
AC 2012-2968: UNIVERSITY FRESHMAN RETENTION IN NORTH CAROLINA

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Robert Wayne Ford spent his first 37 years working in numerous trades, but always managed to move into leadership positions after a short period of time. After his father's death in 1997, Ford ended his career on the road and accepted a supervisory position with a local manufacturer in Arkansas. In 1999, Ford was given an opportunity through the NAFTA agreement to get a degree from the local two-year college. During his endeavors at NPCC, he was inducted into Phi Theta Kappa and received the George O. Bierkoe Distinguished Member Award for his contributions to the Garland County Foster Parent Association. In May of 2002, Ford received his A.A. degree from National Park Community College and he was offered a scholarship to complete his undergraduate studies at Texas A&M University in Commerce, Texas. Ford participated in the honors program on the TAMU-C campus and was the first from his department in 12 years to be pinned on stage at graduation. Because of his dedication to the college the president offered him one-year in state tuition towards a graduate degree and he completed all 36 hours of graduate studies in 12 months with a 4.0 GPA.

University freshman retention in North Carolina

Abstract- On the sixteen campuses of the University of North Carolina, student retention is becoming a strategically critical factor. For the period from 1998 to 2007, the University of North Carolina System had an average campus freshman retention rate of 80.8%. The North Carolina University System is composed of sixteen individual, public institutions located throughout the state. The current economic situation prompted an examination of student retention and graduation rates at each of the System's sixteen institutions. Administrators at each institution have been charged to review the status of student retention at their institution and to take the necessary measures to improve retention rates and to set retention goals. Taxpayers want to know their tax dollars are well spent. In North Carolina, retention of students at the University of North Carolina campuses is of utmost importance for institutional administrators to ensure efficient stewardship of taxpayers' funds. Retention of students is becoming a fundamental consideration for all university faculty and staff at North Carolina higher education institutions. Due to the generally accepted higher costs of their programs, engineering and technology faculty and administrators should be especially cognizant of retention rates, and the relationship of SAT scores to the successful completion of their programs by their students.

A linear regression model to predict an expected campus freshman retention rate was produced using average campus SAT scores. Initial examination indicates that some campuses have lower average freshman retention rates than other campuses due substantially to the level of freshman high school preparation as reflected by Scholastic Aptitude Test (SAT) scores. Student performance on the SAT is a primary indicator of first year student success, but other factors may also influence retention and provide opportunities for faculty and administrators to improve retention rates above expected levels as predicted by the SAT alone. After comparing SAT scores and retention rates at the sixteen state institutions, a regression model was built to predict expected retention rates which were compared to recent historical retention rates.

Recommendations to improve retention rates are provided.

Keywords: freshman retention, University of North Carolina student enrollment, student retention, scholastic aptitude scores, SAT

Introduction

The University of North Carolina (UNC) was chartered in 1789 and was the first public university in the United States [UNC, 2007]. The University has grown to sixteen campuses located throughout the state. Accrediting organizations and taxpayer considerations have propelled cost efficiency measures, such as student retention, to the forefront of strategic plans for the state's universities. Over 222,000 students were most recently served by University campuses. Of this number of students, about 32,000 were freshman undergraduates [UNC, 2010]. Based upon average campus retention rates of 80.7%, almost 6200 freshman students would be expected to drop out in their first year. At a conservative estimate of \$10,000 per year in average tuition and expenses per student, this dropout rate could cost as much as \$62,000,000 annually to taxpayers in North Carolina. State and local tax burdens hit a 25-year high, according to a Tax Foundation study released April 4, 2007 [Dubay, 2007]. Taxpayers want to know their tax dollars are well spent. In North Carolina, retention of students at the University of North Carolina campuses is of utmost importance for institutional administrators to ensure efficient stewardship of taxpayers' funds. Retention of students is becoming a fundamental consideration for all university faculty and staff at North Carolina higher education institutions.

“Seventy-five percent of students who drop out of college do so during their first two years” of college [Mattson, 2007, pg 9]. Factors such as student economic situation [SES], gender, race, high school grade point average and SAT scores have been linked to student retention [Astin, 1997; Mattson, 2007; Johnson & Molnar, 1996]. First year college grade point averages have also been found to be good predictors of retention [Mattson, 2007; Johnson & Molnar, 1996]. While retention rates predicted by standardized tests have been questioned recently [Mattson, 2007; Vogel, 2006], combined math and verbal SAT scores may provide a reasonable predictor of freshman university student retention. This paper provides an examination of the retention rates at the sixteen campuses of the University of North Carolina. A model to predict retention rates was generated for the UNC system. Actual retention rates and future retention rate goals were compared to the model.

