



# A Model for Success: CART's Linked Learning Program Increases College Enrollment

January 2011

## Table of Contents

I. Introduction	Page 3
II. Data and Analysis	Page 4-5
III. The Center for Advanced Research and Technology (CART)	Page 6
IV. Linked Learning	Page 7
V. Methodology	Page 8
VI. Appendix	
Table 1. Cohort Characteristics	Page 9
Table 2. CART Students and Matched Comparison Group, Grade 12	Page 10
Table 3. Percent of Grade 12 CART Students Enrolling into Community College and University After High School	Page 11

## **I. Introduction**

When rigorous academics are combined with demanding technical learning and real-world experience, students are better prepared to succeed after high school. Embracing that Linked Learning model, the Center for Advanced Research and Technology (CART), a high school in Clovis, California, released data that clearly shows hands-on learning can lead to a higher percentage of enrollments in both community college and four-year universities.

As noted in a recent policy brief from the Alliance for Excellence in Education (2010), students in

**“...college-going findings indicate that CART is serving its students well and holds promise as a model for improving the readiness of California’s high school graduates.”**

California (and nationally) are not graduating high school prepared for college and, in turn, careers. And a recent analysis by the California Department of Education (2010) concludes that the Linked Learning approach can deeply transform the state’s high schools. Preliminary findings from an independent evaluation indicated that students enrolled in these programs were more likely to pass the California High School Exit Examination as sophomores, to graduate from high school, and to complete college entrance requirements. Students in these career-themed programs also get hands-

on learning experience in real-world learning environments.

CART has been a trailblazer in developing and implementing the Linked Learning approach and their students are demonstrating positive results. Each student enters a pathway linked to a career with the goal of graduating ready to complete their education in postsecondary institutions. Students are provided rigorous academic coursework that is contextualized for their identified career path as well as training in the technical aspects of the career. Furthermore, each pathway acts as a small learning community encouraging students to work together, creating a personalized education experience around the chosen career path.

Using intersegmental transcript data from the California Partnership for Achieving Student Success (Cal-PASS) database, the Institute for Evidence Based Change has begun exploring educational outcomes for CART students. Preliminary findings from the past seven years are promising and notably positive. Students matriculated to postsecondary institutions at a higher rate than a matched sample of similar students from area high schools. This was true whether one examined college-going within one year of graduation or at any time after graduating from CART. Also, this was true for community college and university enrollments.

Although further research questions currently are being explored (e.g., need for postsecondary remediation in English and math, extent to which students continue in their career path after graduation, subpopulation differences), college-going findings indicate that CART is serving its students well and holds promise as a model for improving the readiness of California’s high school graduates.

### **What is Linked Learning?**

Linked Learning transforms students' high school experience by bringing together strong academics, demanding technical education and real-world experience to help students gain an advantage in high school, postsecondary education and careers.

