In higher education’s world of rising costs and shrinking funds, universities are facing tremendous pressure to innovate. As a result, progressive institutions have sought to leverage student data for increased business insights through the promise of improved efficiency and effectiveness resulting from predictive analytics (Ekowo & Palmer, 2017). Through use of student demographics, past performance data and a host of varied factors models have been shown capable of predicting the future behavior of students, a critical outcome of predictive analytics in the student life cycle (Eduventures, 2013). This is particularly important in the areas of learning outcomes, recruitment, and retention.

The current study utilized predictive analytics in relation to two innovative approaches: a non-traditional, online delivery, competency-based education (CBE) model, and a shift in scholarship awarding process. Results show that the CBE model was able to break negative historical persistence patterns, reducing both time and costs to degree completion in comparison to the traditional transfer student population. Through the innovative approach, students were able to accelerate degree completion by at least a year, resulting in up to 53% financial savings. A second use of predictive analytics in creation of a scholarship awarding process has shown promise in driving diversity among new students. Shifting institutional awarding policies from standard test scores to high school percentiles has positively impact minority student applications, and shows promise in increasing overall retention for our first-time freshmen students. The results show that high school class percentile was ranked in the top 5 most powerful predictors for FTFT-FR. Performing a quick query for both SAT and ACT predictors, no test score predictor appeared until a distant 34th position in the predictive ranking.

### Methodology

**Predictive analytics** encompasses a variety of statistical techniques from predictive modeling, machine learning and data mining that analyze current and historical data to improve student access and success and to examine how historical data can be used to predict values for new data. Modeling provides results in the form of predictions that represent a probability of a target variable based on a set of input variables.

**Purpose and Focus of the Study**

To identify contemporary challenges faced by institutions in higher education and allow institutional stakeholders to address these challenges to make better informed business decisions that can improve organizational efficiency and effectiveness using predictive analytics. To explore the use of predictive analytics in higher education to improve student access and success and to examine how historical data can be used to identify persistence trends over time.

### Findings

**Is High School Percentile a better indicator of Student Persistence over test scores?**

Previous scholarships awarded by test scores:

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>ACT/SAT Score</th>
<th>Scholarship Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>30-1300</td>
<td>$3,500 per year/1,000 per semester</td>
</tr>
<tr>
<td>Academic Excellence</td>
<td>22-1100</td>
<td>$1,000 per year/500 per semester</td>
</tr>
<tr>
<td>Blue &amp; Gold</td>
<td>22-1300</td>
<td>$1,000 per year/500 per semester</td>
</tr>
</tbody>
</table>

We found that high school class percentile was ranked in the top 5 most powerful predictors for FTFT-FR. Performing a quick query for both SAT and ACT predictors, no test score predictor appeared until a distant 34th position in the predictive ranking.

At or above the 80th percentile, this predictor showed an inverse relationship: persistence dramatically increases and non-persistence decreases. Students at or above the 80th percentile persist 7.1% higher than the average persistence for this student population and high school class percentile at our A&M-Commerce for this student population. The figure at the bottom is using a paired predictor plot tool comparing High School Class Percentile (**X**) with Max ACT Composite Score (**Y**). The top right quadrant is telling us that a combination of both predictive indicators is the best indicator of persistence. The top left quadrant shows that Max ACT Composite by itself is 5.19 percent below the average persistence for this student population. The bottom right quadrant demonstrates that High School percentile by itself is slightly above the average historical persistence for these students. We ran the same analysis multiple times with SAT predictive indicators as well, displaying similar results.

**Max ACT vs. High School Class Percentile**

Persistence probabilities for first-time full-time students by high school class percentile:

- • High school class percentile by itself is slightly above the average historical persistence for first-time, full-time freshmen.
- • The heat map on the right shows that the highest concentration of persistence is in the bottom right quadrant at or above 75 percentile or above.

We can see that high school class percentile is a powerful indicator for persistence.

### Findings (Continued)

**Are Competency-Based Edcuations Transfers persisting at higher rates than traditional transfers?**

- Historically, traditional transfer students who only take 6 or less credit hours (Part-Time) represent more than 52% of all non-persisting students.
- On average CBE students are taking 6 SCHs per term and are being retained at 87%. These students are breaking the historical negative pattern.