Methodology

Annual average first-time freshman retention rates and combined math and verbal SAT scores were obtained from the system website for all sixteen campuses of the University of North Carolina dating from the Fall semester of 1998 to the Fall semester of 2008. The data points were tabulated in an Excel spreadsheet. Initial observation of a graph of retention rates versus SAT scores did not immediately indicate a detectable pattern over the period of analysis. By manipulating the data, several different graphs of retention rates versus SAT scores were generated to identify trends. The method of least squares was used to create trend lines within the graphs generated. These graphs were then used to determine a linear relationship between first-time freshman retention rates at University of North Carolina campuses and combined SAT scores. Pearson's Correlation Coefficients (r) and coefficients of determination (R^2) were also determined for the data sets. A best fit model was found which considered only combined SAT scores above 1000 points to predict retention rates.

Results

A coefficient of determination describing the relationship between all retention rate data points and all combined SAT scores was found to be 0.5733. The graph is shown in Figure 1.

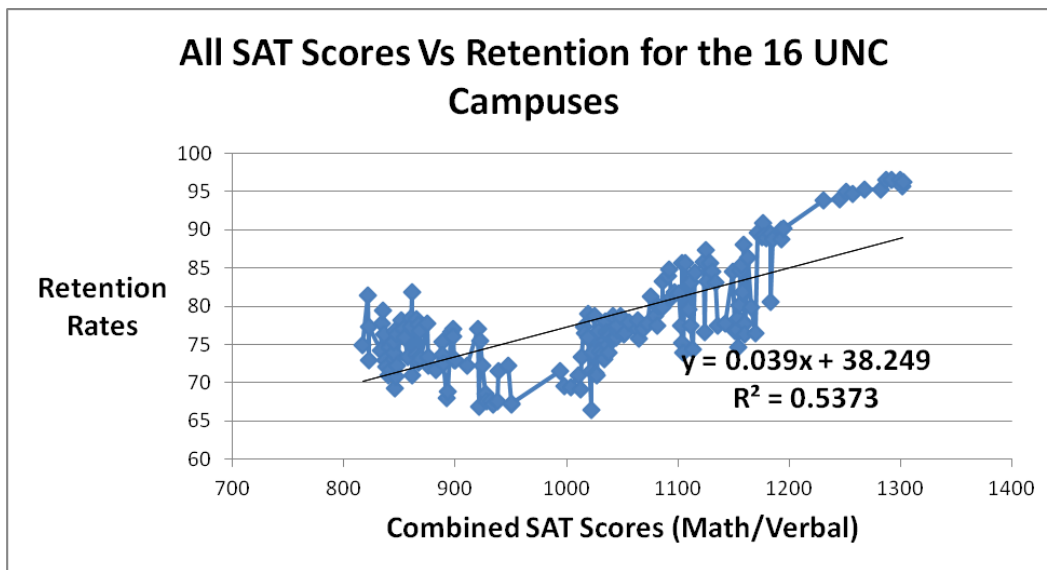


Figure 1

The data set was adjusted to only include average combined SAT scores above 1000 points and another graph, including trend line, was produced to compare retention rates and SAT scores. The graph is shown below:

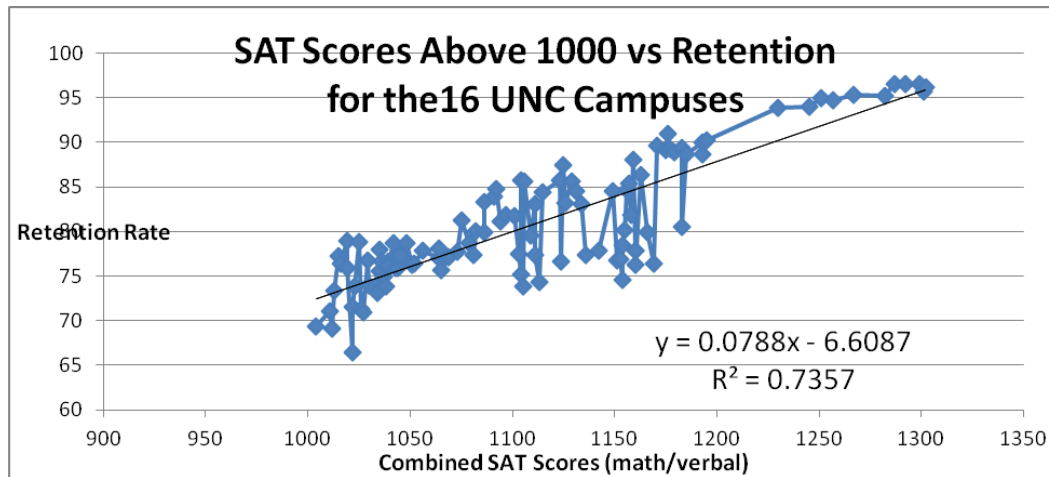


Figure 2

Discussion

Model versus actual

The coefficient of determination for the second scenario shown, Figure 2, is 0.7357. The regression model, $y = 0.0788x - 6.6087$, provides very good predictions of retention rates when actual scores are plugged into the equation for institutions where freshman SAT scores are above 1000. An average error was calculated over the ten year period of 1998 to 2008 to be 2.7% for those campuses with SAT scores above 1000. For all institutions, including those with SAT scores below 1000, the average error is 5.88%.

Observation of the trends in Figure 1 indicates an inverse relationship between SAT scores and retention rates for the lower (left) end of the curve. The lowest SAT scores reflected higher relative retention rates, but retention rates decline to SAT scores of about 950 points, then gradually rise linearly. These higher than expected retention rates may be worthy of further study. For instance, if it can be shown that specialized student advising, or that lower class sizes improve retention, administrators at other institutions may replicate these conditions on their campuses. A reasonable conclusion is that students with lower anticipated academic performance are provided

programs of study which are tailored to abilities, and that programs to assist these students, such as early alerts or required tutoring, are also provided.

Model versus goals

The UNC system reported retention goals in 2010 [UNC, 2010]. These goals are shown in Figure 3. Six institutions met or exceed their 2010 retention goals in 2008. At nine of the universities, the 2008 actual retention rate was within 3% of the goal. One institution was 6% away from their goal. At SAT scores above 1000 points, the regression model $y = 0.0788x - 6.6087$ indicates 15 SAT points equals just over 1% retention. SAT scores increased more than 30 points at seven of the UNC campuses over ten years, so an increase in retention would be expected. In all but one of these universities retentions did increase. At three campuses, SAT scores dropped over the ten year period, but retention rates were nearly unchanged. While the majority of variation in retention rates is statistically explained by the model, further investigation of potential factors affecting retention rates is warranted.

	Retention Goals (%)				
	2008	2009	2010	2011	2012
Appalachian	86	87	88	90	90
East Carolina	79	81	82	82.5	83
Elizabeth City	76	77	78	80	80
Fayetteville	74	76	77	78	80
N.C. A and T	72	74	76.5	77	80
N.C. Central	76	77	78	79	80
N.C. School of the Arts	76	77	77	77	78
N.C. State	90.5	91	91	91.5	91.5
UNC-Asheville	80	81.5	82	83	84
UNCC	78	79	80	81	82
UNC-CH	96.5	96.5	96.5	96.5	96.5
UNC-Greensboro	76.6	77.4	78.3	79.1	80
UNC-Pembroke	70.8	72	73	74	75
UNC-Wilmington	86	87	88	89	90
Western Carolina	69	72	73	74	75
Winston-Salem	71	73	75	78	80

Figure 3

The derived model relating SAT scores to retention rates appears to justify university admission based upon SAT scores. If North Carolina state educational budgets continue to decline, admission requirements, SAT scores may be used to reduce the number of freshman admitted UNC institutions.

Conclusions

The regression model, $y = 0.0788x - 6.6087$, provides very good predictions of retention rates when actual scores are plugged into the equation. Administrators at University of North Carolina University institutions with combined SAT scores above 1000 points may use this equation to predict their expected first year freshman retention rates. While predicting retention using the derived equation is not without risks, it may be used to benchmark campus retention.

In the future, administrators at institutions with SAT scores above 1000 points may produce regression models at their institutions to use to judge their institutions' retention performance.

