



University of Central Florida

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{ Final Presentation }

**Six Sigma Project
Sunshine High School**

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AGENDA

- **SHS Background**
- **Problem Statement**
- **Voice of the Customer**

ANALYZE

- **Cause and Effect Diagram**
- **Cost of Quality**
- **Quality Function Deployment**
- **Metrics and Performance Targets**
- **Analysis of Data Collected**
- **Sigma Levels**

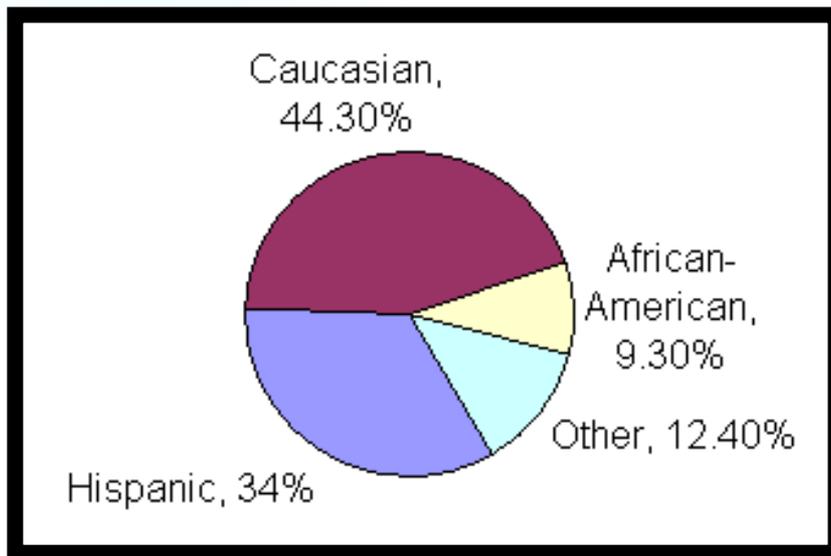
IMPROVE

- **Revised Process Flow**
- **Recommendations**

CONTROL

SHS Background

- **60% Minority, 40% Free/Reduced Rate**
- **30 AP Courses offered**
- **982 Students enrolled**



Problem Statement

There has been no assessment on the performance of students in AP courses since the implementation of the new Open Access system.

There is a possibility of improving the overall system and the experience of Advanced Placement for all stakeholders involved.

Voice of Customer

- **Counselors (Covered in Measure)**
- **Teachers** →
- **Students** →

7 AP Teachers

Statistics, Env. Science, Macroeconomics,
Calculus, World History, European History,
English Language.

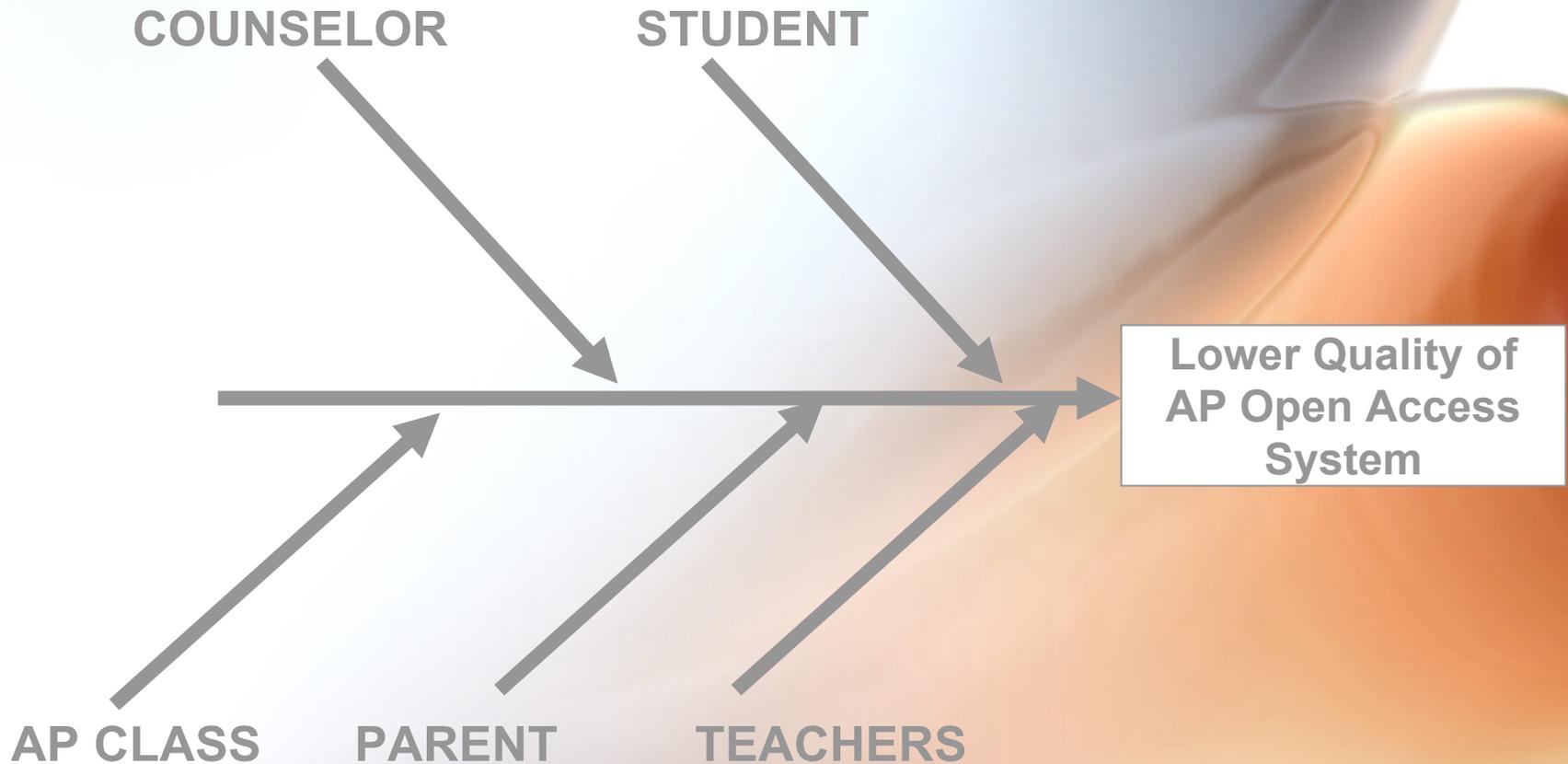
Open Discussion about following questions
How do you feel about the current OA system?
How does it affect your class?

