EFFECTS OF TYPES OF EARLY COLLEGE COURSES ON STUDENT OUTCOMES

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PURPOSE

- To explore if the impact of early college courses varies by student background characteristics and
- To investigate the effect of types of early college courses on student postsecondary outcomes measured by first year GPA, fall to fall retention and college attainment.

The data is comprised of first-time-in-college (FTIC) freshmen cohorts that entered in the fall semester from 2010 to 2015 (N = 12,188).

The data naturally falls in to four groupings:

(1) students who took both exam-based (AP/IB) and dual-credit (DC) coursework,

(2) students who took only exam-based (AP/IB) coursework,

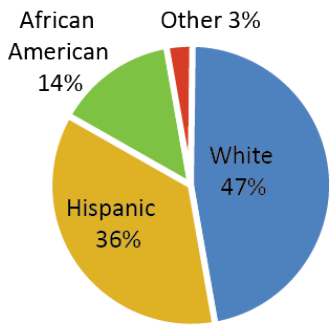
(3) students who took only dual-credit (DC) coursework, and

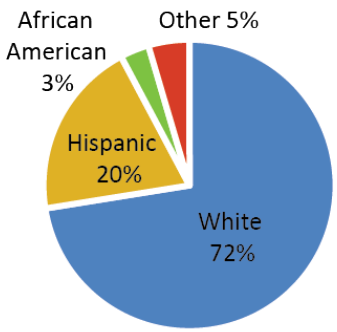
(4) students presenting no early college coursework.

STATE CONTEXT

Since 2000, Dual Credit programs in Texas witnessed a 650% growth in the number of high school students enrolling in DC education programs.
However, in 2015 only 9% of all high school students took dual credit.*

2000 Enrollment - High School & Dual Credit

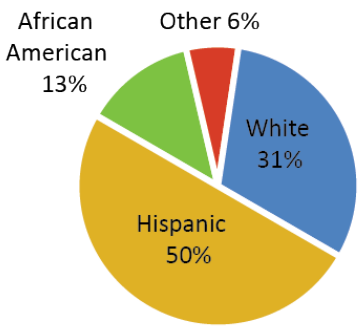


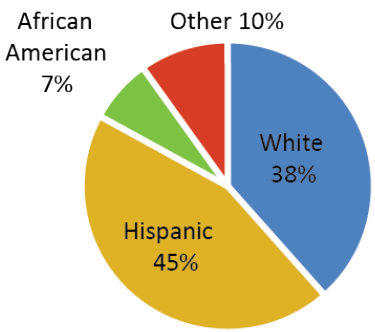


High School Enrollment
1,095,930
1999-00 Academic Year

Dual Credit Enrollment
17,784
Fall 2000

2015 Enrollment - High School & Dual Credit





High School Enrollment
1,449,066
2014-15 Academic Year

Dual Credit Enrollment
133,342
Fall 2015

In contrast, at UT-Dallas:
For the Fall 2010-2015 cohorts (N= 12,188)
45% of first-time freshmen arrived with dual credits
74% of first-time freshmen arrived with some form of early college credits

*Source: Texas Higher Education Coordinating Board, extracted 4/24/2017: http://www.60x30tx.com/
http://www.60x30tx.org/media/1103/dual-credit-interim-report.pdf

TEXAS LEGISLATION AND DUAL CREDIT: SHOOT, READY, AIM

HB 505 - Eased restrictions on dual credit course work by removing limits on (1) the number of dual credit courses or hours in which a student may enroll while in high school; (2) the number of dual credit courses or hours in which a student may enroll each semester or academic year; or (3) the grade levels at which a high school student may be eligible to enroll in a dual credit course. Signed into law May 23, 2015

HB 1638 - Statewide goals for dual credit programs provided by school districts. Signed into law May 23, 2017

HB 2937 - Establishment of a pilot program under which a licensed hospital may offer dual credit courses to public high school students. Signed into law June 9, 2017

SB 802 - Study and report regarding best practices in the transfer of course credit between public institutions of higher education. Signed into law May 29, 2017

SB 1091 - Limitations on courses that may be offered for dual credit by school districts and public institutions of higher education. Signed into law June 12, 2017

www.capitol.state.tx.us/BillLookup/BillNumber.aspx

SELECTED LITERATURE

- Speroni (2011) used data on two cohorts of all high school students in Florida to study effects of advanced placement (AP) and dual enrollment (DE) programs on success. Both AP and DE are strongly associated with college access and degree attainment. AP students were more likely to matriculate at four-year institutions. The positive effects of DE were associated with students who took DE at the community college (as opposed to high school).

- Gruman (2013), analyzed more than 4,700 students from the Shawnee Mission School District in Kansas who graduated 2005 through 2009, and examined variations in outcomes for students who enroll in a college preparatory course of study among those who pursue college credit through participation in AP, DE, Both, or Neither. Students who participated in Both completed a four-year degree earlier than the other groups.

- Miller et al., (2017) examined data collected by the Texas education agencies on the effects of dual credit (DC) enrollment. "DC students had higher grades in DC courses in the same subject as their non-DC peers, and higher grades in follow-on courses in the same subject.4 DC students also had higher college enrollment rates, particularly at four-year colleges, and were significantly more likely to persist in and complete college."

- CIERP (2016) focused on the impact of earning dual credit on first-year GPA, first-year retention, and four-year and six-year graduation at UTEP and found that even after controlling for other student characteristics, DC had a positive impact on the outcome variables.

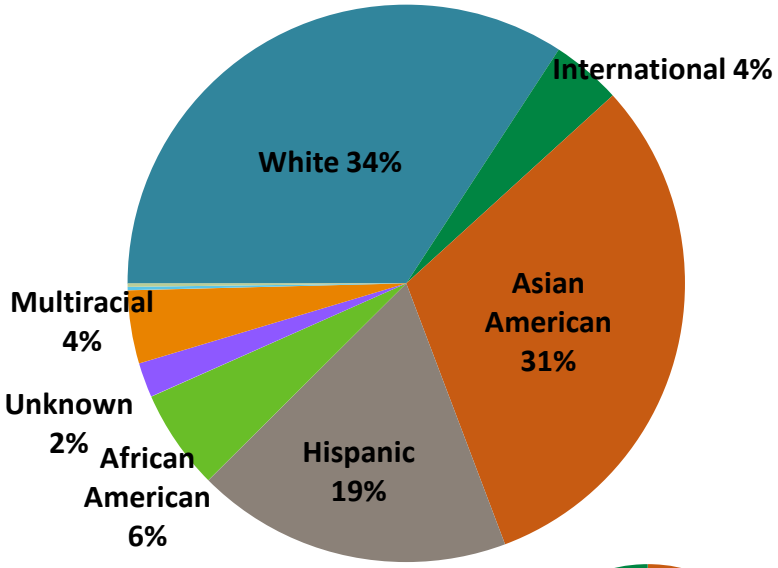
ABOUT THE UNIVERSITY OF TEXAS AT DALLAS

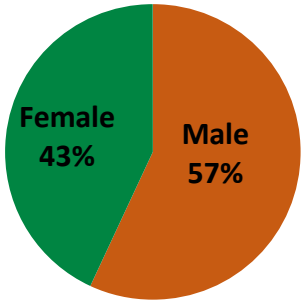
In fall 2016, UTD enrolled 3,229 first-time freshmen. Forty-four percent submitted AP coursework and 32% submitted Dual-credit coursework.

Top Undergraduate Majors: Computer Science, Biology, Mechanical Engineering, Finance, Neuroscience, Electrical Engineering, Healthcare Studies, Biomedical Engineering, Information Technology and Systems, Arts and Technology, Accounting, and Business Administration.

