What’s so Special about Spatial Analysis?
ArcGIS in the Reporting Process
February 29th, 2016

Presented by
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Using ArcGIS and SPSS to Evaluate and Conduct Analyses on Student Headcount
Using ArcGIS in the Reporting Process

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- Analytics and Institutional Reporting
- At LSC for 3 years
Using ArcGIS in the Reporting Process

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- Analytics and Institutional Reporting
- At LSC for 10 years
Using ArcGIS in the Reporting Process

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- Senior Analyst, IR
- Analytics and Institutional Reporting
- At LSC for 2 years
Lone Star College

• 84,000 credit students each semester, total enrollment of more than 95,000 (credit and non-credit).
• Largest institution of higher education in the greater Houston area.
• One of the fastest-growing college systems in the U.S.
• 86% increase in student headcount in ten years (Fall 2005 to Fall 2015) Adding 38,810 students
• 11 school districts, 1,400 square miles, population of 2.4 million.
• 6,300+ employees (part-time and full-time).
Lone Star College

- Six colleges, seven centers, two University Centers.
- Top 10 associate degree producer, ranked 5th among all community colleges in the U.S. (2013-14).
- Leads state-wide Texas Completes and Texas Reverse Transfer student success initiatives.
- Maintains AAA bond rating with S&P.
- Economic impact of $3.1 billion annually.
- Recognized as a 2015 Military-Friendly School and helps veterans fast-track to new careers with special grant funding.
• **ArcGIS 10.2 for Desktop**
  Created buffers, clipped zip code areas, to determine any overlap between the colleges

• **SPSS v.23**
  Used data collected from zip code areas to see if any predictors stood out positive or negative on student headcount
Why did we choose this Study?

- Increased headcount for most colleges but one.
- We wanted to see if we could determine any underlying factors related to a decrease in student headcount.
- And...USE the data to make informed decisions!
Why did we choose this Study?

Headcount at all 6 colleges

- LSC-CyFair
- LSC-Kingwood
- LSC-Montgomery
- LSC-North Harris
- LSC-Tomball
- LSC-University Park
Theories began to surface as to why this one college was down while everyone was up

- Shallow Pond Theory
- Stealing Students Theory
• We had to look at all 6 colleges

• All 6 colleges: 68 Zip Code Service Area

• Too large to manage

• Needed to figure out how to narrow down the area to study around each college
Study Area: 10 Mile Radius
• Narrow down our study area further

• How would this affect enrollment by zip narrowing down the zip code pool almost in half

• Creating a 5 mile radius took our 68 zip code area down to 38
Study Area
5 Mile Radius
### Top 15 Zip Codes in Which Our Students Reside

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>77449</td>
<td>4.0%</td>
</tr>
<tr>
<td>77429</td>
<td>3.7%</td>
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<tr>
<td>77346</td>
<td>3.0%</td>
</tr>
<tr>
<td>77070</td>
<td>2.4%</td>
</tr>
<tr>
<td>77073</td>
<td>2.1%</td>
</tr>
<tr>
<td>77095</td>
<td>3.9%</td>
</tr>
<tr>
<td>77433</td>
<td>3.6%</td>
</tr>
<tr>
<td>77373</td>
<td>2.9%</td>
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<tr>
<td>77375</td>
<td>2.4%</td>
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<tr>
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<td>77084</td>
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<tr>
<td>77379</td>
<td>3.3%</td>
</tr>
<tr>
<td>77064</td>
<td>2.5%</td>
</tr>
<tr>
<td>77388</td>
<td>2.2%</td>
</tr>
<tr>
<td>77040</td>
<td>2.0%</td>
</tr>
</tbody>
</table>
Top Four ISD Attendance Areas in Which Our Students Reside

**CYPRESS-FAIRBANKS**
- 22,169

**CONROE ISD**
- 9,143

**KLEIN ISD**
- 8,995

**ALDINE ISD**
- 8,798
What Next?

Determining Outside Predictors and Collecting census data within the selected zip code study areas

- US Census Bureau
  www.census.gov

- ArcGIS BAO (Business Analyst Online)
  https://bao.arcgis.com/esriBAO/login
Choosing Outside Predictors

• What outside predictors could we use that would be useful to our study?

• Finding data for the predictors that we choose meant that we would need to visit the US Census Bureau’s website and that we would have to use historical Lone Star data since the US Census is always behind is not always up to date.
First Predictor:

- Total Population
  - Collecting population by zip code
Second Predictor

• What is the “traditional” college age student?
• How does this group affect student headcount?
• Article: https://nces.ed.gov/pubs/web/97578e.asp
Third Predictor

• Unemployment Rate
  – Article on Unemployment Rate and Enrollment as a predictor
    http://www.monroeccc.edu/institutionalresearch/analyses/Unemployment%20Rate%20and%20Tuition%20as%20Enrollment%20Predictors%20Final.pdf
Outside Predictors
Family Income

Fourth Predictor

• How does family Income influence a student’s path to college?