5 Students

Chemistry, Statistics, Economics, Government
Env. Science, US History, Portfolio.

Open Discussion about following questions
What do you think of the OA system?
Do you think teachers AP courses harder?
What are your motivations for taking an AP class?

Cause and Effect



Cause and Effect

COUNSELOR

NOT AWARE OF STUDENTS' HISTORY
OUTSIDE OF PAPER DATA

GIVING FALSE SENSE OF SECURITY

NO REQUIREMENTS TO ENTER CLASS

Lower Quality of
AP Open Access
System



Cause and Effect

STUDENTS

STUDENTS NOT COMMITTED

STUDENTS DON'T HAVE BASIC SKILLS

STUDENTS NOT AWARE OF CLASS RIGOR

STUDENTS "PRESSURED" TO ENTER AP CLASSES



Lower Quality of
AP Open Access
System

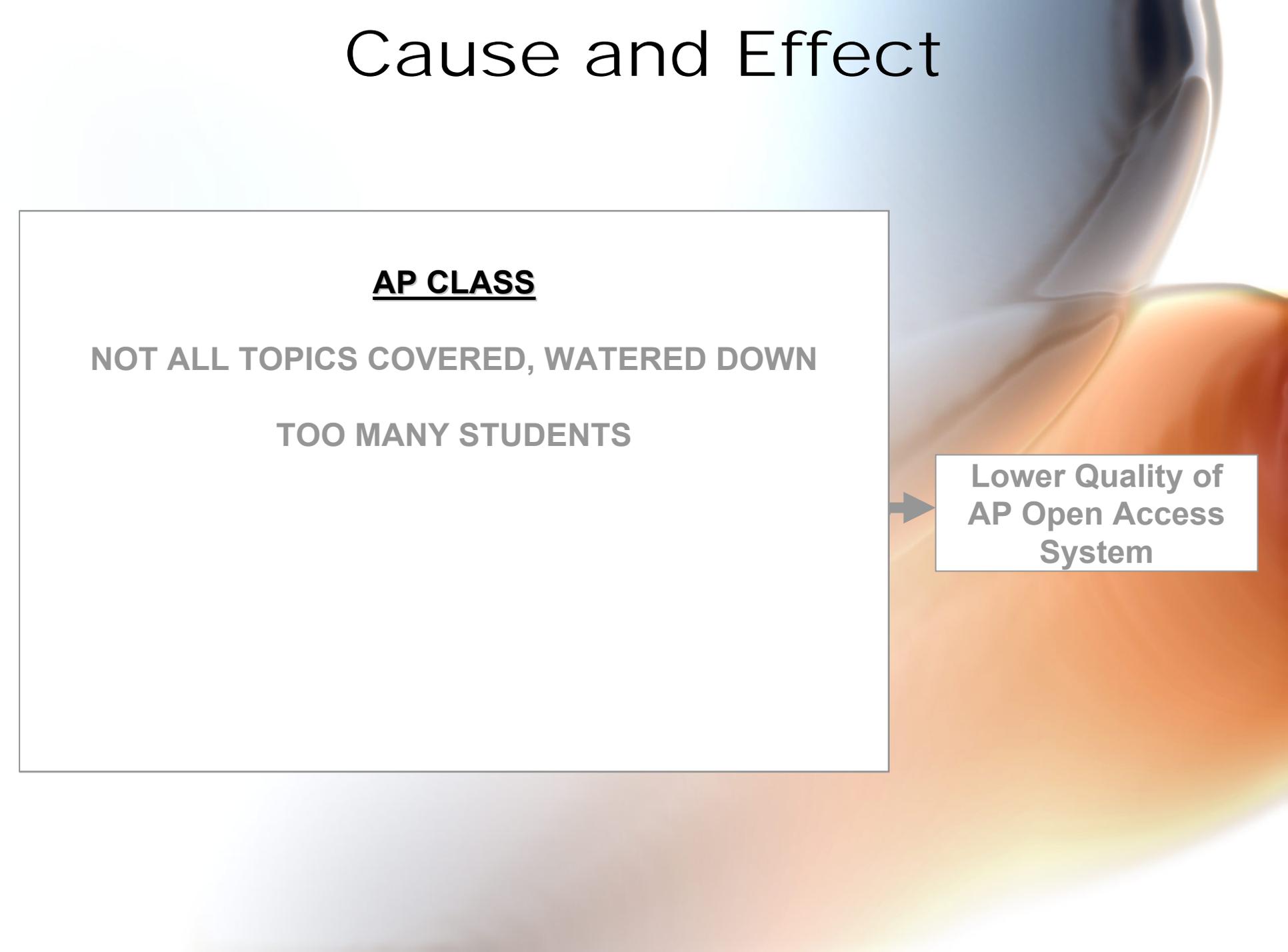
Cause and Effect

AP CLASS

NOT ALL TOPICS COVERED, WATERED DOWN