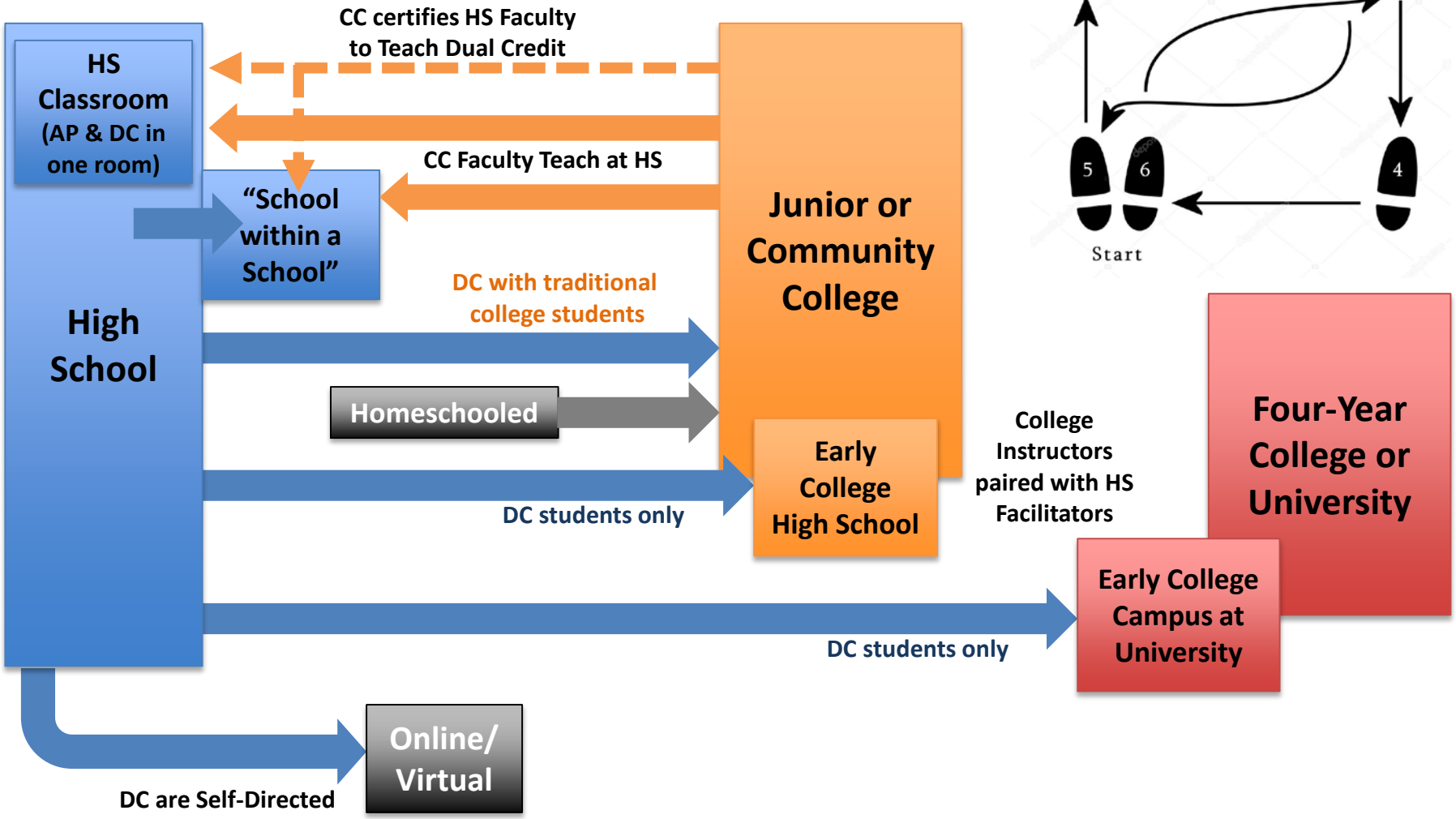
UT-Dallas is not typical of other universities. However, the UT System Study "Dual Credit and Success in College" indicates that the qualities, concerns and experiences of our DC and AP students <u>are</u> typical of students who attend other universities.

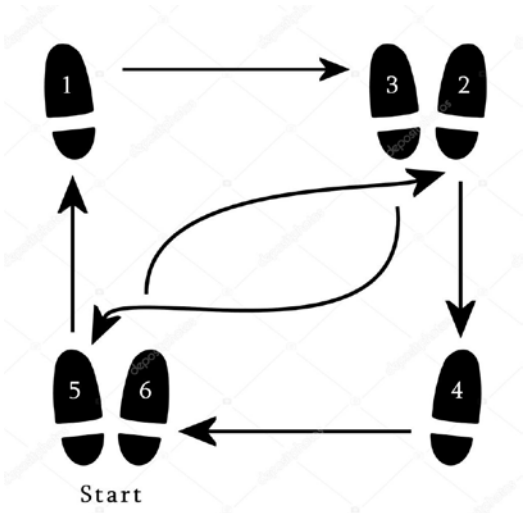
Undergraduate Ethnicity and Gender





THE MANY PATHS TO DUAL CREDIT





DATASET

Dataset: all first-time-in-college (FTIC) students (12,188 total) enrolled fall 2010 to fall 2015 at The University of Texas at Dallas.

Student characteristics variables:

- Gender
- Ethnicity
- SAT test scores
- High school
- Merit scholarship status
- Pell grant status
- UT Dallas major

Academic performance outcomes:

- First Year GPA
- First Year to Second Year Retention
- 4-Year Graduation

MODEL AND ANALYSIS

Student Characteristics

- Gender
- Ethnicity
- SAT Test Score
- High School of Origin
- Merit Scholarships
- Pell Grant Status
- UT Dallas Majors

N =12,188

4 Groups:
Both (AP/IB + DC)
DC-only
Exam-only (AP/IB)
No AP/IB or DC

Performance Outcomes

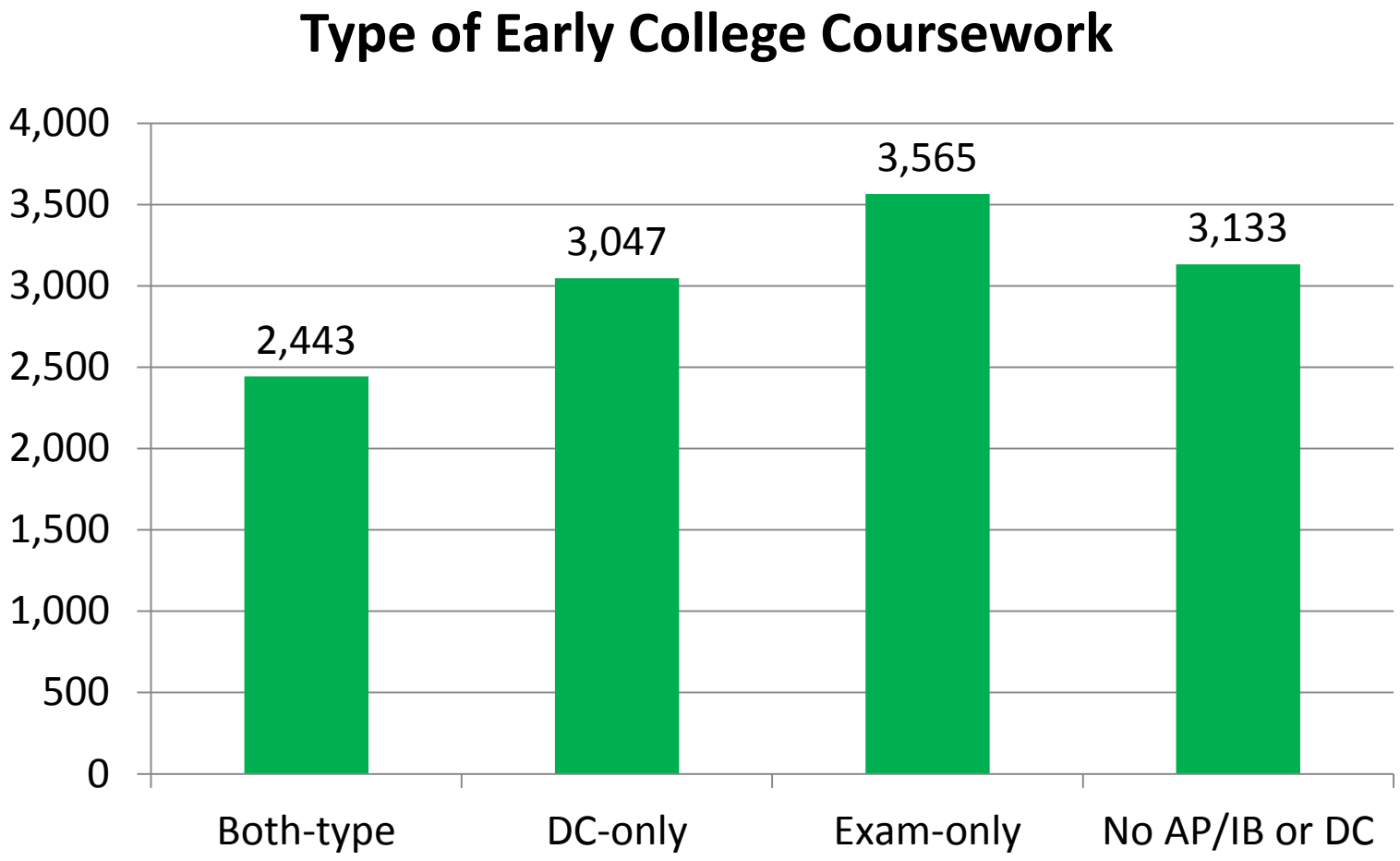
- 1st Year GPA
- 1st Year Retention
- 4 Year Graduation

A series of cross tabulations were utilized to examine the relationships among variables.