• According to US News and a statement released by National Student Clearinghouse, Students from high-poverty schools are less likely to immediately enroll in college – and to remain enrolled after one year

• **Total Population by zip code:** We expect to see a Positive correlation between population and student headcount

• If the total population increases, we should expect to see an increase in student headcount
What we Expect

• **Unemployment Rate**: We expect student headcount to increase when the unemployment rate is up.

• If we see unemployment rates down in a specific population area, we will expect to see little to no change in headcount.
What we Expect

• **Traditional College Student:** 68-72% of the population of students at Lone Star fall in the Under 25 age group.

• If student headcount increases, we should expect to see this portion of the population that are Under 25 (16-24) to be larger than some of the other age groups in that area’s population.
What we Expect

• **Family Income:** When family income is up, we should expect to see an increase in student headcount.

• If family income is down we should expect to see a decrease in student headcount.
## Actual Results

### Total Population

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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
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<td>51,200</td>
<td>79,948</td>
<td>28,748</td>
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<tr>
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<td>22,627</td>
<td>32,311</td>
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<tr>
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<td>11,986</td>
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<tr>
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<td>44,625</td>
<td>43,385</td>
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<tr>
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<td>36,405</td>
<td>33,994</td>
<td>-2,411</td>
<td>-6.6%</td>
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- We found Population Growth to be a meaningful predictor for LSC's student headcount growth (Positive correlation; $r = 0.17 \sim 0.31$)
Actual Results
Under 25 Population

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<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>77389</td>
<td>9,684</td>
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<tr>
<td>77095</td>
<td>-16,587</td>
<td>-25.3%</td>
<td>1,418</td>
</tr>
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</table>

- Population growth in the Under 25 age group is a more powerful predictor for LSC college headcount growth
  (Positive correlation; r=0.41 ~0.68 )
Actual Results
Family Income

Family income change is also a significant predictor for LSC's headcount growth (Positive correlation; r= 0.15 ~0.35)

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<tbody>
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<td>%</td>
<td>#</td>
<td>%</td>
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<td>3.5%</td>
<td>-320</td>
<td>-16.7%</td>
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</table>

Family income change is also a significant predictor for LSC's headcount growth (Positive correlation; r= 0.15 ~0.35 )
# Actual Results

## Unemployment Rate

- A change in the unemployment rate is not a significant predictor (likely positive relation; $r=0.03 \sim 0.4$)

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</thead>
<tbody>
<tr>
<td>77066</td>
<td>10.4%</td>
<td>8.8%</td>
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<td>77379</td>
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<td>10.2%</td>
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<tr>
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<td>5.7%</td>
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<td>-0.3%</td>
<td>-147</td>
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### Notes:
- The table above shows the actual results in terms of population growth, income change, unemployment rate change, and lone star college headcount growth for three different zip codes. The change in the unemployment rate is not significant, indicating a likely positive relation with $r=0.03 \sim 0.4$. This suggests that higher unemployment rates may correlate positively with certain demographic or economic indicators.
Revisit Shallow Pond Theory

• Revisiting the “Shallow Pond Theory” and how our research showed this theory to have some validity.
• Increase in Total Population had a direct effect on student headcount
• If the Under 25 population decreased (and the overall population increased), LSC-Tomball saw our headcount decrease or stay relatively the same
Although all predictors positively affect LSC student headcount growth, we found that LSC-Tomball (individual) may not always received benefit from these predictors.
Revisit Stealing Students Theory

- We can see that if other colleges experienced growth in the shared service area, this can negatively affect the growth of LSC-Tomball
Recommendations
Under 25 Population

• We recommend that LSC-Tomball might consider advertising more heavily in zip code areas where we saw growth in the Under 25 population
• For colleges that lost students in their service area (LSC-T) from another college, we might suggest to investigate other possible reasons on student’s choice by conducting student surveys on that group of students.

• We would also like to make a recommendation to conduct further analysis on population density since population is a meaningful predictor.
Recommendations

Family Income

• Family income is also a meaningful predictor. We recommend that LSC-Tomball emphasize in zip code areas of low income that financial aid is available to Lone Star College students.

• Make sure to advertise in the community and social media when the college holds a Job Fair.
• Advertise in the zip code areas where we saw low family income levels on how a college education or a degree in one of our workforce programs will help to find better jobs
Questions?
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  281.290.3569
Sources

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  http://www.lonestar.edu/air

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  http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

• ArcGIS Business Analyst Online