		7	8	5	2	1	1	1	25
Other			4						4
Unknown							7		7
TOTAL	48	443	283	29	7	2	8	8	828



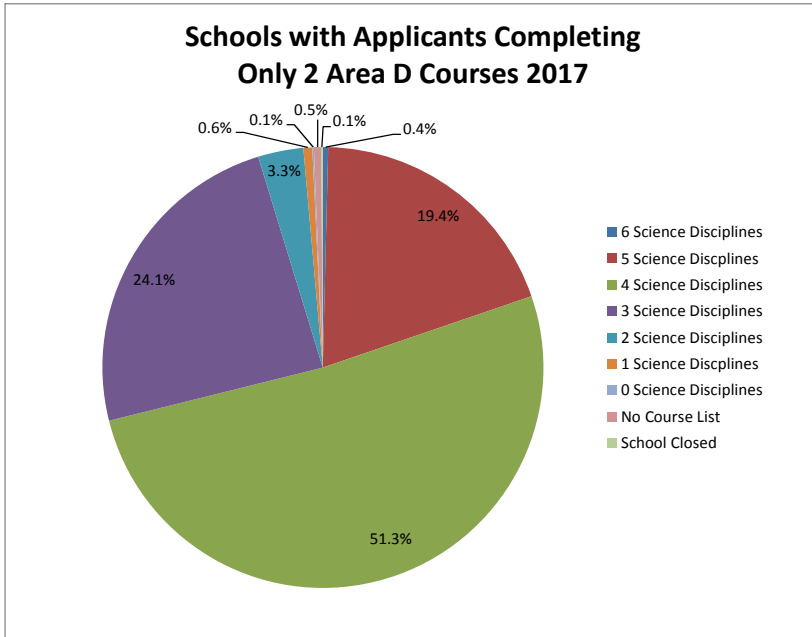
Schools with Applicants Completing Only 2 Area D Courses 2016

School Type	6 Science Disciplines	5 Science Disciplines	4 Science Disciplines	3 Science Disciplines	2 Science Disciplines	1 Science Disciplines	0 Science Disciplines	No Course List	School Closed	Total
Comprehensive High School		98	389	188	18		1		2	696
High School			2	3				1		6
K-12 School		1	3	13	1	1				19
Alternative High School of Choice	1	2	2	12	2	2	3			24
Other				3						3
Unknown								4		4
TOTAL	1	101	396	219	21	3	4	5	2	752



Schools with Applicants Completing Only 2 Area D Courses 2017

School Type	6 Science Disciplines	5 Science Disciplines	4 Science Disciplines	3 Science Disciplines	2 Science Disciplines	1 Science Disciplines	0 Science Disciplines	No Course List	School Closed	Total
Comprehensive High School	3	145	389	169	17	2				725
Continuation High School				1	1					2
High School		2	2	2	1					7
K-12 School		2	5	9	3	1			1	21
Alternative High School of Choice		2	2	5	3	1	1			14
Special Education / State Special School						1				1
Other			2	2	1					5
Unknown								4		4
TOTAL	3	151	400	188	26	5	1	4	1	779





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January 22, 2018

Henry Sánchez

Chair, Board of Admissions and Relations with Schools (BOARS)

University of California

Via Email Only: Henry.Sanchez@ucsf.edu

RE: Support for Proposed Revisions to Senate Regulation 424.A.3 (Area D)

Dear Dr. Sánchez:

The California Science Teachers Association (CSTA) supports the proposed revisions to University of California Senate Regulation 424.A.3 (Area D) and urges the Academic Council to approve the recommended changes. CSTA is a 501(c)(3), professional, membership association with more than 3,000 members. CSTA has played a leadership role in the development, adoption, and subsequent implementation of the California Next Generation Science Standards (CA NGSS) since their conception. CSTA provided feedback during the development of the standards, and has informed and participated in one capacity or another in all aspects of their implementation including assessment, accountability, curriculum framework development, teacher preparation and credentialing. The alignment of the UC's area "d" subject requirement with the CA NGSS is a critical component to successful implementation in high school and we therefore fully support the proposed revisions.

The proposed changes would bring UC's admission requirements for science into alignment with the newly adopted California K-12 science standards and communicate that the UC system supports the shift to the CA NGSS. The changes proposed support all high school course models in the *California Science Framework* as well as high school course sequences that may be developed locally. Additionally, raising the requirement from two years to three is consistent with actions recently taken by the California State Board of Education. When California adopted CA NGSS and appendices, the state adopted a set of high school standards that necessitate three years of science to achieve. In 2017, the California State Board of Education adopted the *California Science Framework* which offers three possible high school course models, all requiring three or four years to actualize. The changing of the name of the area "d" subject requirement from "Laboratory Science" to "Science" is also consistent with CA NGSS. The change in the name covers the broader range of CA NGSS-aligned fields and provides greater clarity to course designers seeking area "d" approval for their courses. The proposed changes also eliminate alignment with the 1998 California Science Standards, a move



CALIFORNIA'S ADVOCATE FOR HIGH QUALITY SCIENCE EDUCATION

CSTA sees as critical in communicating with high school course designers and educators that UC supports K-12 implementation of CA NGSS.