Multiple regression and logistic regression were conducted to investigate the effect of types of early college courses on student postsecondary outcomes measured by first year GPA, fall to fall retention and college attainment, controlling for student characteristics and academic ability.

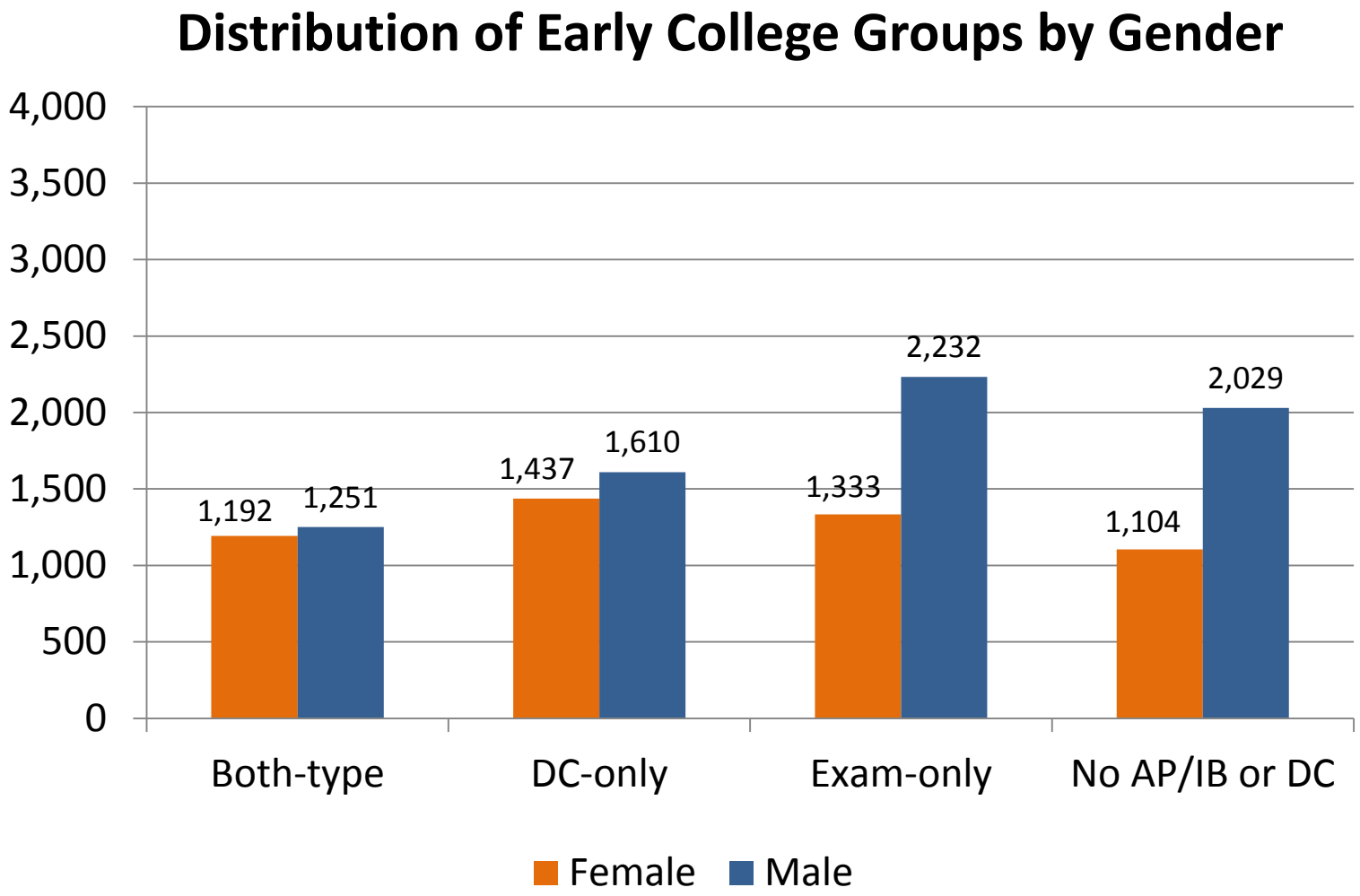
EARLY COLLEGE CREDITS DISTRIBUTION

For the six cohorts in the database, 74% of entering first-time freshmen arrived with some form of early college credits



STUDENT CHARACTERISTICS

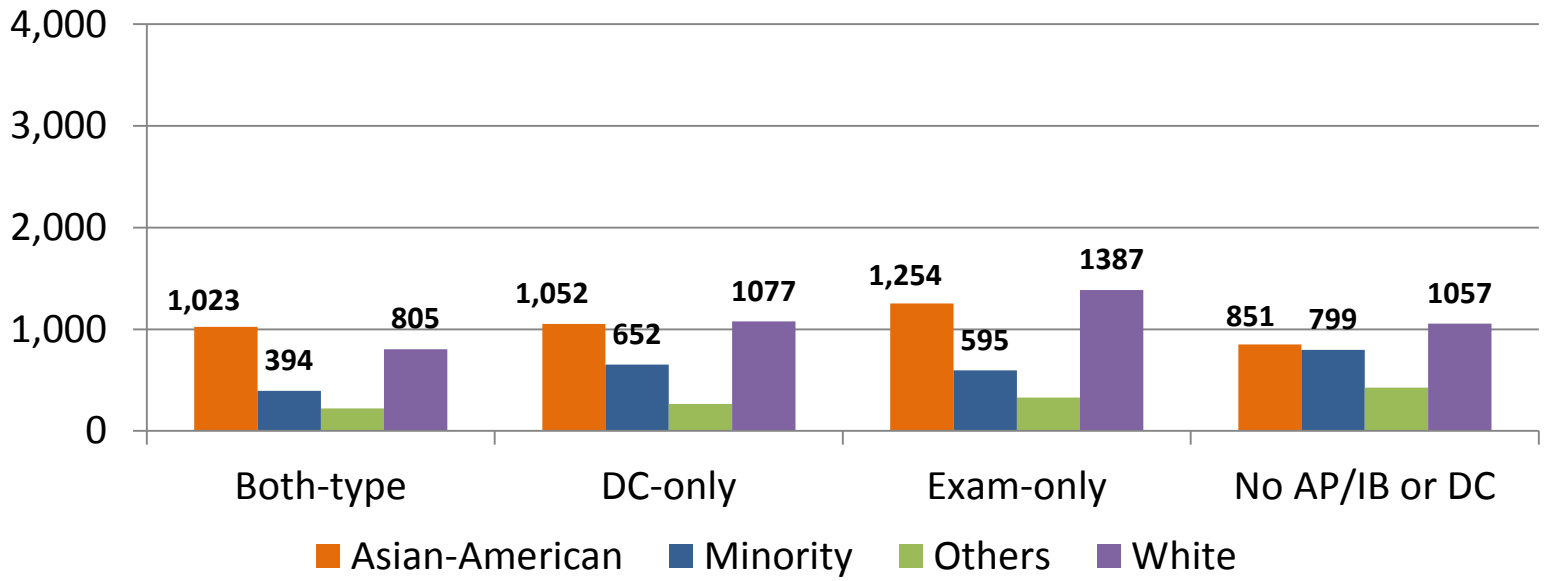
There is a significant difference in the patterns of Early College Credits by Gender



X^2 (3. n=12188)=169.0350. p<.0001: Cramer's V=0.1178

Distribution of Early College Groups by Ethnicity

Asian American and White students are most likely to avail themselves of AP/IB and DC opportunities



	ASIAN AMERICAN		MINORITY		OTHERS		WHITE	
GROUP	FREQ	%	FREQ	%	FREQ	%	FREQ	%
Both-type	1023	24.47%	394	16.15%	221	17.79%	805	18.61%
DC-only	1052	25.17%	652	26.72%	266	21.42%	1077	24.90%
Exam-only	1254	30.00%	595	24.39%	329	26.49%	1387	32.06%
NO AP/IB or DC	851	20.36%	799	32.75%	426	34.30%	1057	24.43%
TOTAL	**4180**	**100.00%**	**2440**	**100.00%**	**1242**	**100.00%**	**4326**	**100.00%**

X^2 (9, n=12188)=243.7386.0602, p<.0001; Cramer's V=0.0816

*Minority includes African American, Hispanic/Latino, Native Hawaiian, and American Indian.
**Others includes International, Two or more races, and Unknown

ACADEMIC CHARACTERISTICS

Academic Characteristics and Performance by Early-College Groups

GROUP	SAT*	AP SCH**	IB SCH**	DC SCH**	POST MATRIC. SCH***	1ST FA GPA	1ST YR GPA	FALL TO FALL RETENTION	STEM MAJOR	PELL GRANT
Both-type	1311.64	10.55	10.15	11.49	8.55	3.46	3.42	95.05%	67.83%	23.91%
DC-only	1213.93			26.05	9.79	3.05	3.01	86.51%	61.63%	30.52%
Exam-only	1339.04	12.54	10.11		8.61	3.35	3.28	90.46%	67.35%	21.09%
NO AP/IB or DC	1212.37				12.62	2.58	2.49	71.27%	56.62%	28.25%
TOTAL	**1269.76**	**11.74**	**10.12**	**19.59**	**9.58**	**3.10**	**3.04**	**85.46%**	**63.26%**	**25.85%**