TOO MANY STUDENTS

Lower Quality of
AP Open Access
System



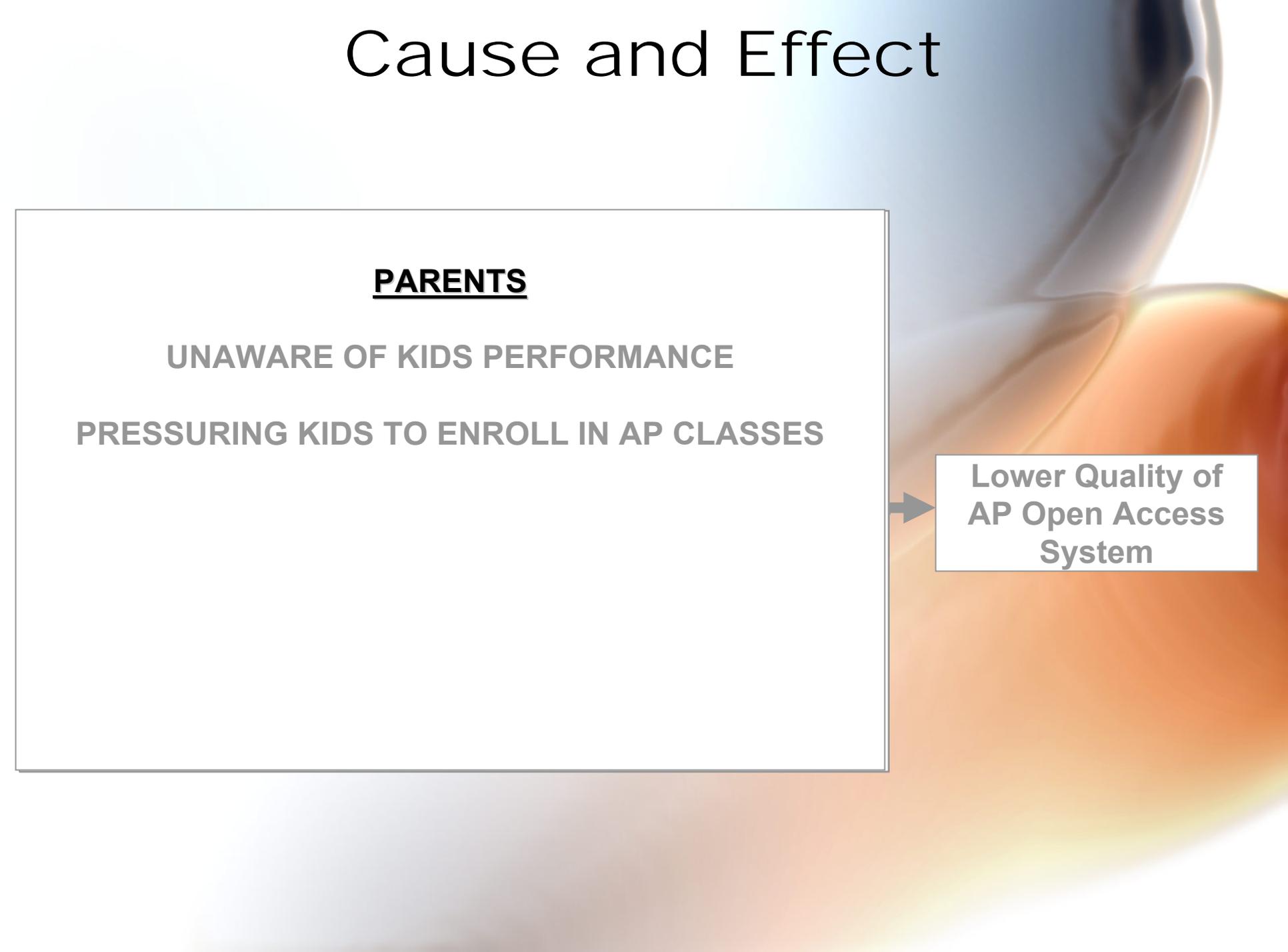
Cause and Effect

PARENTS

UNAWARE OF KIDS PERFORMANCE

PRESSURING KIDS TO ENROLL IN AP CLASSES

Lower Quality of
AP Open Access
System



Cause and Effect

TEACHERS

STRONGER EFFORT TO KEEP STUDENTS AT
THE SAME LEVEL

NO EXPERIENCE TEACHING AP

NOT CONSIDERED DURING IMPLEMENTATION

MORE STUDENTS FAILING

Lower Quality of
AP Open Access
System



Cost of Quality

Prevention - Appraisal – Internal - External

	Prevention	
	Action	Yearly Cost
Student	Tutor	40 hours/ year @ \$20.00/ hour TOTAL \$800/year
School	Training for counselors	10 hours at \$30/hour TOTAL \$300
	Training for teacher	10 hours at \$30/hour x 15 new teachers TOTAL \$4500
TOTAL		\$ 56,000.00