High schools face many challenges in developing their science course models. They need to help students meet the UC admission requirements, they want to support existing AP and IB programs, many have developed outstanding career pathway programs in STEM fields, and they want courses that are meaningful to the local context and student populations. As mentioned above, California has offered three example course models for high schools to consider. Additionally, the CA NGSS Appendix K: Model Course Mapping in Middle and High School for the Next Generation Science Standards offers guidance to high schools that may choose develop their own course models, including accelerated course pathways (one such model has already been published by Achieve, Inc.) and Career Technical Education (CTE) pathways that integrate CA NGSS. The proposed changes are supportive of the many course models that exist and will be developed by high schools. These models will be based in their local context and designed to best meet the needs of their students. By “opening up” the third year of required science to courses such as engineering, computer science, applied sciences, earth/space science, and more, while maintaining course requirements that are rigorous and aligned with CA NGSS, UC would not be placing an undue burden on schools and students. This is also consistent with CA NGSS's broadening of science standards to include engineering, technology, and computational thinking. This third year allows for more flexibility for students and schools in course decision-making. This flexibility would support schools in modifying and/or designing and developing their courses and course sequences that would meet the revised course requirements. In rural and hard-to-staff schools, the options outlined in the course requirements allow for schools and districts to consider teaching faculty credentials and experience when designing courses to meet both student educational needs as well as area “d” course requirements.

Increasing the amount and quality of science education for all students improves their scientific literacy and helps to prepare them not only for college and career, but also as educated, informed voters and citizens. Careers in Science, Technology, Engineering, and Math (STEM) are some of the fastest growing and best paying that require highly skilled and literate workers now and in the future. Increasing the science requirement helps insure that California students have access to good careers and California employers have the skilled workers needed to keep in the lead of the worldwide economy. CSTA has a long-standing policy of supporting a three-year science high school graduation requirement. California lags behind other states in graduation requirements for students in science. According to a data [recently released by the Public Policy](#)

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[Institute of California](#) (PPIC), 42 states currently require three years of science in order to graduate. Currently, UC's admission requirements exceed the state's requirements in both math and English, increasing the science requirement from two years to three is not without precedent, and is good policy. As many as four in ten districts currently have a three year high school science graduation requirement, and 51% of districts align their graduation requirements with UC course requirements. Increasing the requirement would likely have the impact of increasing graduation requirements in many districts across the state, a move that is critical in preparing all students for career and college in the 21st century.

CSTA urges you to support the revisions to the area "d" course requirements and increasing of the admission requirements for science from a "two years required, recommended three" to three years required. High schools look to the UC for leadership and direction and these changes would be important to support the successful implementation of the California Next Generation Science Standards.

Sincerely,

A handwritten signature in black ink that reads 'Jill Grace'.

Jill Grace
President

Appendix E

2016-2017 Science Course Enrollment In Grades 10-12

2016 -2017 Science Course Enrollment - 10th Grade

	Science Course Enrollment	Public School Enrollment	%
California Total	417,740	486,085	85.9%
Female	204,650	236,827	86.4%
Male	213,090	249,258	85.5%
African American	24,362	28,731	84.8%
American Indian	2,190	2,886	75.9%
Asian	40,251	43,757	92.0%
Filipino	12,753	14,037	90.9%
Hispanic	223,004	260,201	85.7%
Pacific Islander	2,046	2,436	84.0%
White	99,294	117,592	84.4%
Two or More Races	11,424	13,238	86.3%
English Learners	47,357	59,222	80.0%

2016 -2017 Science Course Enrollment - 11th Grade

	Science Course Enrollment	Public School Enrollment	%
California Total	364,359	481,521	75.7%
Female	180,372	234,673	76.9%
Male	183,987	246,848	74.5%
African American	20,590	28,696	71.8%
American Indian	1,795	2,889	62.1%
Asian	39,625	45,840	86.4%
Filipino	11,876	14,273	83.2%
Hispanic	188,878	252,458	74.8%
Pacific Islander	1,845	2,471	74.7%
White	88,150	119,308	73.9%
Two or More Races	9,718	12,810	75.9%
English Learners	35,642	53,556	66.6%

2016 -2017 Science Course Enrollment - 12th Grade

	Science Course Enrollment	Public School Enrollment	%
California Total	211,215	484,169	43.6%
Female	104,392	234,014	44.6%
Male	106,823	250,155	42.7%
African American	12,787	30,799	41.5%
American Indian	1,045	3,020	34.6%
Asian	25,611	43,001	59.6%
Filipino	7,221	14,469	49.9%
Hispanic	106,092	253,193	41.9%
Pacific Islander	1,111	2,571	43.2%
White	50,623	121,771	41.6%
Two or More Races	5,777	13,000	44.4%
English Learners	17,145	48,053	35.7%

Source: California Department of Education

Note: Public School Enrollment based on Census Day Counts