* ACT converted to SAT equivalent-if student had both scores highest score used.
**Advancement placement (AP), International Baccalaureate (IB), or Dual Credit (DC) semester credit hours earned while in high school
***Community college semester credit hours earned after students entered UT Dallas

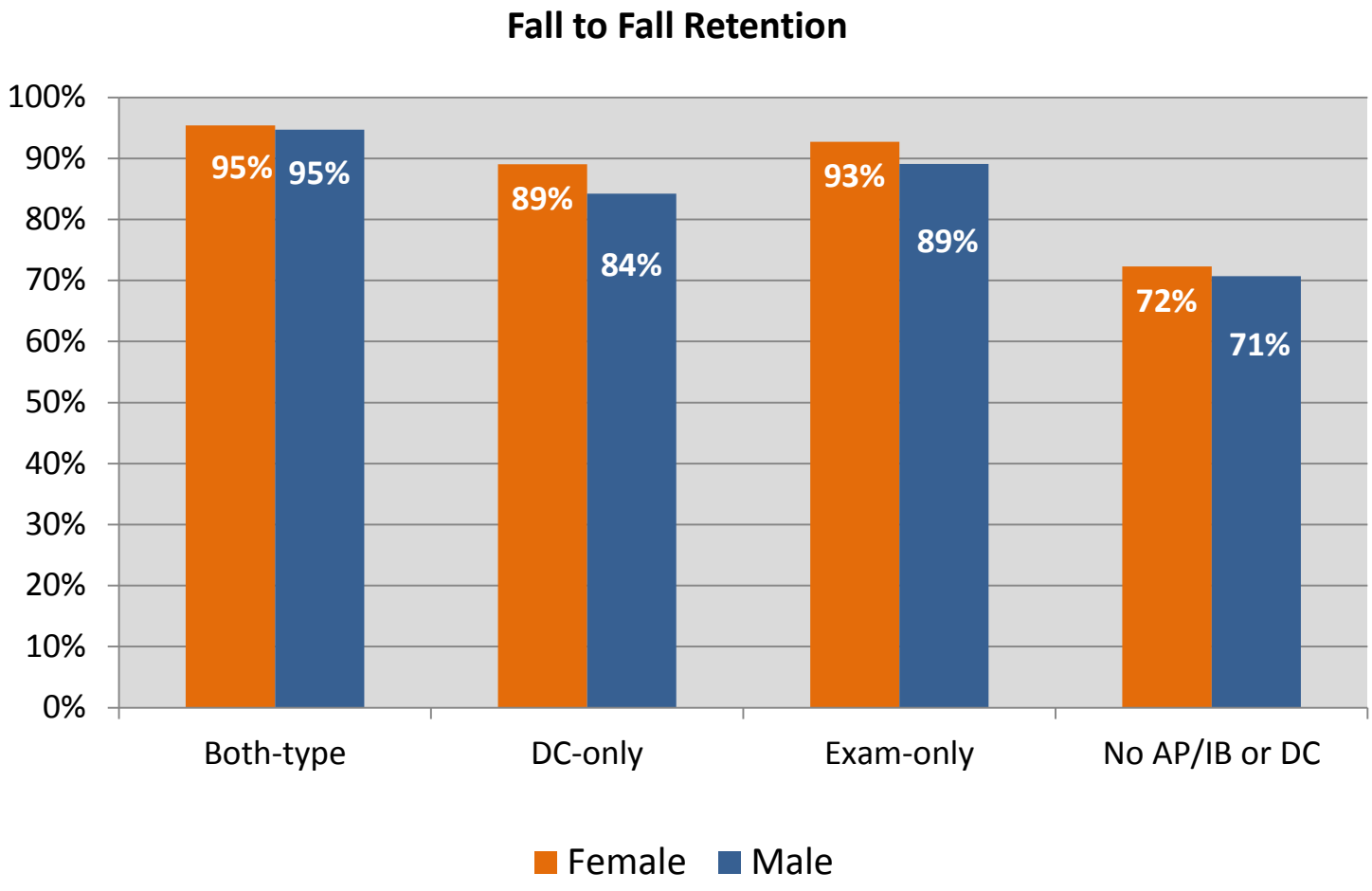
MERIT SCHOLARSHIP STATUS BY EARLY COLLEGE GROUPS

Both-type and Exam-only groupings have higher test scores (previous slide) and are significantly more likely to have full or partial merit awards.

	Full Scholarship		Partial Scholarship		No Scholarship		Total	
GROUP	FREQ	%	FREQ	%	FREQ	%	FREQ	%
Both-type	993	40.65%	449	18.38%	1,001	40.97%	2,443	100.00%
DC-only	595	19.53%	336	11.03%	2,116	69.45%	3,047	100.00%
Exam-only	1,630	45.72%	561	15.74%	1,374	38.54%	3,565	100.00%
NO AP/IB or DC	373	11.91%	293	9.35%	2,467	78.74%	3,133	100.00%
TOTAL	**3,591**	**29.46%**	**1,639**	**13.45%**	**6,958**	**57.09%**	**12,188**	**100.00%**
X^2 (6, n=12188)=1628.6396, p<.0001; Cramer's V=0.2585								

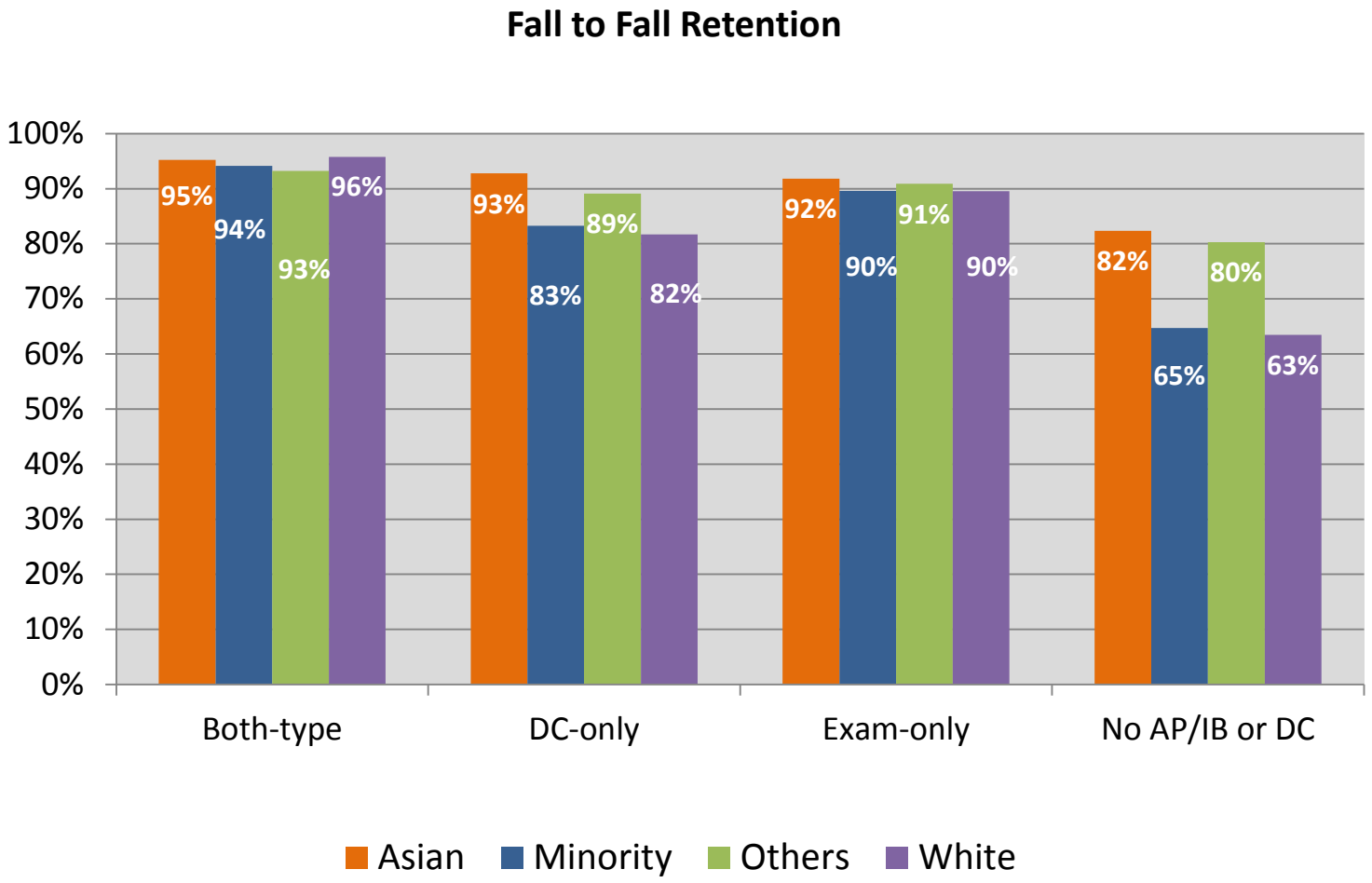
ACADEMIC PERFORMANCE OF EARLY COLLEGE GROUPS BY GENDER AND FIRST YEAR RETENTION

While there is no gender difference for the both-type grouping, females in the DC-only and Exam-only groupings and significantly more likely to be retained after the first year.