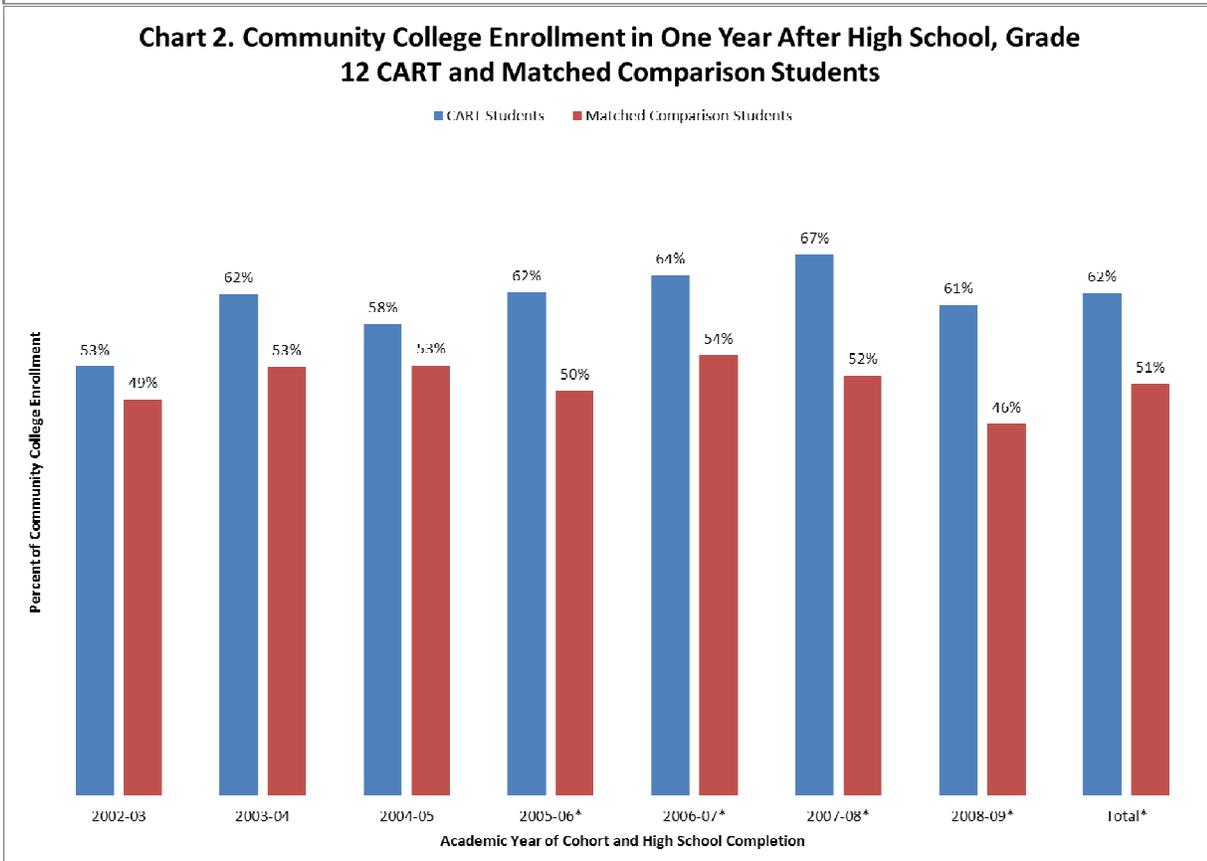
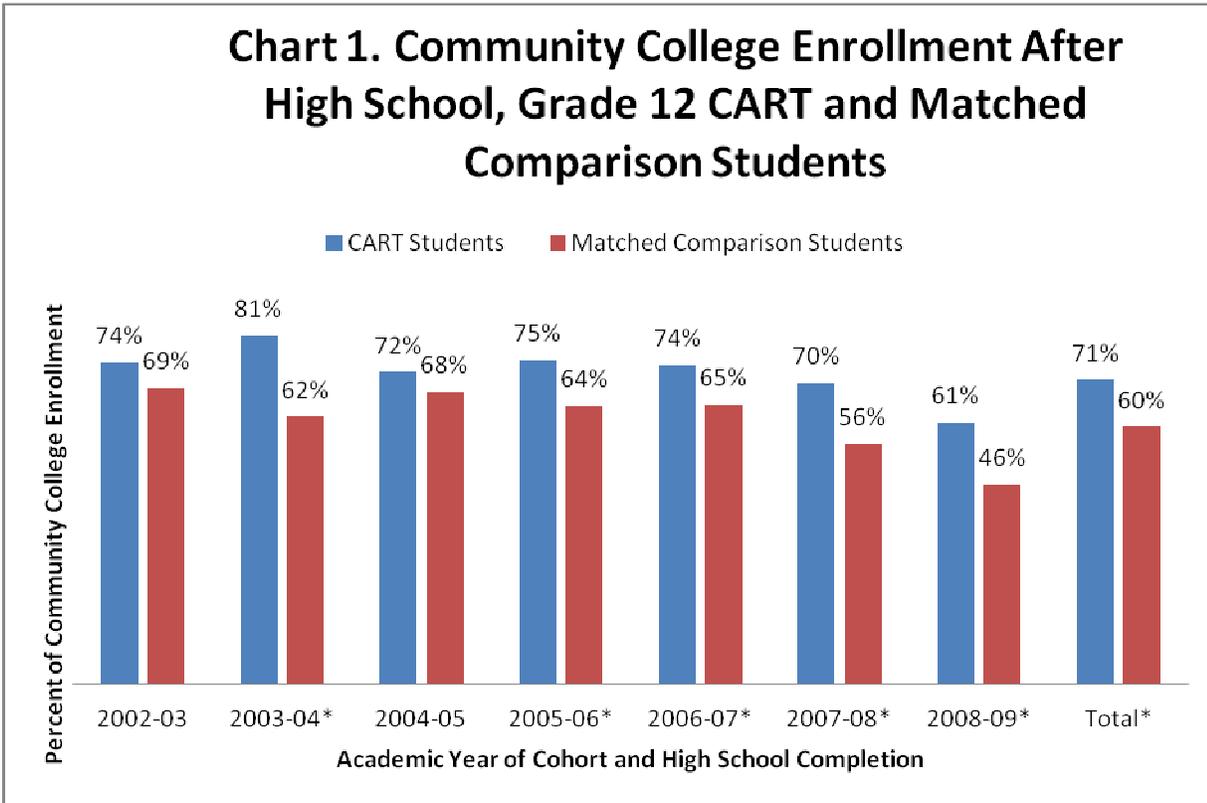
In the Linked Learning approach, students follow industry-themed pathways in a wide range of fields, such as engineering, arts and media, biomedicine and health.