TOTAL OF ALL SECTIONS - \$996,130.00

Cost of Quality

Prevention - Appraisal – Internal - External

	Appraisal	
	Action	Cost
Student	AP study Guides	1 study guide at \$30.00 TOTAL \$30.00
School	After school tutoring	5 tutors at \$20,000/year TOTAL \$100,000
	New Counselors	5 new counselors at \$40,000/ year TOTAL \$200,000
	New Experienced Teachers	15 AP teachers @ \$40,000 TOTAL \$600,000
TOTAL \$		900,030.00

TOTAL OF ALL SECTIONS - \$996,130.00

Cost of Quality

Prevention - Appraisal - Internal - External

	Internal Failure	
	Action	Cost
Student	Time wasted in class	200 hours at \$6.50/hour TOTAL \$1,300
School	Time spent implementing AP system	100 hours at \$20/hour TOTAL \$2000
TOTAL \$		3,300.00

TOTAL OF ALL SECTIONS - \$996,130.00

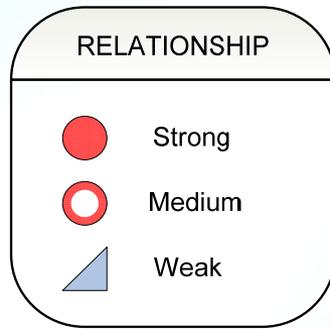
Cost of Quality

Prevention - Appraisal - Internal - External

	External Failure	
	Action	Cost
Student	1 year delayed in graduation/working	1 year at \$35,000
	No credit for AP class	One 3 credit college course at \$600
	Payment to retake the class	1 class at \$200
School	Student retaking class and denying a space for another student	50 students at \$200/student TOTAL \$1000
	TOTAL	\$ 36,800.00

TOTAL OF ALL SECTIONS - \$996,130.00

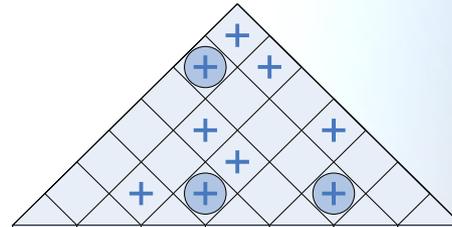
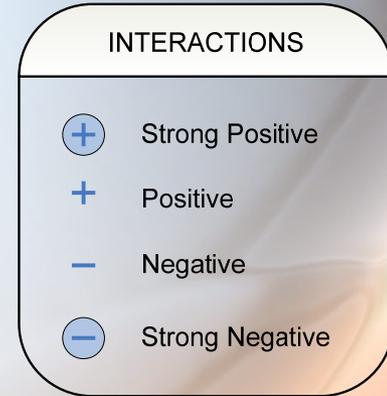
QUALITY FUNCTION DEPLOYMENT



CTQs

Recommendations

	Teacher Training	Attendance Requirement	Student Parent Contract	Guidance Counselor Encouragement	Test Requirement	Standardize Topics	AP Potential Parent/Teacher Night
AP class grades							
AP test grades							
Student Motivation							
Teacher Training							
Student Attendance							
Topics Covered							
% Minorities							
% Lower Socioeconomic Students							
Total # of AP experiences							



TARGETS AND PERFORMANCE METRICS

	METRIC	TARGET
QUALITY		
AP Class Grades	% of grades above B	100%
AP Test Grades	% of test over 3	100%
Student Motivation	Teacher Assessment	High
Teacher Experience	% of teachers with experience teaching AP > 1	100%
Student Attendance	% Absenteeism	0%
Topics Covered	Number of topics covered	All
Course Evaluation	Course Evaluation Rating	100%
QUANTITY		
% Minorities	% minorities enrolled in AP classes	Representative
% Lower Socioeconomic	% lower socioeconomic students enrolled	Representative

Data Collection Plan

Null Hypothesis	Data Used
Performance of Minorities in AP is equal to non-minorities	AP Test Scores, Grades
F&R Lunch performance in AP is equal to non F&R	AP Test Scores, grades, Lunch code
Learning Gains for students enrolled in AP is equal to students not in AP	FCAT Scores
Minority enrollment same for 03-04 than 04-05	Demographics
Percent students achieved 3 or better on AP test is the same for 03-04 and 04-05	AP Test Score
Students enrolled in AP 04-05 performed equally as those in 03-04	AP Class grades
Years teaching AP courses have no effect in student performance	Years teaching, AP test scores

Minorities in AP vs. Non-minorities

AY 04-05

- Looked at all ethnicities separately and studied:
 - AP Test Scores overall and per class
 - AP Class grade overall and per class

-Tool used: ANOVA

Level	N	Mean	StDev
A	125	1.920	1.075
B	66	1.833	1.104
H	252	1.857	1.069
I	6	1.500	0.837
M	7	1.286	0.488
W	459	2.031	1.127

Conclusion: No significant difference in performance between different ethnicities

F&R Lunch vs. Non F&R Lunch

AY 04-05

- Looked at the economic levels separately and studied:
 - AP Test Scores overall and per class
 - AP Class grade overall and per class

Tool used: ANOVA

Level	N	Mean	StDev
N	735	1.951	1.099
Y	180	1.917	1.108

- Conclusion: No significant difference in performance between different economic levels

Learning gains: AP vs. Non AP

Looked at the learning gains separately and studied:
FCAT Learning gains in 10th grade AP students
FCAT learning gains in 10th grade non-AP students

Tool used: ANOVA of avg. gain per course

03-04

Level	N	Mean	StDev
N	437	137.3	176.6
Y	86	125.1	221.6

04-05

Level	N	Mean	StDev
N	367	56.4	156.5
Y	201	91.7	192.8

- Conclusion: AP students have higher learning gains.

