Experiences in Using Academic Data for BI Dashboard Development

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University of Central Florida
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Session Highlights

• Who We Are
• Introduction
• Project 1 – Retention Report Dashboard
  – Background
  – Challenges and Outcomes
• Project 2 – Undergraduate Research Dashboard
  – Background
  – Challenges and Outcomes
• Conclusion
• Questions and Answers
Introduction to the EDS Office

• EDS - Enterprise Decision Support
• Unit of Institutional Knowledge Management (IKM)
• Data Integration Services
• Enterprise Data Warehouse
• Business Intelligence & Information Portal
• Support Decision-making and Planning
Introduction

- **SAS® Information Delivery Portal**
- **SAS® Web Report Studio**
- **SAS® Stored Processes**
- **SAS® BI Dashboard**
  - Single Screen Display
  - Key Performance Indicators (KPI’s)
  - Tables and Charts
- **Information Requests and Challenges**
Retention Report Dashboard: Background

• Retention, Graduation, and Attrition
  – Retention: Student returned each subsequent Fall term
  – Graduation: Student earned a degree
  – Attrition: Student did not return to UCF

• Undergraduate Student Cohorts
  – Annual and/or term based cohorts
  – Full-time and part-time cohorts
  – Transfer students and First Time in College (FTIC)

• Rates and Alerts
  – Rates calculated based on number initially in cohort (adjusted)
  – Alerts created based on change over time
### Retention Report Dashboard: Background

#### Existing Reports

**University of Central Florida**

**Undergraduate Retention and Progression Report**

**Summer-Fall FTIC Cohort**

**University Total - Male and Female - All Ethnic Groups**

<table>
<thead>
<tr>
<th>Cohort Yr</th>
<th>One Year</th>
<th>Two Years</th>
<th>Three Years</th>
<th>Four Years</th>
<th>Five Years</th>
<th>Six Years</th>
<th>Seven Years</th>
<th>Eight Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-2005</td>
<td>5722</td>
<td>9756</td>
<td>12596</td>
<td>14966</td>
<td>17183</td>
<td>21888</td>
<td>29396</td>
<td>36176</td>
</tr>
<tr>
<td>2005-2006</td>
<td>6025</td>
<td>9905</td>
<td>12505</td>
<td>14855</td>
<td>16845</td>
<td>22729</td>
<td>30311</td>
<td>37282</td>
</tr>
<tr>
<td>2006-2007</td>
<td>6379</td>
<td>9286</td>
<td>11916</td>
<td>14065</td>
<td>16045</td>
<td>21974</td>
<td>29797</td>
<td>36477</td>
</tr>
<tr>
<td>2007-2008</td>
<td>6621</td>
<td>9130</td>
<td>11631</td>
<td>13725</td>
<td>15845</td>
<td>21272</td>
<td>28527</td>
<td>35088</td>
</tr>
<tr>
<td>2008-2009</td>
<td>6960</td>
<td>9090</td>
<td>11330</td>
<td>13420</td>
<td>15440</td>
<td>19883</td>
<td>26760</td>
<td>33032</td>
</tr>
<tr>
<td>2009-2010</td>
<td>6926</td>
<td>8832</td>
<td>10937</td>
<td>13037</td>
<td>14903</td>
<td>19438</td>
<td>26404</td>
<td>32648</td>
</tr>
<tr>
<td>2010-2011</td>
<td>6134</td>
<td>7624</td>
<td>10524</td>
<td>12524</td>
<td>14124</td>
<td>18132</td>
<td>25204</td>
<td>30944</td>
</tr>
<tr>
<td>2011-2012</td>
<td>5467</td>
<td>6960</td>
<td>10076</td>
<td>11976</td>
<td>13676</td>
<td>17584</td>
<td>24384</td>
<td>29326</td>
</tr>
</tbody>
</table>

**First Year Retention & Progression**

<table>
<thead>
<tr>
<th>Cohort Year</th>
<th>Summer-Fall Cohort Count</th>
<th>Retained Count Yr 1</th>
<th>Retained Rate Yr 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>6,192</td>
<td>5,387</td>
<td>87.5%</td>
</tr>
<tr>
<td>2010-2011</td>
<td>6,111</td>
<td>5,748</td>
<td>93.3%</td>
</tr>
<tr>
<td>2009-2010</td>
<td>6,227</td>
<td>5,409</td>
<td>86.7%</td>
</tr>
<tr>
<td>2008-2009</td>
<td>6,134</td>
<td>5,343</td>
<td>87.1%</td>
</tr>
<tr>
<td>2007-2008</td>
<td>6,345</td>
<td>5,427</td>
<td>85.5%</td>
</tr>
<tr>
<td>2006-2007</td>
<td>6,375</td>
<td>5,353</td>
<td>85.3%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>6,025</td>
<td>4,941</td>
<td>82.0%</td>
</tr>
</tbody>
</table>