Due to the generally accepted higher costs of their programs, engineering and technology faculty and administrators should be especially cognizant of retention rates, and the relationship of SAT scores to the successful completion of their programs by their students. As tuition dollars become more and more limited, policies may be emplaced by public institutions which would limit admittance of students with lower SAT scores or require attendance at two-year institutions prior to entering a university. This measure could save tens of millions of dollars in North Carolina. In addition, administrators may learn methods to retain students by studying aspects of programs at institutions with lower SAT scores but with higher retention rates. For example, the data set included an institution with average freshman SAT scores of 839 and retention rates in excess of 76.3 percent. This retention rate is much higher than would be predicted by the regression model produced by this study.

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Appendix

Retention Rates for entering freshman at UNC Institutions											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Appalachian	81.3	84.8	83.3	81.7	83.1	84.4	85.8	84.5	85.6	87.4	86.4
East Carolina	79	76.4	78	76.7	76.6	78.7	75.9	78.7	77.3	75.9	78.8
Elizabeth City	72.9	77.3	81.4	73	74.9	76.3	74.7	72.3	79.4	76.7	76.3
Fayetteville	74.2	72.6	71	73.9	73.4	72.7	75.4	70.8	73.3	69.2	73.6
N.C. A and T	75.5	72.3	76.6	76	73	73.1	72.5	68.9	71.7	73.6	77.1
N.C. Central	77	72.3	78.5	81.8	78.2	77.8	75.9	71	77.3	71.6	77
N.C. School the Arts	77.4	79.6	75.2	74.3	74.6	76.9	73.9	76.6	81.1	77.5	77.4
N.C. State	88	88.9	88.7	89.1	90	90.2	88.7	89.4	89.2	89.6	90.9
UNC-Asheville	77.8	76.8	80.2	77.8	77.8	79.9	76.4	80.5	76.3	78.5	81.9
UNCC	73.4	73.1	77.7	76.4	75.7	77.1	78.7	77.4	77	78.1	77.9
UNC-CH	93.9	94	95	94.7	95.3	95.2	96.5	96.6	96.5	96.2	95.7
UNC-Greensboro	74	73.9	74.9	73.8	75.5	76.9	77.4	76.3	75.9	76	76.6
UNC-Pembroke	66.8	67.6	68.6	72.2	67.2	67.1	72.3	67.5	71.5	67.3	67.5
UNC-Wilmington	80	79.9	81.8	83.9	85.6	85.7	83.2	83.1	84.5	85.4	84.7
Western Carolina	69.6	71.5	69.4	71	69.1	73.9	70.9	71.3	66.5	71.5	76.2
Winston-Salem	73.1	72.1	73.1	78.3	76.7	77.6	75.3	73	68	73.4	77.8

UNC Institutions SAT Combined Math/Verbal Scores

	Fall 1998	Fall 1999	Fall 2000	Fall 2001	Fall 2002	Fall 2003	Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010
Appalachian	1075	1092	1086	1101	1111	1115	1123	1131	1129	1125	1163	1158	1136
East Carolina	1019	1016	1035	1029	1036	1048	1043	1042	1015	1019	1025	1046	1039
Elizabeth City	823	823	822	837	817	848	841	848	835	846	836	841	841
Fayetteville	833	867	840	845	868	867	845	847	857	846	865	843	855
N.C. A and T	922	911	896	898	899	899	889	893	883	888	920	903	895
N.C. Central	898	876	860	861	852	834	855	861	860	842	854	849	857
N.C. School Arts	1136	1109	1104	1113	1154	1153	1105	1124	1094	1103	1111	1113	1118
N.C. State	1159	1179	1185	1175	1193	1195	1193	1183	1177	1171	1176	1184	1186
UNC-Asheville	1142	1151	1155	1160	1160	1166	1169	1183	1160	1154	1158	1175	1168
UNCC	1013	1034	1073	1052	1065	1069	1079	1081	1064	1064	1056	1060	1072
UNC-CH	1230	1245	1251	1257	1267	1282	1287	1299	1292	1302	1301	1302	1304
UNC-Greensboro	1030	1038	1037	1033	1035	1045	1045	1051	1044	1039	1039	1032	1030
UNC-Pembroke	921	932	927	924	934	950	948	938	939	950	928	926	921
UNC-Wilmington	1082	1086	1097	1091	1106	1104	1126	1134	1149	1157	1156	1166	1170
Western Carolina	998	994	1004	1011	1012	1023	1027	1026	1022	1022	1039	1034	1045
Winston-Salem	845	838	869	865	868	867	888	900	892	876	875	893	904