### **For more information about this report contact:**

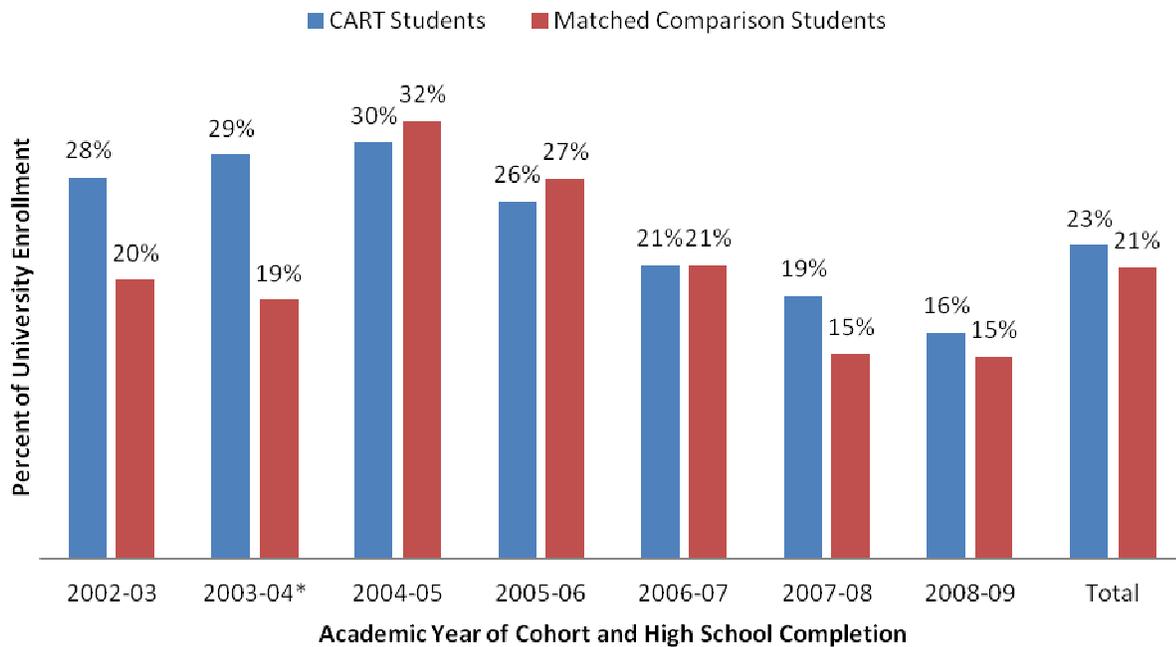
John Forbes, Ed.D., Dean of Curriculum and Instruction  
Center for Advanced Research and Technology  
(559) 248-7405, JohnForbes@CART.org