**Fourth Year Retention & Progression**

<table>
<thead>
<tr>
<th>Cohort Year</th>
<th>Summer-Fall Cohort Count</th>
<th>Retained Count Yr 4</th>
<th>Retained Rate Yr 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-2009</td>
<td>6,134</td>
<td>2,132</td>
<td>34.8%</td>
</tr>
<tr>
<td>2007-2008</td>
<td>6,345</td>
<td>2,356</td>
<td>37.1%</td>
</tr>
<tr>
<td>2006-2007</td>
<td>6,375</td>
<td>2,245</td>
<td>35.3%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>6,025</td>
<td>2,111</td>
<td>35.0%</td>
</tr>
</tbody>
</table>

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**UCF**

![UCF Logo]
RetentionPolicyDashboard: Challenges and Outcomes

• Data Sources
  – 10-year Data Model
  – Student Type Categories
  – Percent Difference Using the SAS function DIF()
  – Stored Process to Generate Data

• Indicator Data and Indicator Development
  – Series of %DO Loops Within a %MACRO
  – Generate and Publish a Package
  – Stored Process Errors
  – Formats Unavailable or Not Applied Correctly

• Dashboard Design and Development
  – Multiple Indicators on One Screen
  – Client-side Filters/Prompts
/* Create package for data set */
%let _archive_path=%sysfunc(pathname(WORK));
data _null_
  rc = 0;
pid = 0;
desc = 'Retention Detail';
nameValue = "
call package_begin(pid,desc,nameValue,rc);
call insert_dataset(pid,"WORK","retdtl","Recent_Retention_Detail","",rc);
length fullpath $4096;
call package_publish(pid, "TO_ARCHIVE", rc, "archive_path,
               archive_name,
               archive_fullpath","&_archive_path", "retdtl", fullpath);
call symput('_ARCHIVE_FULLPATH', fullpath);
call package_end(pid, rc);
run;
Retention Report Dashboard: Challenges and Outcomes

- Stored Process Executed Correctly
- Data Set Created in Physical Path of WORK
- Package Creation Code After the %MEND Statement
Retention Report Dashboard: Challenges and Outcomes

• Display of Values in Indicators
• Limited Formats Available for Data Type
• Create New Variables and Custom Formats

/* Create picture formats for numeric variables */
proc format;
   picture pctfmt (round) low-<0 ='009.9%' (prefix='-' mult=1000)
       0-high ='009.9%' (mult=1000);
   picture numfmt low-high = '00,009';
run;
Retention Report Dashboard: Design and Development

- Multiple Indicators Viewed At Once
- Indicator Types Not Applicable to This Data Set
- Multiple Indicator Data Objects Needed
- Interactive Prompts / Client-side Filters
# Retention Report Dashboard: Design and Development

## Retention Dashboard

<table>
<thead>
<tr>
<th>Cohort Year</th>
<th>Cohort Count</th>
<th>Progression Year</th>
<th>Progression Type</th>
<th>Progression Count</th>
<th>Progression Rate</th>
<th>Prog Rate Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2003</td>
<td>5,298</td>
<td>First Year</td>
<td>Retention</td>
<td>4,389</td>
<td>82.8%</td>
<td></td>
</tr>
<tr>
<td>2003-2004</td>
<td>5,638</td>
<td>First Year</td>
<td>Retention</td>
<td>4,649</td>
<td>82.5%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>2004-2005</td>
<td>5,722</td>
<td>First Year</td>
<td>Retention</td>
<td>4,747</td>
<td>83.0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>6,025</td>
<td>First Year</td>
<td>Retention</td>
<td>4,941</td>
<td>82.0%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>2006-2007</td>
<td>6,379</td>
<td>First Year</td>
<td>Retention</td>
<td>5,353</td>
<td>83.9%</td>
<td>1.9%</td>
</tr>
<tr>
<td>2007-2008</td>
<td>6,345</td>
<td>First Year</td>
<td>Retention</td>
<td>5,427</td>
<td>86.5%</td>
<td>1.6%</td>
</tr>
<tr>
<td>2008-2009</td>
<td>6,134</td>
<td>First Year</td>
<td>Retention</td>
<td>5,343</td>
<td>87.1%</td>
<td>1.6%</td>
</tr>
<tr>
<td>2009-2010</td>
<td>6,237</td>
<td>First Year</td>
<td>Retention</td>
<td>5,409</td>
<td>86.7%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>2010-2011</td>
<td>6,011</td>
<td>First Year</td>
<td>Retention</td>
<td>5,246</td>
<td>87.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>2011-2012</td>
<td>6,139</td>
<td>First Year</td>
<td>Retention</td>
<td>5,387</td>
<td>87.8%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