Minority Enrollment 03-04 vs. 04-05

- Looked at the ethnicities separately and studied:

- % increase in Hispanics

- % increase in Blacks

- % increase in Asians

- % increase in others.

- Tool used: Test of proportions

Hispanic				Black			
Year	X	N	Sample p	Year	X	N	Sample p
2003	43	1306	0.032	2003	9	274	0.032
2004	185	1277	0.145	2004	53	273	0.194

Asian				White			
Year	X	N	Sample p	Year	X	N	Sample p
2003	21	257	0.082	2003	109	1398	0.07
2004	78	225	0.347	2004	317	1266	0.25

- Conclusion: Increase in enrollment across all ethnicities.

3 or better in 03-04 vs. 04-05

- Looked at all students enrolled in AP and studied
AP scores in 03-04 vs. AP scores in 04-05

-Tool used: Test for 2 proportions

Sample	X	N	Sample p
1	344	621	0.553945
2	452	1287	0.351204

Difference = p (1) - p (2)
Estimate for difference: 0.202741

Conclusion: There is a smaller percentage of students scoring higher than a 3.

AP grades in 03-04 vs. 04-05

- Looked at all the students enrolled in AP and studied
Weighted GPA in 03-04
Weighted GPA in 04-05 of same students
- Tool used: Paired T-test

	N	Mean	StDev	SE Mean
W GPA 04-05	106	3.87859	0.54758	0.05319
W GPA 03-04	106	3.92038	0.49527	0.04810
Difference	106	-0.041785	0.116782	0.011343

- Conclusion: Students had a significantly lower GPA the following year.

Teaching Experience

- Looked at the AP Teachers and studied
 - Class performance for AP Teachers with 2+ years of experience
 - Class performance for new AP Teachers
- Tool used: ANOVA of AP Test Scores

Level	N	Mean	StDev
1	251	1.518	0.831
2	637	2.195	1.083

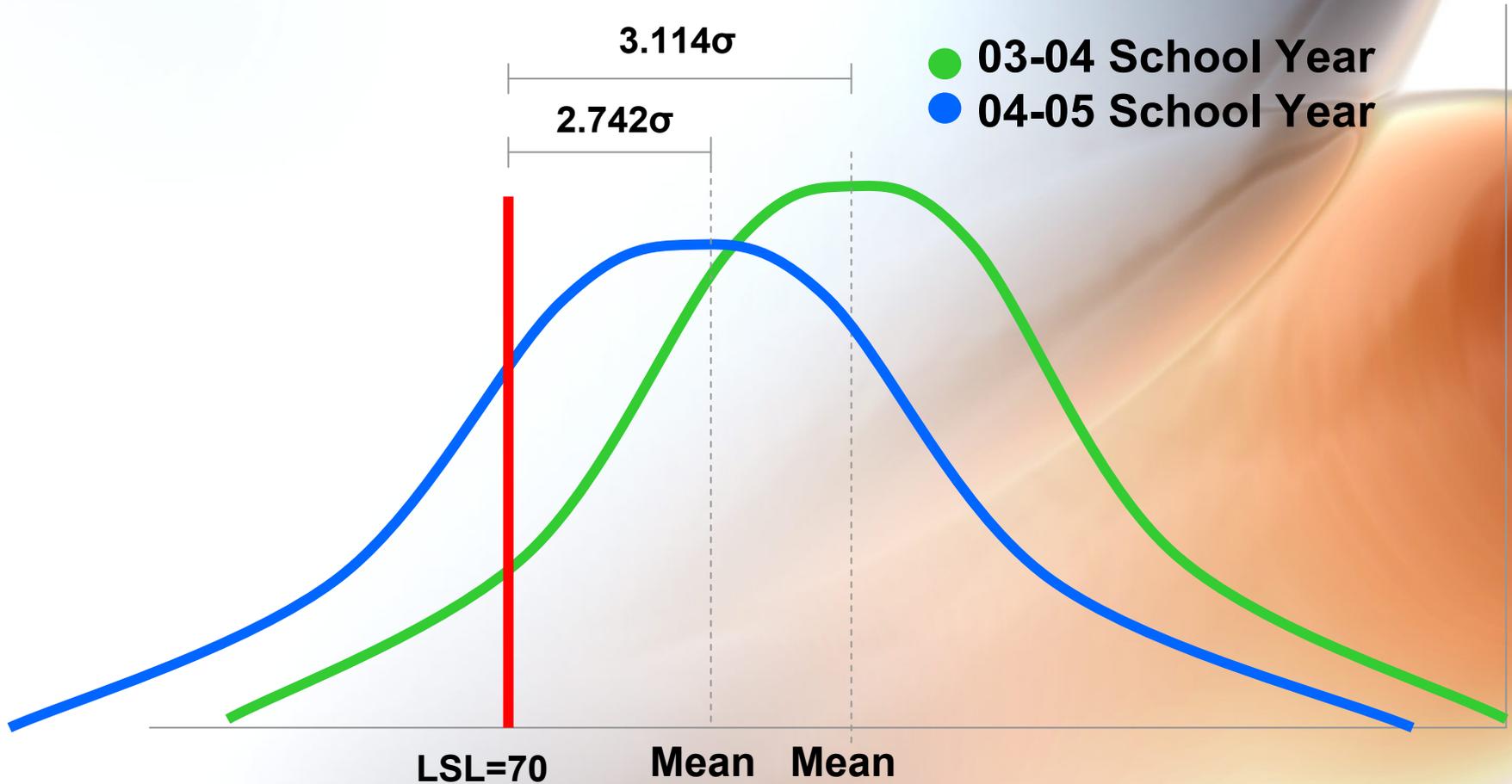
- Conclusion: Students who have classes with more experienced teachers tend to perform better on the AP exam