## II. Data and Analysis

CART’s data shows that from 2002-2008 students who participated in CART’s Linked Learning approach had a higher percentage of enrollments in community colleges after completing Grade 12 and one year after high school. After Grade 12, 71 percent of students who participated in CART attended a community college, while 60 percent of a demographically similar group of non-CART students attended community college – a difference of 11 percentage points; the same percentage difference holds true one year after high school.



### Chart 3. University Enrollment After High School, Grade 12 CART and Matched Comparison Students



CART students also surpassed their non-CART counterparts in university enrollment. University enrollment was two percentage points higher for CART students as compared to similarly matched non-CART students.

### **III. The Center for Advanced Research and Technology (CART)**



The Center for Advanced Research and Technology (CART) used the Linked Learning approach to combine rigorous academics with technical, design, process, entrepreneurial and critical thinking skills organized around career clusters. Through individualized learning plans and a coordinated sequence of projects, CART students explore the many ways they can achieve their career goals. Working with business partners, teachers, and parents, students design a program of study that qualifies them to pursue the post-secondary path of their choice from entry-level positions to industry certification to university admission. With the knowledge, skills, and support they receive, students leave CART ready to launch their careers – ultimately becoming globally competitive members of our modern economy.

#### **How does CART work?**

Eleventh and twelfth grade students from 15 high schools in the Clovis and Fresno Unified School Districts attend half-day classes taught by teams of instructors from both education and business, integrating subjects into project-based labs. More than 1,300 students from a variety of backgrounds enroll in one of 13 labs ranging from human behavior and psychology to biomedical engineering and forensic science. The partnership between the school districts is a unique opportunity to positively influence the future of all students in the San Joaquin Valley.

The CART model combines rigorous academics with career clusters including professional sciences, engineering, advanced communications and global dynamics. Within each cluster are several career-specific laboratories in which students complete industry-based projects and receive academic credit for advanced English, science, social science and technology.

Aligning with CART's quality project-based instruction, Linked Learning offers secondary students a multi-year program of study that combines academic and technical learning organized around broad industry sectors, such as biomedical and health sciences; finance and business; information technology; public services; and arts, media and entertainment.

#### **CART Reinvents High School**

The CART model has taken bold steps to reshape the education system in Clovis and Fresno Unified School Districts. CART has increased the number of students graduating from high school and the number of internships available to high schools students throughout both districts. CART students are motivated to pursue excellence when projects are relevant to their interests and they have the opportunity to work with businesses and community members on "real" projects that inspire them to achieve their full potential. CART's integrated curriculum, project-based learning and career focused labs have instilled a sense of responsibility and personal motivation making high school relevant for CART students.

#### **IV. Linked Learning: Pathways to College and Career Success**



Linked Learning transforms students' high school experience by bringing together strong academics, demanding technical education and real-world experience to help students gain an advantage in high school, postsecondary education and careers.

Linked Learning students follow industry-themed pathways in a wide range of fields, such as engineering, arts and media, biomedicine and health. These pathways connect learning with students' interests and job preparation, leading to higher graduation rates, increased postsecondary enrollments, higher earning potential and greater civic engagement. Used in schools throughout California, this integrated approach helps students build a strong foundation for success in college and career – and life.