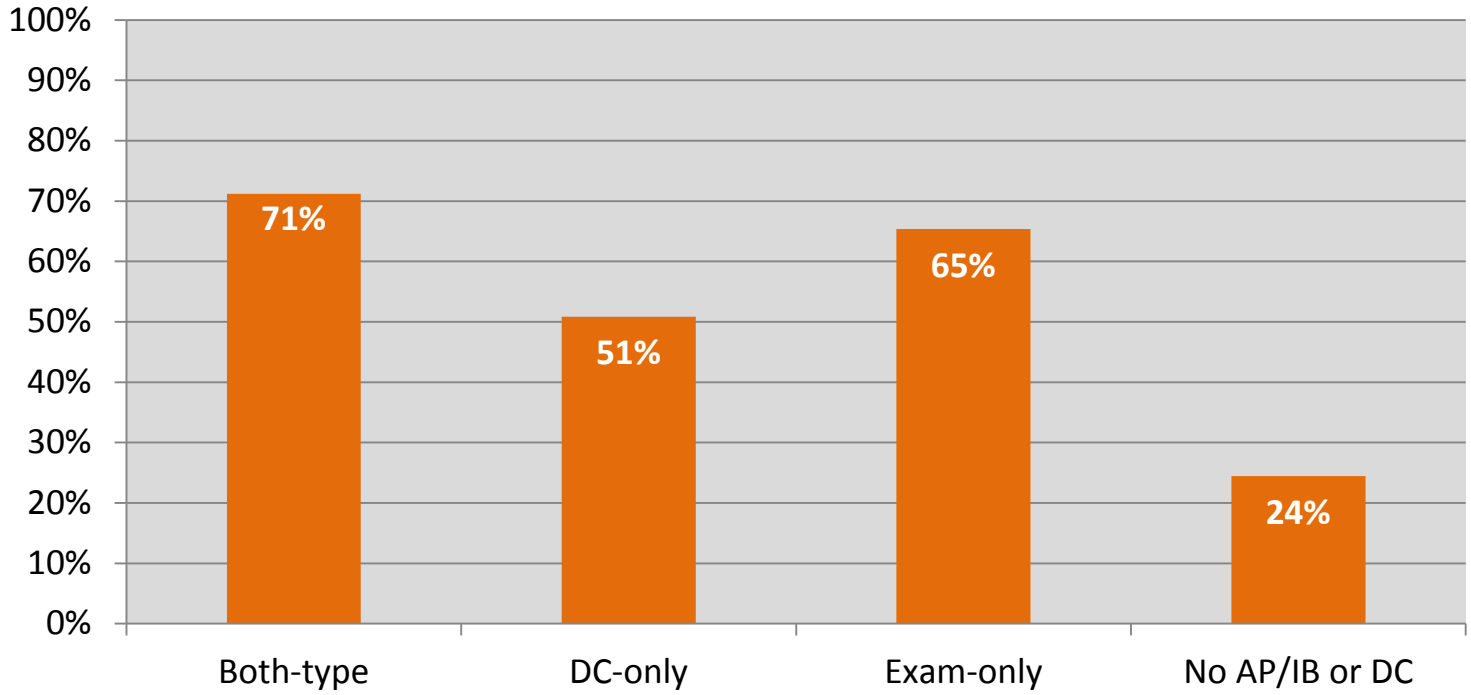


ACADEMIC PERFORMANCE OF EARLY COLLEGE GROUPS BY ETHNICITY

Exam-Only and Both-Type Groupings evidence no differences by ethnicity. This is not the case for DC and No Early College

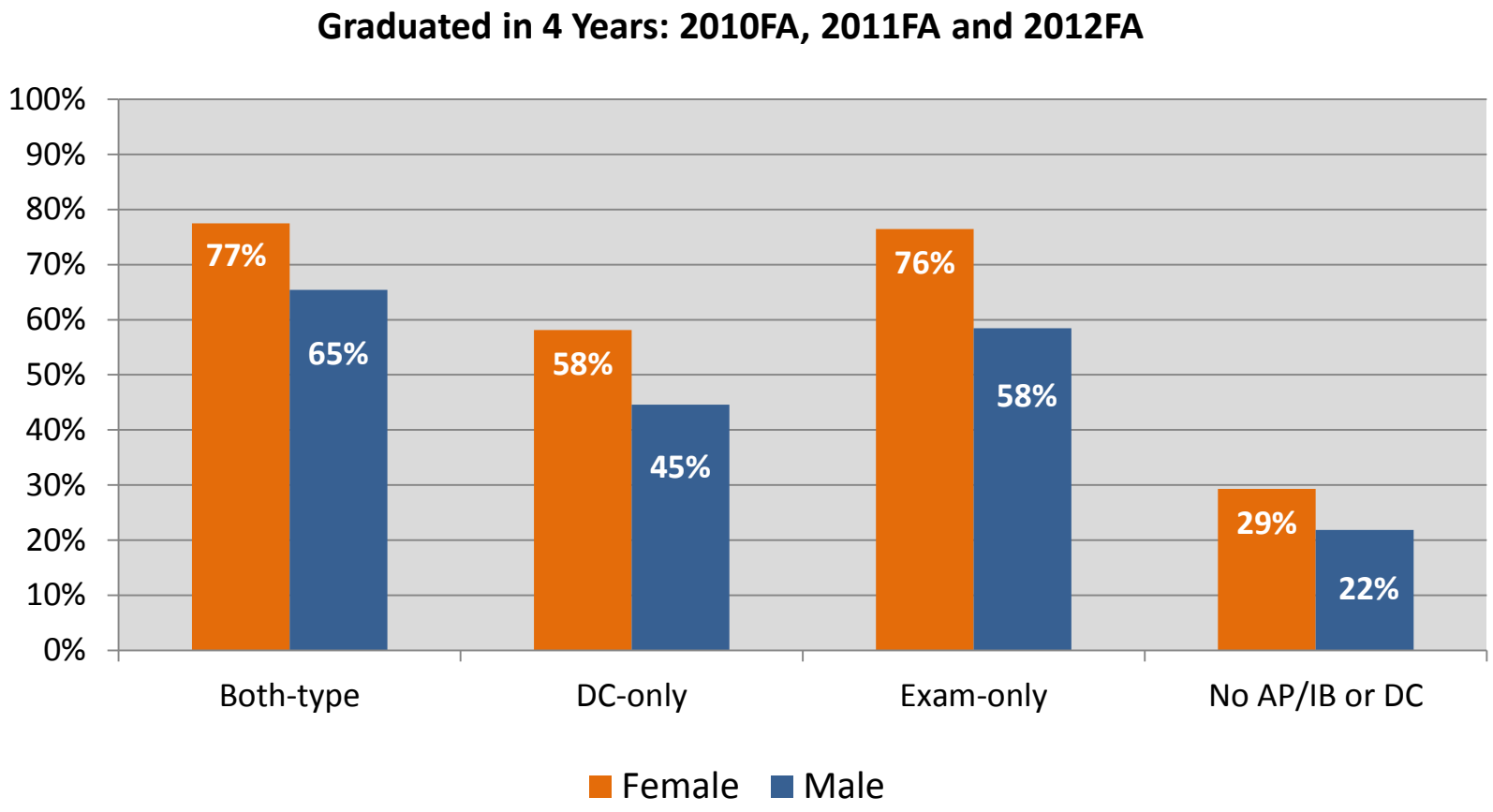


Four-Year Graduation Rate by Early-College Groups for FTIC 2010, 2011, 2012 Cohorts (n=4,710)