## Progression Rate Chart

- **2002-2003**: 80%
- **2003-2004**: 60%
- **2004-2005**: 80%
- **2005-2006**: 40%
- **2006-2007**: 80%
- **2007-2008**: 80%
- **2008-2009**: 80%
- **2009-2010**: 80%
- **2010-2011**: 80%
- **2011-2012**: 80%
Undergraduate Research Dashboard: Background

• Office of Undergraduate Research (OUR)
  – Data Collection (3 Years of Historical Data)

  – Goals:
    • Profile of Undergraduate Research at UCF
    • Strategic Goals and Assessments

  – More Information Needed

  – Information Delivery Method
• Data Sources

  – Initial Raw Data Provided by OUR
    • Manually Entered into Excel
    • Various Data Entry Users

  – Data Cleansing and Validation
    • PROC FREQ, CASE Statements, IF-THEN/ELSE Statements
    • Various SAS® Functions
    • State Vetted Demographic/Enrollment Data for Validation
Undergrad Research Dashboard: Challenges and Outcomes

• **Indicator Data Challenges**
  – Character/ Numeric Data Types
  – Structure and Nature of Academic Data

• **Indicator Data Solutions**
  – Convert Variables
  – Create Numeric Columns
  – Filter, Breakout, Aggregate
• **Indicator Object Challenges**
  – Example 1
Undergrad Research Dashboard: Challenges and Outcomes

\[
\text{PUT((INPUT(PUT(t1.Percentage,4.2),best4.2)*100),4.))} \|\%'
\]
Undergrad Research Dashboard: Challenges and Outcomes

- Indicator Object Challenges
  - Example 2

CASE
  WHEN t1.EXCEL_Pct > 0
  THEN
  PUT((INPUT(PUT(t1.EXCEL_Pct,6.3),BESTD6.3)*100),6.2)||'%' 
  ELSE ' '
END

---

<table>
<thead>
<tr>
<th>Year</th>
<th>EXCEL</th>
<th>IDS</th>
<th>YES</th>
<th>HIM</th>
<th>McNair</th>
<th>RAMP</th>
<th>PURE</th>
<th>STEAM</th>
<th>STEM</th>
<th>ICUBED</th>
<th>LEARN</th>
<th>ORC</th>
<th>SURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2010</td>
<td>3.51%</td>
<td>38.60%</td>
<td>0.57%</td>
<td>20.93%</td>
<td>1.07%</td>
<td>3.72%</td>
<td>0.68%</td>
<td>0.64%</td>
<td>0.14%</td>
<td>0.04%</td>
<td>26.30%</td>
<td>4.62%</td>
<td></td>
</tr>
<tr>
<td>2010-2011</td>
<td>3.28%</td>
<td>37.62%</td>
<td>1.86%</td>
<td>18.45%</td>
<td>2.68%</td>
<td>5.78%</td>
<td>0.89%</td>
<td>0.64%</td>
<td>0.14%</td>
<td>0.04%</td>
<td>25.37%</td>
<td>3.25%</td>
<td></td>
</tr>
<tr>
<td>2011-2012</td>
<td>2.79%</td>
<td>30.76%</td>
<td>1.80%</td>
<td>21.02%</td>
<td>2.32%</td>
<td>10.22%</td>
<td>0.66%</td>
<td>0.04%</td>
<td>1.62%</td>
<td>0.92%</td>
<td>23.45%</td>
<td>2.35%</td>
<td></td>
</tr>
</tbody>
</table>

* Students who participate in more than one program will be counted in each program respectively.
Undergrad Research Dashboard: Challenges and Outcomes

• Dashboard Design and Development

  – Flowchart

  • Organizing Areas of interest
  
  • Indicator Components
  
  • Client-side Filters/Prompts
Undergrad Research Dashboard: Design and Development

Student Demographics | Enrollment Demographics | UCF Population Comparison | Program Participation