#### **What is the Linked Learning approach?**

Linked Learning offers secondary students a multi-year program of study that combines academic and technical learning organized around broad industry sectors, such as biomedical and health sciences; construction and building design; agriculture and renewable resources; and arts, media and entertainment. Linked Learning prepares students for all the avenues they might pursue following high school graduation: two- and four-year colleges, certification programs, apprenticeships or formal job training. The Linked Learning approach challenges and inspires students to learn, and creates well-rounded, highly skilled individuals with the foundation for lifelong success.

#### **Growing and Expansion: The Linked Learning District Initiative**

Linked Learning is flourishing in high schools throughout California, with promising results. The District Initiative provides funding and support to help California school districts develop and implement plans for expanding Linked Learning in their high schools and is managed by ConnectEd, The California Center for College and Career. Each participating district is developing between six and eight high-quality Linked Learning pathways, greatly increasing the options for students.

#### **Linked Learning Alliance**

The Linked Learning Alliance is a statewide coalition of hundreds of education, industry and community organizations dedicated to improving California's high schools and preparing students for both postsecondary education and career. The Alliance brings a collective voice and coordinated effort to expanding access to Linked Learning for California's students. It seeks to build awareness of the Linked Learning approach, optimize resources to support further development of Linked Learning, and encourage policy development that will support the Linked Learning approach.

## **V. Methodology**

Using intersegmental transcript data from the California Partnership for Achieving Student Success (Cal-PASS) database, the Institute for Evidence Based Change examined educational outcomes for CART students.

The results are based on a cohort of students who attempted one or more CART course(s) in the second semester in either the Clovis or Fresno Unified school districts. The CART courses in this report include only those courses where the locally assigned course numbers matched with the course numbers provided in the spreadsheet. Other CART courses, such as CART Technology Applications, Physics and Technology, etc., listed on the CART website, are not included.

The comparison group was selected from students who had not attempted any of the CART courses and were enrolled in the same district, academic year, and grade level (grade level 12). The comparison group was selected using a propensity score matching method estimated based on gender, ethnicity, home language, school, as well as 10<sup>th</sup> grade CAHSEE English Language Arts (ELA) and math scale scores, when available; English proficiency, special education status, parent education level, participation in the National School Lunch Program (NSLP), and the CST ELA scale score from 11<sup>th</sup> grade, when available. Students were matched using the “nearest neighbor match” method within grade level and academic year.

The expected graduation date was calculated based on grade level and academic year (June 10 of academic year when the student was expected to complete grade 12). Note that college and university enrollments are limited to local member institutions only and college and university enrollment counts are not mutually exclusive.

The overall differences in community college enrollment for participant and comparison group were statistically significant at  $\alpha = 0.5$  level and relatively consistent across years. The differences in university enrollment were not as consistent.

For academic years 2002-03 and 2003-04 data were available from one district only.