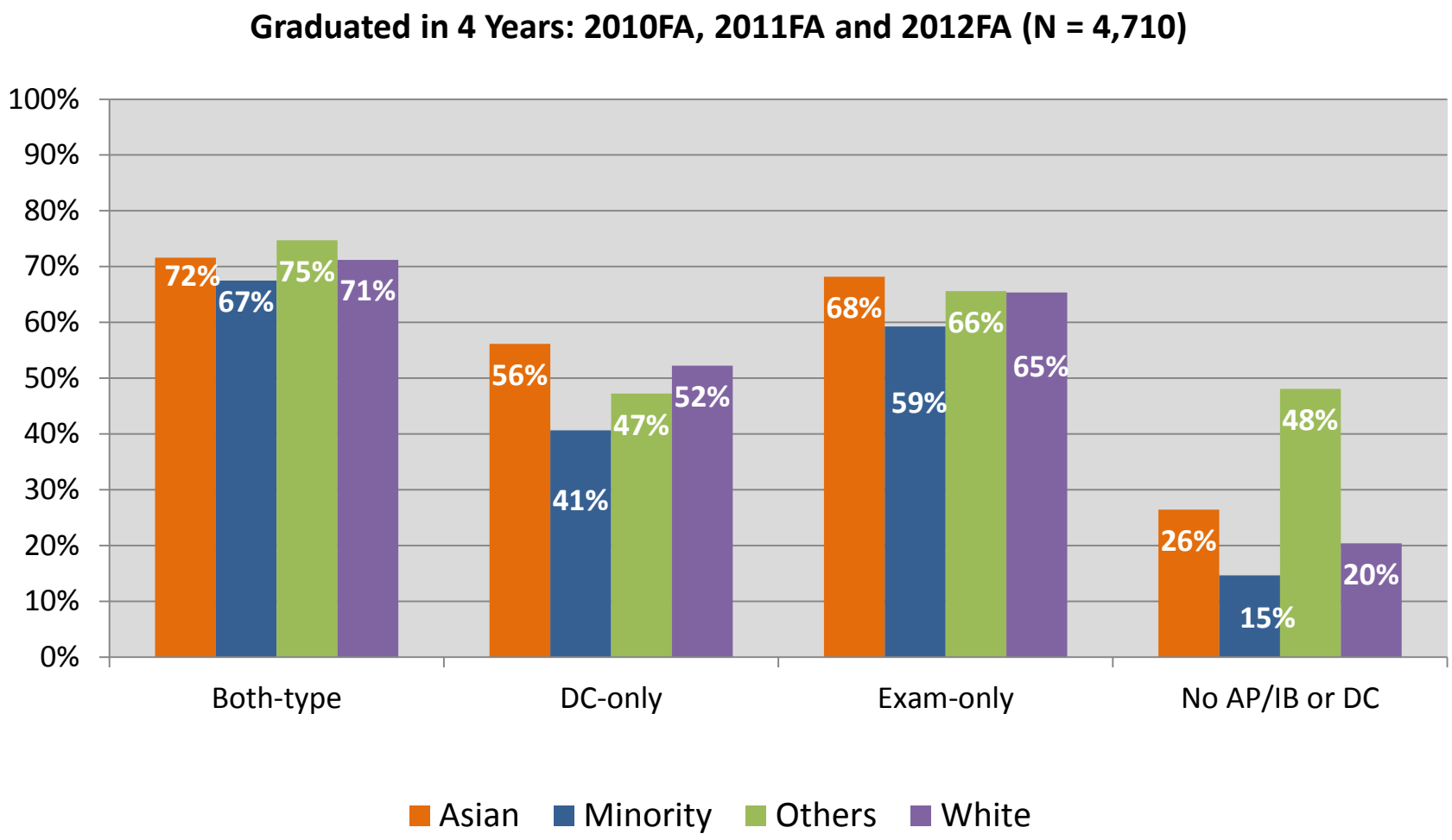


GROUP	# Students	GRAD. IN 2 YRS		GRAD. IN 3 YRS		GRAD. IN 4 YRS	
Both-type	927	0	0.00%	83	8.95%	660	71.20%
DC-only	1,258	24	1.91%	156	12.40%	640	50.87%
Exam-only	1,346	2	0.15%	86	6.39%	880	65.38%
NO AP/IB or DC	1,179	1	0.08%	4	0.34%	288	24.43%
TOTAL	**4,710**	**27**	**0.57%**	**329**	**6.99%**	**2,468**	**52.40%**

ACADEMIC PERFORMANCE OF EARLY COLLEGE GROUPS BY GENDER



ACACEMIC PERFORMANCE OF EARLY COLLEGE GROUPS BY GENDER, ETHNICITY AND SCHOLARSHIP STATUS



*Minority includes African American, Hispanic/Latino, Native Hawaiian, and American Indian. **Others includes International, Two or more races, and Unknown

LOGISTIC REGRESSION ON 1ST YEAR RETENTION

Logistic Regression on Fall to Fall Retention for All FTIC Students							
Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Point Estimate	95% Wald Confidence Limits	
Intercept	-1.7929	0.3533	25.7595	<.0001***			
Female	-0.0451	0.0685	0.4335	0.5103			
Asian	0.5103	0.0882	33.4734	<.0001***	1.6660	1.4010	1.9800
White	-0.0942	0.0811	1.3502	0.2452			
Others	0.2781	0.1185	5.5106	0.0189			
Full_Scholarship	-0.0366	0.1082	0.1148	0.7348			
Partial_Scholarship	-0.2825	0.1003	7.9272	0.0049			
SAT_Final	-0.0001	0.0003	0.1491	0.6994			
GPA_1YR	1.1774	0.0347	1153.7465	<.0001***	3.2460	3.0330	3.4740
Transfer_SCH	0.0012	0.0025	0.2300	0.6315			
Exam-only	0.4960	0.0869	32.5807	<.0001***	1.6420	1.3850	1.9470
DC-only	0.3807	0.0948	16.1427	<.0001***	1.4630	1.2150	1.7620
Both-type	0.9540	0.1227	60.4945	<.0001***	2.5960	2.0410	3.3010
Major_Biology	0.1638	0.1128	2.1073	0.1466			
Major_ComputerScience	0.2429	0.1153	4.4375	0.0352			
Major_Neuroscience	0.3342	0.1673	3.9901	0.0458			
Major_BiomedicalEngineering	0.5352	0.1829	8.5628	0.0034			
Major_Biochemistry	0.1436	0.1768	0.6604	0.4164			
Major_ElectricalEngineering	0.2902	0.1752	2.7424	0.0977			
Major_MechanicalEngineering	0.1014	0.1277	0.6307	0.4271			
Major_Undecided	-0.3092	0.1217	6.4551	0.0111			
Major_ArtsandTechnology	0.0950	0.1352	0.4932	0.4825			
Major_BusinessAdministration	-0.2030	0.1595	1.6201	0.2031			
Major_ComputerEngineering	0.0290	0.1566	0.0342	0.8533			
Major_Finance	-0.1401	0.1917	0.5339	0.4650			
Major_HealthcareStudies	0.0585	0.2203	0.0704	0.7907			
Major_Psychology	-0.3159	0.1671	3.5733	0.0587			
Major_Accounting	0.0216	0.1961	0.0122	0.9122			
***p=0.0001							
Chi-Square value=2426.7103 df=27							

LOGISTIC REGRESSION ON 1ST YEAR GPA

Multiple Regression on 1st Year GPA for All FTIC Students								
	Model 1		Model 2		Model 3		Model 4	
Parameter	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Intercept	2.1173	<.0001***	2.3231	<.0001***	2.3635	<.0001***	2.2730	<.0001***
Female	0.2030	<.0001***	0.1959	<.0001***	0.1943	<.0001***	0.1591	<.0001***
Asian	0.1307	<.0001***	0.1287	<.0001***	0.1315	<.0001***	0.1290	<.0001***
White	0.0190	0.3571	0.0241	0.2340	0.0299	0.1391	0.0331	0.0986
Others	0.1604	<.0001***	0.1642	<.0001***	0.1686	<.0001***	0.1711	<.0001***
Full_Scholarship	0.5776	<.0001***	0.5591	<.0001***	0.5343	<.0001***	0.5287	<.0001***
Partial_Scholarship	0.3626	<.0001***	0.3397	<.0001***	0.3378	<.0001***	0.3381	<.0001***
Accelerated	0.5411	<.0001***						
Pell_Grant	0.0139	0.4102						
SAT_final	0.0001	0.1773	-0.0001	0.4012	-0.0001	0.1971	0.0000	0.7858
Collegiate_School	-0.0147	0.7829	0.1142	0.0347	-0.1924	0.0032		
Islamic_School	0.1685	0.0192	0.3019	<.0001***	0.1068	0.1600		
TAMS	0.0986	0.0939	0.2431	<.0001***	-0.0020	0.9760		
Homed_School	0.1148	0.1029	0.208	0.0032	0.1414	0.0457		
Plano_ISD	0.0993	<.0001***	0.0812	0.0002	0.0819	0.0001		
Public_15 miles	0.0155	0.3450	0.0018	0.9125	0.0010	0.9511		
Exam-only			0.5701	<.0001***	0.5136	<.0001***	0.5353	<.0001***
DC-only			0.4113	<.0001***	0.3105	<.0001***	0.3222	<.0001***
Both-type			0.6991	<.0001***	0.5901	<.0001***	0.6099	<.0001***
Transfer_SCH					0.0056	<.0001***	0.0049	<.0001***
Major_Biology							0.0230	0.3344
Major_ComputerScience							-0.2015	<.0001***
Major_Neuroscience							-0.0837	0.0114
Major_BiomedicalEngineering							-0.1384	0.0002
Major_Biochemistry							-0.0023	0.9491
Major_ElectricalEngineering							-0.0557	0.1356
Major_MechanicalEngineering							-0.1590	<.0001***
Major_Undecided							-0.0096	0.7582
Major_ArtsandTechnology							0.1048	0.0012
Major_BusinessAdministration							0.0816	0.0364
Major_ComputerEngineering							-0.1734	<.0001***
Major_Finance							0.1796	<.0001***
Major_HealthcareStudies							0.0388	0.4279
Major_Psychology							-0.0715	0.0871
Major_Accounting							0.1949	<.0001***
R^2	**0.246**		**0.256**		**0.260**		**0.271**	
***p=0.0001								