Summary of Results

Null Hypothesis	Data Used	Conclusion
Performance of Minorities in AP is equal to non-minorities	AP Test Scores, Grades	No significant difference in AP performance between different ethnicities.
F&R Lunch performance in AP is equal to non F&R	AP Test Scores, grades, Lunch code	No significant difference in AP performance between different economic levels.
Learning Gains for students enrolled in AP is equal to students not in AP	FCAT Scores	AP Students have higher learning gains.
Minority enrollment same for 03-04 than 04-05	Demographics	Increase in AP enrollment across all ethnicities.
Percent students achieved 3 or better on AP test is the same for 03-04 and 04-05	AP Test Score	There is a smaller percentage of students scoring higher than a 3 on AP test scores.
Students enrolled in AP 04-05 performed equally as those in 03-04	AP Class grades	AP students had a significantly lower GPA from 03/04 to 04/05.
Years teaching AP courses have no effect in student performance	Years teaching, AP test scores	Students who have classes with more experienced AP teachers tend to perform better on the AP exam.

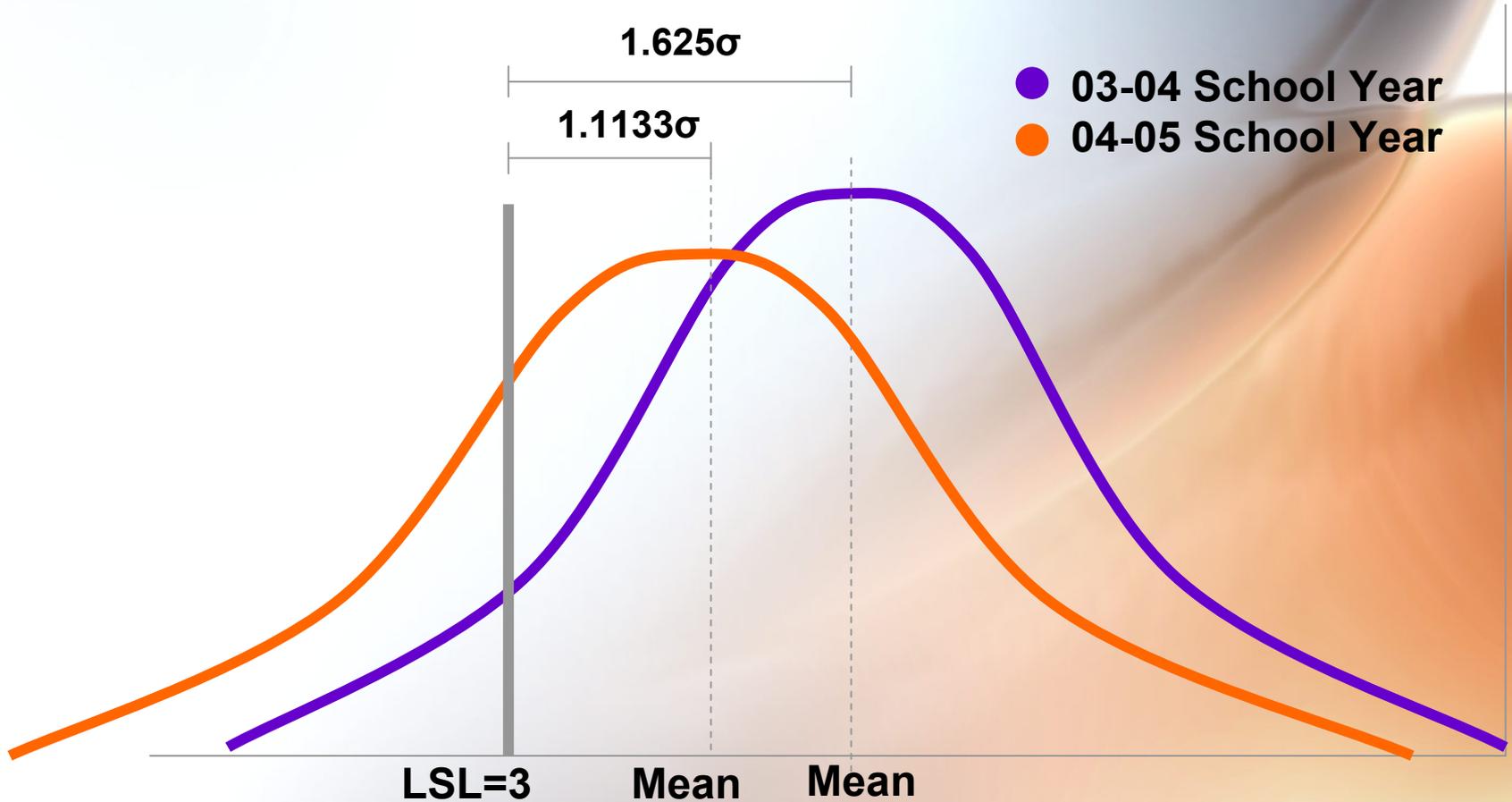
Sigma Levels

SIGMA LEVEL – Grades in AP classes



Sigma Levels

SIGMA LEVEL – Scores in AP exams



Conclusions

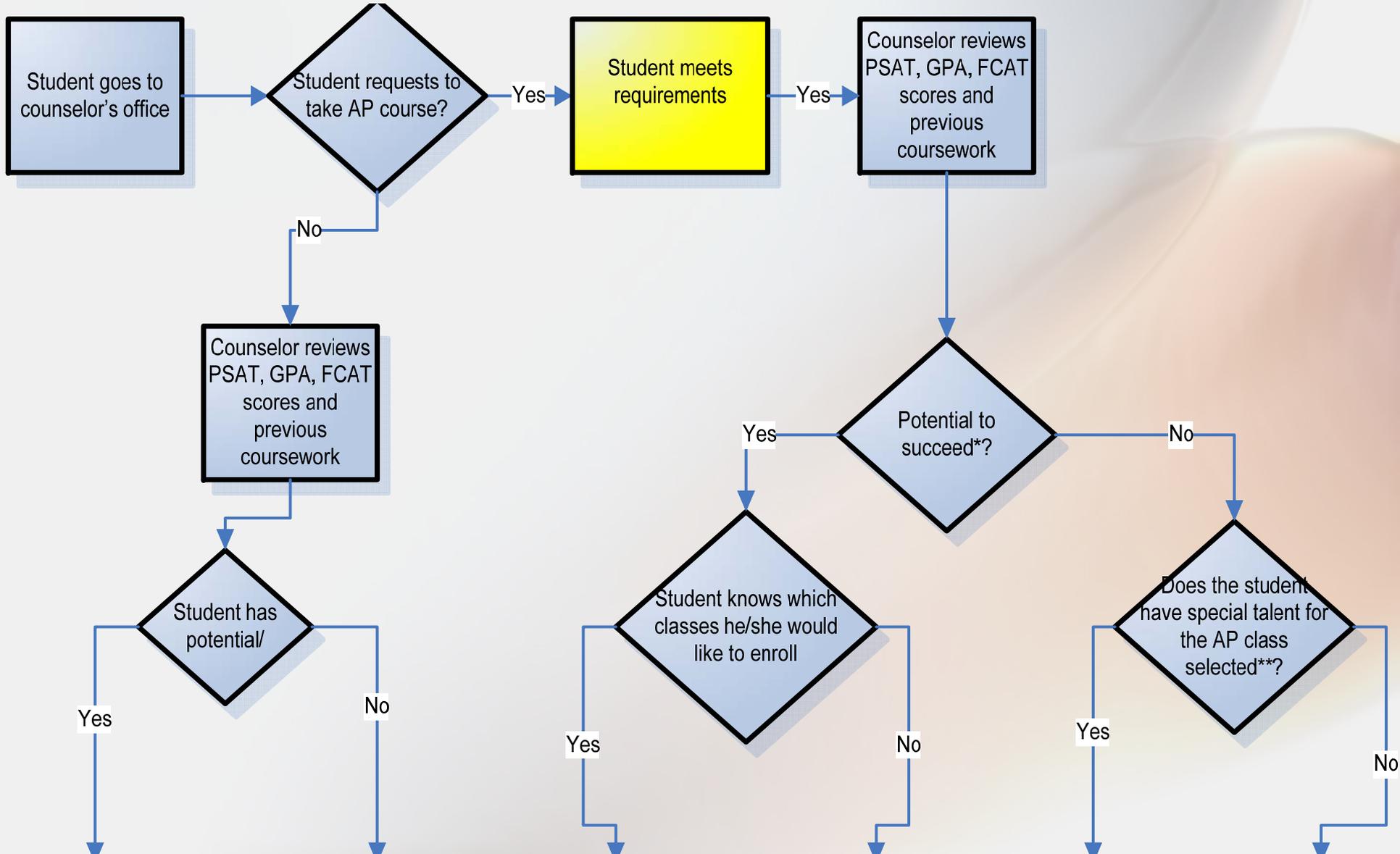
Quantity:

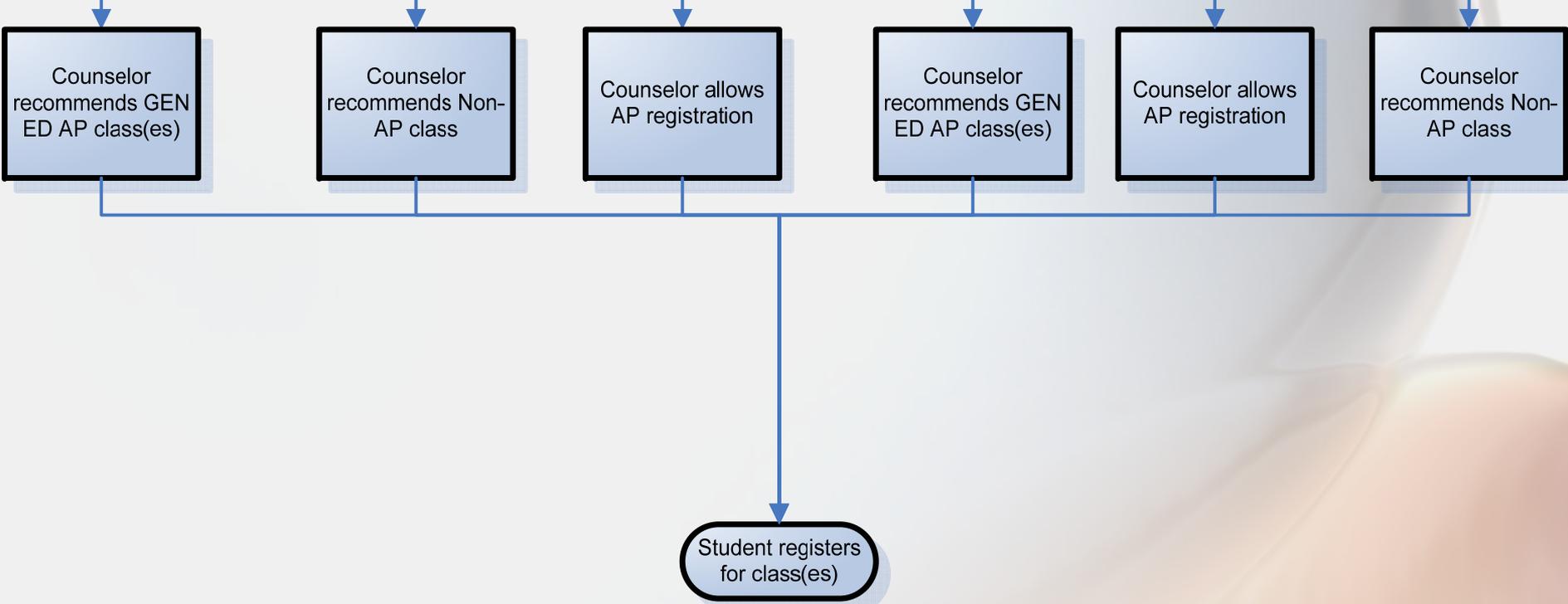
The number and percentage of the AP students has increased with open enrollment.

Quality:

The quality of AP (AP grades and test scores) has decreased with open enrollment.

Revised Process Flow





Revised Process Flow (cont'd)

Requirements for AP courses

- **Student submits application with:**
 - **Letter of recommendation (either academic teacher or parent)**
 - **Essay is submitted for appropriate courses**
- **Student fulfills pre-requisites**
- **Student is interviewed by counselor and granted entry into the desired AP course.**

IMPROVE AND CONTROL

- **Recommendations for Improvement**

Recommendation # 1

Develop a more standardized AP enrollment process.

Control

Counselors will meet with School Principal on a periodic basis and discuss performance

Recommendation # 2

Set minimum requirements for enrollment into AP classes

Control

Create a checklist of requirements to be reviewed before and during enrollment

Recommendation # 3

Create a contract for students/parents enrolling in an AP course.

Control

Contract is renewed each new semester specifying the amount of work and time needed

Recommendation # 4

**Establish and encourage parental involvement
for students enrolled in AP**

Control

**Periodic communication between parents and
teachers**

Recommendation # 5

Consider to keep AP classes small

Control

**Analyze capacity for classes, develop a matrix
with maximum number of AP students per class**

Recommendation # 6

Continuous training for AP professors

Control

Ensure teachers are continuously tuning their teaching skills in AP

Recommendation # 7

Set minimum attendance requirements

Control

Run attendance lists and encourage students to complete 90% attendance

Recommendation # 8

Generate highly detailed class syllabus

Control

**Perform revisions and updates to the workload
and time requirements**

	CTQ	Metrics	Problems	Root Cause	Recommendation
Quality	AP class grades	Percent of grades above a B	Lower AP grades in 2004/2005 vs. 2003/2004	No requirement to enter AP course Low motivation Low attendance rate	Minimum requirements Attendance Requirement
	AP test grades	Percent of test scores over 3	Lower percentage of students receiving a 3,4 and 5 in 2004/2005	Lack of past AP teaching experience Low student attendance Low student motivation	Teacher Expertise Group Attendance Requirement
	Student Motivation	Teacher Assessment	Lack of student motivation for classes	No requirement to enter AP course Low motivation Low attendance rate	Student/Parent Contract Attendance Requirement
	Teacher Experience	Percent of Teachers with experience teaching AP > 1 year	Lack of past experience teaching AP courses	Lack of past AP teaching experience	Teacher Expertise Group
	Student Attendance	Record of student attendance	Low attendance to AP classes	Low student motivation No attendance requirement	Student/Parent Contract Attendance Requirement
	Topics Covered	Number of topics covered	Courses cover less topics	No requirement to enter AP course Lack of past AP teaching experience	Smaller AP classes Class syllabus Teacher Expertise Group
	Minimum Requirements	Percent of requirements met for entering AP class	There are no current requirements to enter AP class	Attempt to increase the number of students enrolled in AP classes	Minimum requirements
Quantity	% Minorities	% Minorities enrolled in AP classes	Minorities are not well represented in AP courses	Low encouragement in pre-open access system	Guidance Counselor Encouragement
	% Lower Socieconomic	% Lower socioeconomic students enrolled in AP classes	Lower Socieconomic students are not well represented in AP courses	Low encouragement in pre-open access system	Guidance Counselor Encouragement
	Total AP experiences	Number of students enrolled x Classes offered	Total number of AP experiences could be greater	Less number of classes in pre-open access system Low encouragement to in pre-open access system	Standard AP procedures

A close-up, artistic shot of a glass filled with a golden-brown liquid, likely whiskey, with a blurred background. The glass is partially filled, and the liquid has a rich, warm hue. The background is a soft, out-of-focus gradient of light colors, creating a clean and elegant aesthetic.

THE END