## VI. Appendix

**Table 1. Cohort Characteristics**

Group	Academic Year														Total	
	2002 - 03**		2003 - 04**		2004 - 05		2005 - 06		2006 - 07		2007 - 08		2008 - 09		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Total***	323	100%	312	100%	588	100%	715	100%	727	100%	872	100%	1123	100%	4660	100%
<b>Gender</b>																
Female	165	51%	149	48%	312	53%	308	43%	368	51%	443	51%	596	53%	2341	50%
Male	158	49%	163	52%	276	47%	407	57%	359	49%	429	49%	527	47%	2319	50%
<b>Ethnicity</b>																
American Indian	*	*	*	*	*	*	10	1%	*	*	11	1%	9	1%	41	1%
Asian	92	28%	97	31%	116	20%	99	14%	107	15%	147	17%	129	11%	787	17%
Black	35	11%	35	11%	38	6%	33	5%	63	9%	81	9%	83	7%	368	8%
Filipino	*	*	*	*	10	2%	17	2%	15	2%	6	1%	19	2%	69	1%
Hispanic	119	37%	105	34%	165	28%	188	26%	215	30%	260	30%	333	30%	1385	30%
Pacific Islander	*	*	-	-	*	*	*	*	*	*	5	1%	*	*	19	0%
White	73	23%	73	23%	252	43%	365	51%	320	44%	362	42%	546	49%	1991	43%
<b>Grade Level‡</b>																
Grade Level 11	174	54%	178	57%	192	33%	225	31%	261	36%	335	38%	594	53%	1959	42%
Grade Level 12	149	46%	134	43%	396	67%	490	69%	466	64%	537	62%	529	47%	2701	58%
<b>Advanced 2-year Program</b>																
In Advanced Program	19	6%	18	6%	58	10%	43	6%	47	6%	35	4%	67	6%	287	6%
Not In Advanced Program	304	94%	294	94%	530	90%	672	94%	680	94%	837	96%	1056	94%	4373	94%
<b>ROP</b>																
ROP	116	36%	140	45%	202	34%	344	48%	240	33%	464	53%	506	45%	2012	43%
Not In ROP	207	64%	172	55%	386	66%	371	52%	487	67%	408	47%	617	55%	2648	57%
<b>Lab</b>																
Architecture	9	3%	13	4%	28	5%	42	6%	43	6%	44	5%	40	4%	219	5%
Biomedical Engineering	17	5%	49	16%	73	12%	81	11%	60	8%	61	7%	96	9%	437	9%
Biomedicine	69	21%	27	9%	56	10%	65	9%	65	9%	72	8%	116	10%	470	10%
Economics & Finance	20	6%	9	3%	57	10%	54	8%	49	7%	63	7%	52	5%	304	7%
Environmental Science	44	14%	50	16%	70	12%	73	10%	56	8%	88	10%	115	10%	496	11%
Forensic Research	21	7%	28	9%	55	9%	54	8%	68	9%	59	7%	102	9%	387	8%
Interactive Game Design	-	-	-	-	-	-	-	-	30	4%	36	4%	45	4%	111	2%
Law & Order	36	11%	30	10%	61	10%	75	10%	55	8%	84	10%	91	8%	432	9%
Marketing	17	5%	10	3%	27	5%	20	3%	27	4%	36	4%	53	5%	190	4%
Multimedia	58	18%	35	11%	98	17%	86	12%	90	12%	107	12%	130	12%	604	13%
Networking	18	6%	21	7%	37	6%	54	8%	31	4%	35	4%	59	5%	255	5%
Product Development	-	-	14	4%	2	0%	27	4%	-	-	46	5%	21	2%	110	2%
Psychology and Human Behavior	-	-	-	-	-	-	-	-	92	13%	89	10%	132	12%	313	7%
Robotics	-	-	-	-	-	-	13	2%	19	3%	19	2%	20	2%	71	2%
Web Application Development	14	4%	26	8%	24	4%	71	10%	42	6%	33	4%	51	5%	261	6%
<b>Cluster</b>																
Science	153	47%	162	52%	258	44%	283	40%	331	46%	381	44%	566	50%	2134	46%
Social Science	73	23%	49	16%	145	25%	149	21%	131	18%	183	21%	196	17%	926	20%
Technology	91	28%	95	30%	168	29%	253	35%	225	31%	273	31%	332	30%	1437	31%
Other†	6	2%	6	2%	17	3%	30	4%	40	6%	35	4%	29	3%	163	3%

**Notes:**

\* Between 1 and 4 students; dashes (-) indicate 0 students.

\*\*Academic years 0203 and 0304 have data from one district only.

‡Last grade level in CART.

†Includes the following courses: ENVIRON FIELD STUDIES AB (P), ROBOT/ELECTRON II AB (P), and

ROBOTICS/ELECTRON AB (P).

\*\*\* Total includes some duplicate counts in cases where a student took two courses during the same term.