LOGISTIC REGRESSION ON 4-YEAR GRADUATION

Logistic Regression on 4-Year Graduation for All FTIC Students							
Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Point Estimate	95% Wald Confidence Limits	
Intercept	-5.1636	0.5223	97.7394	<.0001***			
Female	0.3920	0.0808	23.5663	<.0001***	1.2660	1.0180	1.5750
Asian	0.2362	0.1113	4.5012	0.0339			
White	0.2003	0.1087	3.3953	0.0654			
Others	0.3295	0.1454	5.1385	0.0234			
Full_Scholarship	0.7087	0.1249	32.1979	<.0001***	2.0310	1.5900	2.5950
Partial_Scholarship	0.3803	0.1133	11.2620	0.0008			
SAT_Final	-0.0016	0.0004	14.3467	0.0002			
GPA_1YR	1.8467	0.0794	540.7489	<.0001***	6.3390	5.4250	7.4070
Transfer_SCH	0.0183	0.0028	43.0292	<.0001***	1.0180	1.0130	1.0240
Exam-only	0.8518	0.1133	56.5553	<.0001***	2.3440	1.8770	2.9270
DC-only	0.5178	0.1239	17.4566	<.0001***	1.6780	1.3160	2.1400
Both-type	0.9052	0.1294	48.9679	<.0001***	2.4720	1.9190	3.1860
Major_Biology	-0.1818	0.1204	2.2773	0.1313			
Major_ComputerScience	0.2243	0.1609	1.9427	0.1634			
Major_Neuroscience	0.1390	0.1902	0.5342	0.4649			
Major_BiomedicalEngineering	-0.8425	0.2316	13.2287	0.0003			
Major_Biochemistry	-0.2862	0.1883	2.3116	0.1284			
Major_ElectricalEngineering	-0.3496	0.1829	3.6556	0.0559			
Major_MechanicalEngineering	0.0326	0.1730	0.0356	0.8504			
Major_Undecided	-0.2626	0.1446	3.2996	0.0693			
Major_ArtsandTechnology	-0.0455	0.1852	0.0604	0.8059			
Major_BusinessAdministration	0.4148	0.2037	4.1442	0.0418			
Major_ComputerEngineering	-0.0587	0.2035	0.0833	0.7728			
Major_Finance	-0.2452	0.2366	1.0738	0.3001			
Major_HealthcareStudies	-0.2831	0.6563	0.1860	0.6662			
Major_Psychology	0.1058	0.2270	0.2172	0.6412			
Major_Accounting	0.4245	0.2398	3.1330	0.0767			
***p=0.0001							
Chi-Square value=1975.8849 df=27							

WHAT SUBJECTS DO STUDENTS TAKE?

Dual Credit and AP Credit Students are most likely to take:

US History to Civil War
Rhetoric
American National Gov.
Macroeconomics
US History from Civil War
English Composition
State Government

DC Students take:
College Algebra
Precalculus
Differential Calculus
Trigonometry
Integral Calculus

AP Students likely take:
Differential Calculus
Precalculus
Integral Calculus
Calculus I
Statistics

DC Students likely take:
Biology I & II
General Chemistry I & II

AP Students likely take:
Physics I & II
Computer Science
Biology I & II
General Chemistry I & II

Summary of Early College Coursework Awarded by Major

Top Three Majors (300+ FTIC students) Had a High Percentage of Students Who Took Courses			
DC-AP Course Area	Dual Credit Takers' Majors	AP Takers' Majors	% of Student took DC, AP or IB Courses
History	Accounting (29.51%) Biology (26.58%) Neuroscience (25.73%)	Neuroscience (40.58%) Biochemistry (39.58%) Biology (34.54%)	DC (21.60%) AP (29.13%) IB (0.80%)
Government	Accounting (39.34%) Biology (34.00%) Neuroscience (33.84%)	Biochemistry (23.75%) Neuroscience (23.74%) Biomedical Engineering (20.44%)	DC (27.97%) AP (16.56%)
English	Accounting (25.14%) Biology (24.89%) Psychology (24.87%)	Neuroscience (35.07%) Computer Science (28.31%) Biomedical Engineering (26.59%)	DC (21.32%) AP (23.65%) IB (2.88%)
Math	Biomedical Engineering (14.48%) Neuroscience (13.78%) Electrical Engineering (12.88%)	Computer Science (26.91%) Biomedical Engineering (26.59%) Electrical Engineering (24.74%)	DC (9.40%) AP (17.51%) IB (0.82%)

OBSERVATIONS ON DUAL CREDIT ONLY STUDENTS

N=3,047

Dual Credit Only Group SCH Cohorts 2010.2011, and 2012					
DC SCH	**1 to 9**	**10 to 19**	**20 to 49**	**50+**	**Total**
Tx Acad. Math & Sci.	0	0	3	72	75
Collegiate Academy	0	1	2	96	99
Islamic School	0	0	6	34	40
Home Schooled	3	8	17	6	34
High Schools	416	331	207	56	1010
Total	419	340	235	264	1258

Of the four early college credit groups, the 'dual-only' group had the highest percentage of students graduating in 2 or 3 years. Approximately 41% of the dual-credit only students presenting 50 or more hours graduated in 3 years or less. *Those students who earned 50 or over dual credit hours performed well as same as students in the 'both-type' and 'exam-only' groups.*

Graduation Rate by Early-College Groups for FTIC 2010, 2011, 2012 Cohorts (n=4,710)

GROUP	# Students	GRAD. IN 2 YRS		GRAD. IN 3 YRS		GRAD. IN 4 YRS	
Both-type	927	0	0.00%	83	8.95%	660	71.20%
DC-only	1,258	24	1.91%	156	12.40%	640	50.87%
Exam-only	1,346	2	0.15%	86	6.39%	880	65.38%
NO AP/IB or DC	1,179	1	0.08%	4	0.34%	288	24.43%
TOTAL	**4,710**	**27**	**0.57%**	**329**	**6.99%**	**2,468**	**52.40%**

DC SCH CATEGORY	SAT MV*	ACT COMP*	POST MATRI. SCH**	1ST FA GPA	1ST YR GPA	FALL TO FALL RETENTION	STEM MAJOR	PELL GRANT
0.5-9.99	1181.17	25.61	10.76	2.94	2.89	85.34%	58.44%	31.75%
10-19.99	1177.20	25.93	9.72	3.00	2.94	84.91%	60.96%	29.94%
20-29.99	1168.95	26.23	10.30	3.06	3.01	87.36%	61.24%	26.97%
30-39.99	1189.72	26.31	8.86	3.05	2.98	81.48%	59.26%	25.31%
40-49.99	1217.58	28.02	11.25	3.03	3.06	85.59%	60.36%	27.03%
50-80	1260.57	28.14	7.69	3.30	3.29	91.34%	68.35%	33.39%
TOTAL	**1196.99**	**26.41**	**9.79**	**3.05**	**3.01**	**86.51%**	61.63%	30.52%

*Some students don't have the score on file.