Last Updated: October 2, 2013

Students Engaged in Research Last Year

Year: 2011-2012

Yearly Count of Participants in UG Research


Yearly Percentages By Research Programs*

<table>
<thead>
<tr>
<th>Year</th>
<th>EXCEL</th>
<th>IDS</th>
<th>YES</th>
<th>HIM</th>
<th>McNair</th>
<th>RAMP</th>
<th>PURE</th>
<th>STEAM</th>
<th>STEM</th>
<th>ICUBED</th>
<th>LEARN</th>
<th>ORC</th>
<th>SURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2010</td>
<td>3.01%</td>
<td>45.25%</td>
<td>0.39%</td>
<td>15.68%</td>
<td>0.48%</td>
<td>2.33%</td>
<td>0.44%</td>
<td></td>
<td></td>
<td></td>
<td>19.25%</td>
<td>12.17%</td>
<td></td>
</tr>
<tr>
<td>2010-2011</td>
<td>2.74%</td>
<td>45.57%</td>
<td>1.13%</td>
<td>15.78%</td>
<td>1.32%</td>
<td>3.43%</td>
<td>0.64%</td>
<td>0.73%</td>
<td>0.20%</td>
<td></td>
<td>17.25%</td>
<td>11.22%</td>
<td></td>
</tr>
<tr>
<td>2011-2012</td>
<td>2.49%</td>
<td>43.26%</td>
<td>1.09%</td>
<td>15.67%</td>
<td>1.05%</td>
<td>5.85%</td>
<td>0.39%</td>
<td>0.04%</td>
<td>1.09%</td>
<td>0.52%</td>
<td>15.18%</td>
<td>12.13%</td>
<td></td>
</tr>
</tbody>
</table>

* Students who participate in more than one program will be counted in each program respectively.

** Click on the table to see individual program growth by years

This Dashboard was created for the Office of Undergraduate Research

OUR - Office of Undergraduate Research
Undergrad Research Dashboard: Design and Development

Student Demographics
Click on the stacked bars to see a cluster chart of values by year.

Gender Breakdown

Age Breakdown

IND_StudentsByGender_Cluster

Year

# of Students

Percentage

0.00%
10.00%
20.00%
30.00%
40.00%
50.00%

2009-2010
2010-2011
2011-2012

Ethnicity

# of Students

0
200
400
600
800
1000
1200

American Ind...
Asian
Black/Afric...
Hispanic/Lat...
Multi-racial
Native Ha...
Not Specif...
White
Undergrad Research Dashboard: Design and Development
Undergrad Research Dashboard: Design and Development
Undergrad Research Dashboard: Design and Development

Comparison of OUR and UCF

**OUR & UCF Population Comparison**

The UCF population consists of students enrolled for the Fall term of the respective year. (N=50002)
The OUR population consists of students who participated in at least one research program for the respective year. (N=1804)

**Student Admit Type**
- OUR: Beginner - FTIC, FCS Transfer, Other Undergrad Transfer
- UCF: Beginner - FTIC, FCS Transfer, Other Undergrad Transfer

**Academic Levels**
- Freshman
- Sophomore
- Junior
- Senior
- Second Degree
- Non-Degree

**Full-Time/Part-Time**
- Full-Time
- Part-Time

**STEM vs Non-STEM**
- Percentage

**Academic College**
- Percentage
Undergrad Research Dashboard: Design and Development

### Age Groups

- **OUR**
  - 17 and Younger: [Percentage]
  - 18-19: [Percentage]
  - 20-24: [Percentage]
  - 25 and Older: [Percentage]

- **UCF**
  - 17 and Younger: [Percentage]
  - 18-19: [Percentage]
  - 20-24: [Percentage]
  - 25 and Older: [Percentage]

### Gender

- **OUR**
  - Female: [Percentage]
  - Male: [Percentage]

- **UCF**
  - Female: [Percentage]
  - Male: [Percentage]

### Ethnicity

- **OUR**
  - American Indian/Alaska Native: [Percentage]
  - Black/African American: [Percentage]
  - Multi-racial: [Percentage]
  - Not Specified: [Percentage]
  - Non-resident Alien: [Percentage]

- **UCF**
  - Asian: [Percentage]
  - Hispanic/Latino: [Percentage]
  - Native Hawaiian/Other Pacific Islander: [Percentage]
  - White: [Percentage]
Undergrad Research Dashboard: Design and Development

Program Performance Indicators

2011-2012 Student Involvement in Research Programs Compared to Previous Years Participation

- EXCEL
- HIM
- ICUBED
- IDS
- LEARN
- McNair
- ORC
- PURE
- RAMP
- STEAM
- STEM
- SURE
- YES

UCF
Conclusion

• Challenges to Overcome – Learning Experiences

  – Retention Dashboard
    • Resolve code placement for STP using %MACRO
    • Create additional variables in the data set to properly format percentages

  – Undergraduate Research Dashboard
    • Structural nature of academic data
    • Use labeling to properly format percentages
Conclusion

• Future Recommendations
  – Build Dashboard Backwards
  – Visualize Appropriate Indicators
  – Massage/Format Data to Work Well with Indicators Chosen
Recommended Reading

• SAS® BI Dashboard 4.3 User’s Guide
• Base SAS® 9.2 Procedures Guide
• SAS® 9.2 Language Reference
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