**Table 2. CART Students and Matched Comparison Group, Grade 12**

Group	Total			
	Participant		Comparison	
	N	%	N	%
Total***	2627	100%	2627	100%
<b>Gender</b>				
Female	1284	49%	1267	48%
Male	1343	51%	1360	52%
<b>Ethnicity</b>				
Asian	424	16%	428	16%
Black	187	7%	185	7%
Hispanic	739	28%	734	28%
White	1198	46%	1212	46%
Other	79	3%	68	3%
<b>Home Language</b>				
ENG	2109	80%	2101	80%
HISP	209	8%	219	8%
OTHER	309	12%	307	12%
<b>10th Grade CAHSEE SS</b>				
CAHSEE ELA	-	388	-	389
CAHSEE math	-	387	-	388
<b>English Proficiency</b>				
EO	1502	57%	1416	54%
I-FEP	163	6%	136	5%
EL	181	7%	156	6%
R-FEP	253	10%	246	9%
Unknown/Missing	528	20%	673	26%
<b>Parent Education Level</b>				
Graduate School	326	12%	284	11%
College Grad	516	20%	501	19%
Some College	501	19%	461	18%
High School	328	12%	300	11%
No High School	195	7%	186	7%
Unknown	229	9%	219	8%
Missing	532	20%	676	26%
<b>Average CST ELA Scale Score</b>				
	-	338	-	339

Notes:

\* Between 1 and 4 students; dashes (-) indicate 0 students.

\*\*\*Unduplicated student count.