**Community college semester credit hours earned after students entered UT Dallas

SELECTED SUMMARY OBSERVATIONS: UT-DALLAS

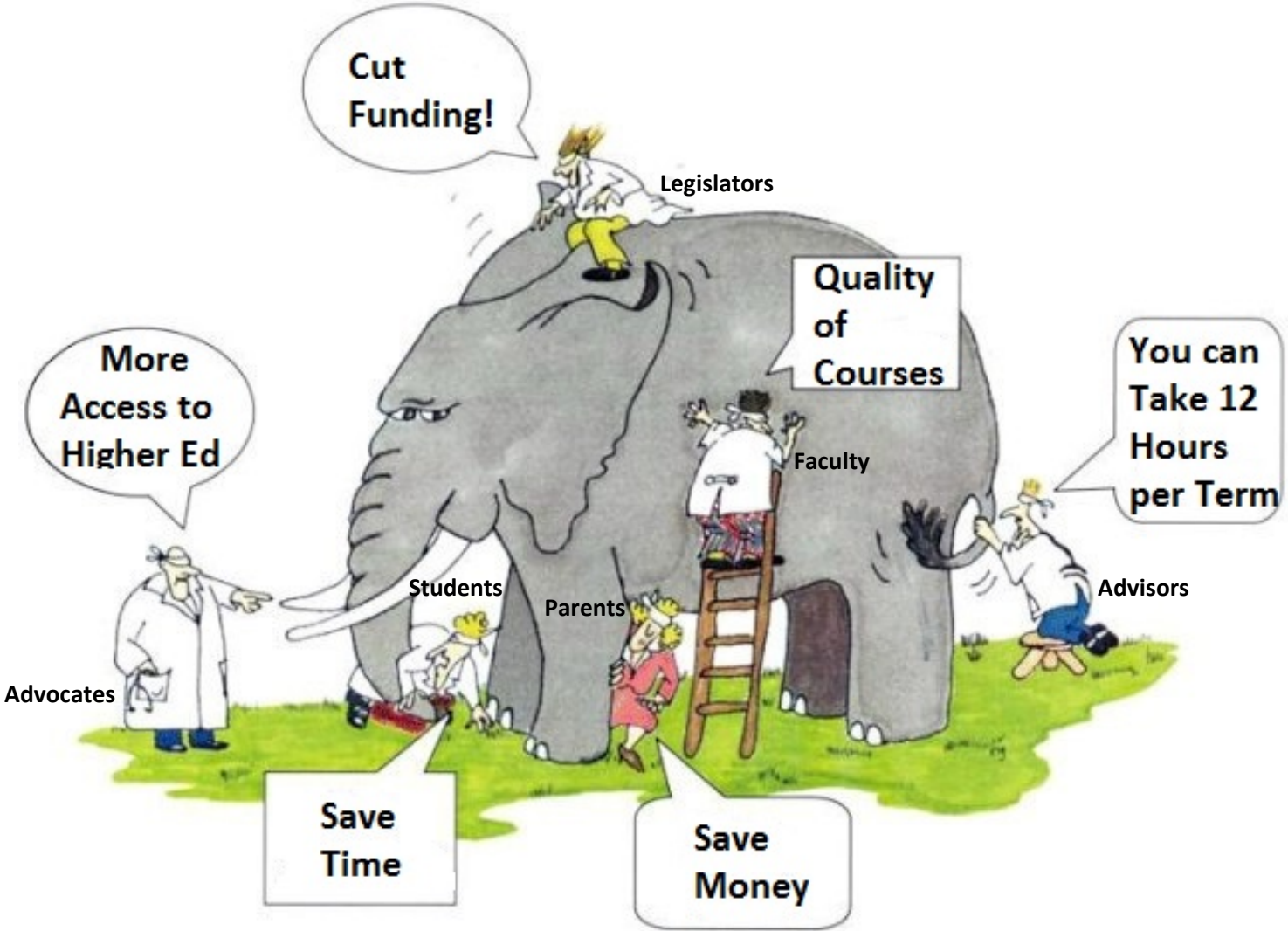
- Students presenting both Exam-based and Dual Credit coursework were more likely to be successful followed by 'exam-only' student grouping.
- Dual-credit only students were more successful than students presenting no early college credits.
- The effect of AP/IB courses was stronger than dual credit courses.
- The academic performance of those four groups on the first year GPA, first year retention, 4-year graduation and 6-year graduation does not vary by student background characteristics.
- Students who did not successfully take early college coursework and have not declared a major are at a greater risk of not being academically successful.
- Focusing on the major of students by early college group, students who did not have early start were less likely to complete the degree in 4 years especially for STEM majors (e.g., engineering and neuroscience).
- Asian Americans were more likely to take any early college courses than other ethnic groups regardless of types of course offering, especially taking a combination of exam-based courses and dual credit courses.
- African American, Hispanic, and American Indian students were less likely to take early college courses, which may partially result from the availability of coursework at their high schools of origin.

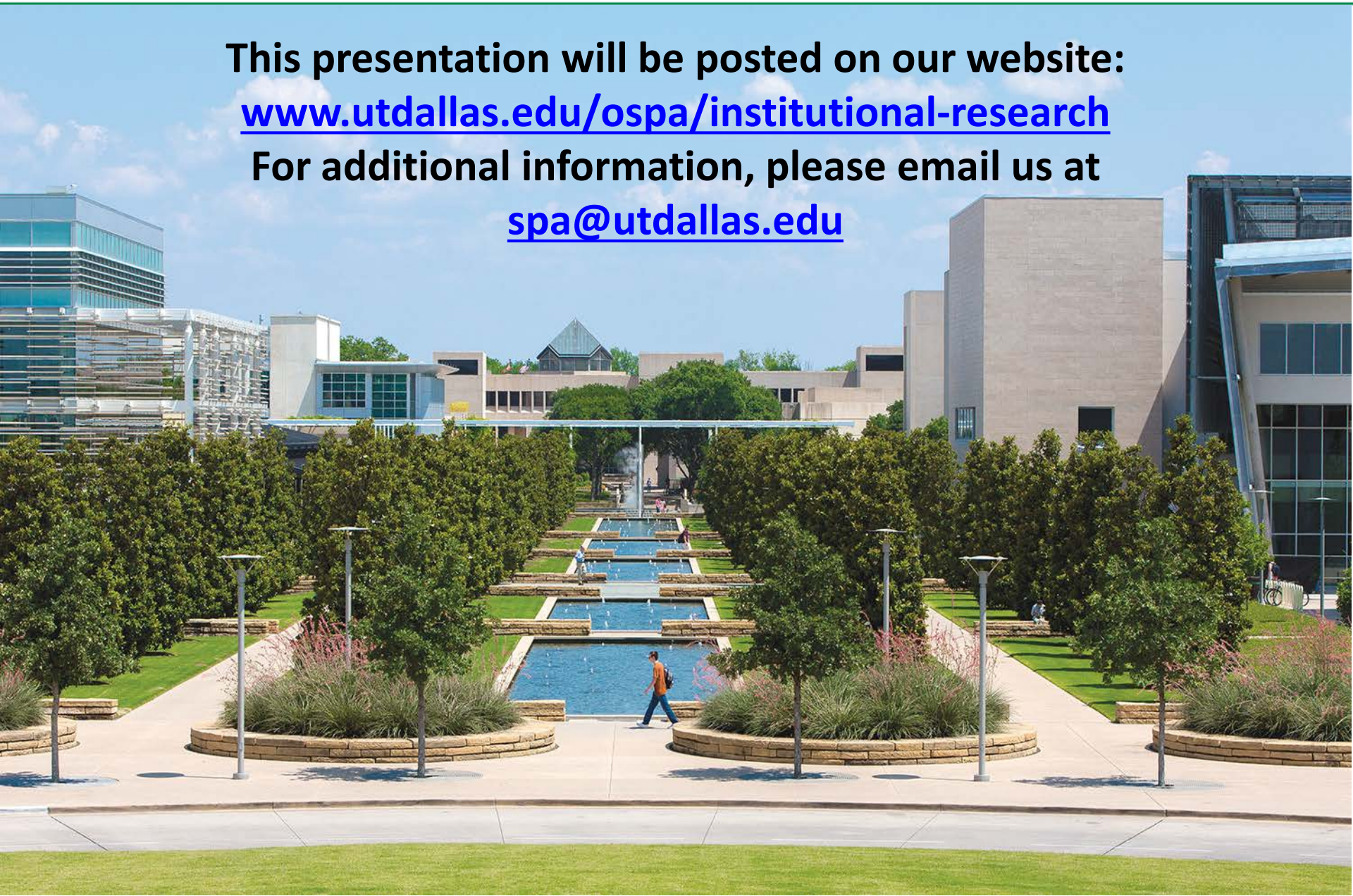
NEGOTIATING CHOICES: ADVANCED PLACEMENT AND DUAL CREDIT

- Of the students who compared AP and DC
  - Majority preferred DC.
  - Most commonly cited reason: credit is not contingent on one test
- Students also expressed criticism of AP courses as overly focused on tests and more difficult than necessary.
- Though many students expressed a preference for DC, others had complex strategies for choosing between AP and DC, assuming that both are available.

Source: UT System Study: Dual Credit and Success in College

"How can anyone describe the whole until he has learned the total of the parts?"



QUESTIONS?

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