**Table 3. Percent of Grade 12 CART Students Enrolling into Community College and University After High School**

Group	Academic Year																					Total			
	2002 - 03			2003 - 04			2004 - 05			2005 - 06			2006 - 07			2007 - 08			2008 - 09						
	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	N	cc Enr	Unv Enr	
<b>Total</b>	149	74%	28%	134	81%	29%	393	72%	30%	444	75%	26%	456	74%	21%	528	70%	19%	523	61%	16%	2627	71%	23%	
<b>Gender</b>																									
Female	70	77%	33%	60	83%	30%	200	72%	33%	196	76%	30%	239	75%	23%	251	73%	22%	268	56%	20%	1284	71%	26%	
Male	79	72%	23%	74	78%	28%	193	73%	27%	248	75%	23%	217	72%	20%	277	68%	17%	255	65%	12%	1343	71%	20%	
<b>Ethnicity</b>																									
Asian	37	68%	38%	41	80%	41%	76	61%	53%	59	61%	37%	62	73%	44%	85	64%	33%	64	55%	28%	424	65%	39%	
Black	9	78%	44%	15	67%	13%	18	67%	17%	19	84%	42%	39	77%	23%	44	66%	27%	43	53%	19%	187	68%	25%	
Hispanic	55	75%	22%	40	85%	25%	98	78%	24%	123	72%	19%	128	73%	16%	165	74%	13%	130	65%	15%	739	73%	18%	
White	44	77%	23%	37	81%	24%	187	75%	26%	222	78%	24%	215	73%	18%	223	71%	17%	270	61%	13%	1198	72%	19%	
Other	*	*	*	*	*	*	14	71%	21%	21	86%	43%	12	92%	17%	11	45%	36%	16	63%	19%	79	75%	29%	
<b>Advanced 2-year Program</b>																									
In Advanced Program	19	79%	37%	18	78%	44%	58	78%	40%	43	77%	47%	47	60%	28%	35	60%	43%	66	42%	30%	286	64%	37%	
Not In Advanced Program	130	74%	26%	116	81%	27%	337	72%	28%	409	75%	25%	411	75%	20%	499	70%	17%	458	63%	14%	2360	71%	21%	
<b>ROP</b>																									
ROP	40	75%	15%	64	77%	27%	131	71%	31%	207	77%	22%	146	75%	18%	282	67%	15%	233	64%	13%	1103	70%	19%	
Not In ROP	109	74%	32%	70	84%	31%	262	73%	30%	246	72%	30%	312	73%	23%	252	72%	24%	292	58%	19%	1543	70%	26%	
<b>Lab</b>																									
Architecture	*	*	*	5	40%	40%	17	82%	12%	33	79%	18%	26	73%	12%	20	80%	25%	15	60%	13%	118	75%	17%	
Biomedical Engineering	13	92%	38%	16	81%	38%	53	77%	36%	46	78%	35%	43	72%	28%	48	63%	38%	39	56%	23%	258	72%	33%	
Biomedicine	31	68%	55%	17	88%	18%	43	79%	33%	48	75%	48%	40	78%	35%	48	75%	40%	75	48%	31%	302	69%	37%	
Economics & Finance	13	77%	23%	*	*	*	47	77%	32%	48	79%	38%	45	71%	31%	54	74%	20%	32	69%	9%	243	74%	27%	
Environmental Science	13	85%	0%	23	78%	9%	44	66%	32%	43	79%	21%	39	82%	5%	42	74%	7%	52	63%	12%	256	73%	14%	
Forensic Research	7	100%	0%	9	78%	33%	27	70%	26%	24	58%	25%	22	77%	18%	30	73%	20%	34	47%	15%	153	67%	20%	
Interactive Game Design	-	-	-	-	-	-	-	-	-	-	-	-	29	72%	14%	34	62%	9%	39	64%	5%	102	66%	9%	
Law & Order	18	72%	33%	11	91%	36%	34	59%	29%	55	75%	24%	36	81%	17%	47	79%	19%	53	66%	13%	254	73%	22%	
Marketing	5	60%	40%	7	86%	43%	23	65%	52%	16	75%	19%	23	70%	17%	28	64%	7%	36	72%	11%	138	70%	22%	
Multimedia	34	74%	18%	16	88%	38%	61	70%	21%	68	66%	21%	53	64%	15%	74	64%	18%	59	59%	14%	365	67%	19%	
Networking	5	40%	0%	11	73%	27%	28	79%	25%	35	63%	11%	16	81%	13%	26	46%	12%	32	69%	13%	153	66%	15%	
Product Development	-	-	-	5	100%	20%	*	*	*	10	80%	10%	-	-	-	18	61%	6%	7	86%	14%	41	76%	12%	
Psychology and Human Behavior	-	-	-	-	-	-	-	-	-	-	-	-	57	77%	23%	41	78%	5%	34	76%	15%	132	77%	15%	
Robotics	-	-	-	-	-	-	-	-	-	9	78%	11%	13	62%	0%	12	50%	17%	8	50%	13%	42	60%	10%	
Web Application Development	8	63%	25%	10	70%	40%	15	67%	27%	27	89%	22%	16	63%	69%	12	83%	42%	9	11%	56%	97	69%	38%	
<b>Cluster</b>																									
Science	61	82%	38%	64	83%	20%	160	74%	29%	157	75%	32%	184	77%	23%	206	71%	23%	230	57%	20%	1062	71%	25%	
Social Science	36	72%	31%	22	86%	41%	104	68%	36%	119	76%	29%	104	74%	23%	129	74%	17%	121	69%	12%	635	73%	24%	
Technology	46	67%	15%	42	74%	36%	113	73%	22%	162	72%	19%	137	69%	20%	171	64%	17%	156	61%	13%	827	68%	19%	
Other***	6	67%	0%	6	83%	33%	17	71%	53%	26	85%	23%	33	73%	12%	28	61%	14%	17	59%	18%	133	71%	21%	

**Notes:**

\* between 1 and 4 students; dashes (-) indicate 0 students

\*\*\* Only college enrollments after the date students completed or would have completed high school are included.

Many thanks to all who made this report possible, including:



Fresno Unified School District



the James Irvine foundation



And a special thanks to all of the students, teachers, parents, business and community members who support CART.

**The Center for Advanced Research and Technology**

2555 Clovis Avenue  
Clovis, CA 93612  
559.248.7400  
[www.CART.org](http://www.CART.org)  
[info@cart.org](mailto:info@cart.org)