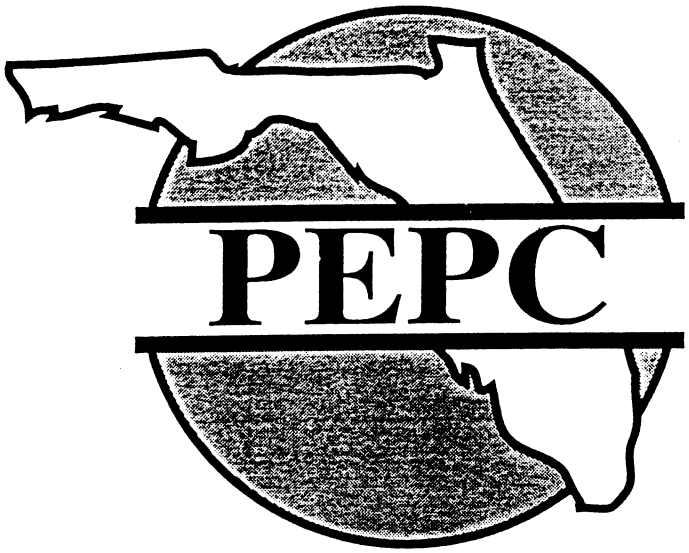

THE DEVELOPMENT OF AN ENROLLMENT PROJECTION MODEL

Report and Recommendations of the
Florida Postsecondary Education Planning Commission

NOVEMBER 1997

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APPENDICES

I. INTRODUCTION

Proviso language accompanying Specific Appropriation 188 of the 1996 General Appropriations Act directed the Postsecondary Education Planning Commission to develop an enrollment projection model in cooperation with the Board of Regents and the State Board of Community Colleges. The Commission carried out this project in two phases. A progress report was completed during fall 1996, which included a summary of the current enrollment profile of Florida postsecondary education and state enrollment projections for the next fifteen years. The report included a plan for the Commission to develop and maintain an enrollment projection model as an ongoing responsibility. In phase two of the project, an enrollment projection for Florida postsecondary education has been calculated which will provide a framework for the Commission's development of the 1998 ***Master Plan for Florida Postsecondary Education.***

II. THE PROCESS

Using current policies and practices for Florida postsecondary education employed by the State, sector boards and institutions, Commission staff has calculated a college credit headcount of the number of additional undergraduate, graduate and professional students that are projected out to the year 2010. Plans call for the calculation of non-college credit enrollments in the near future.

The process include the following steps:

- developed and tested a statistical methodology (model) to calculate enrollment projections.
- met with postsecondary sector representatives to review sector enrollment planning and policies and to gain input regarding the use of the projection model.
- consulted with MGT of America, Inc. to receive an update of national approaches in enrollment projections to evaluate the appropriateness of components in the proposed model and to audit the results of the model. See Appendix D.
- reviewed the enrollment projections with representatives of the state university system, community college system, independent sector, governor's office, and house appropriations and education staff.
- reviewed the modeling process and projection calculations with the staff of the Joint Legislative Management Committee's Division of Economic and Demographic Research. See Appendix E.
- reviewed the modeling process and projection calculations with the staff of the University of Florida's Bureau of Economic and Business Research (BEBR). See Appendix F.

The distribution by level was developed based on current state policies and practices. Different policy assumptions may produce different projections and distributions. A list of factors that may affect future enrollment patterns appears in Appendix B.

III. THE PROJECTION MODEL

The projection model relies upon a series of calculations, such as average annual increase, graduation and retention rates, and econometric relationships of enrollment to college age population, high school graduates and returning adults. Using multiple methods reduces the error that any one particular model may contribute and is similar to the methodology used by the Bureau of Economic and Business Research (BEBR) to project Florida population by county.

This model was developed as an enrollment projection model, which should be distinguished from an enrollment demand model. Because of this distinction, most critiques of this model have concluded that the results of this process should be interpreted as a conservative projection of enrollment.

The appendices to this report include descriptive materials on the model and on the projections that were calculated. The technical work papers that display the calculations are available upon request.

IV. PROJECTIONS FOR FALL SEMESTER 2010

The projection model produces a range of college credit headcount enrollment (community colleges, public and private universities) for the Fall semester of the year 2010. The middle range projection for the year 2010 shows that there will be approximately 789,000 undergraduate students (compared to 557,981 in 1994), 88,000 graduate students (62,623 in 1994) and 12,000 (8,653 in 1994) professional (law and medicine) students. Projected enrollments for the year 2010 by postsecondary sector were also calculated using the model. A graphic display of the projections appears in Appendix A, along with a more detailed summary of the calculations.

For funding considerations, Commission staff will calculate a conversion of these headcount projections to full-time equivalent (FTE) enrollments.

V. CONCLUSION

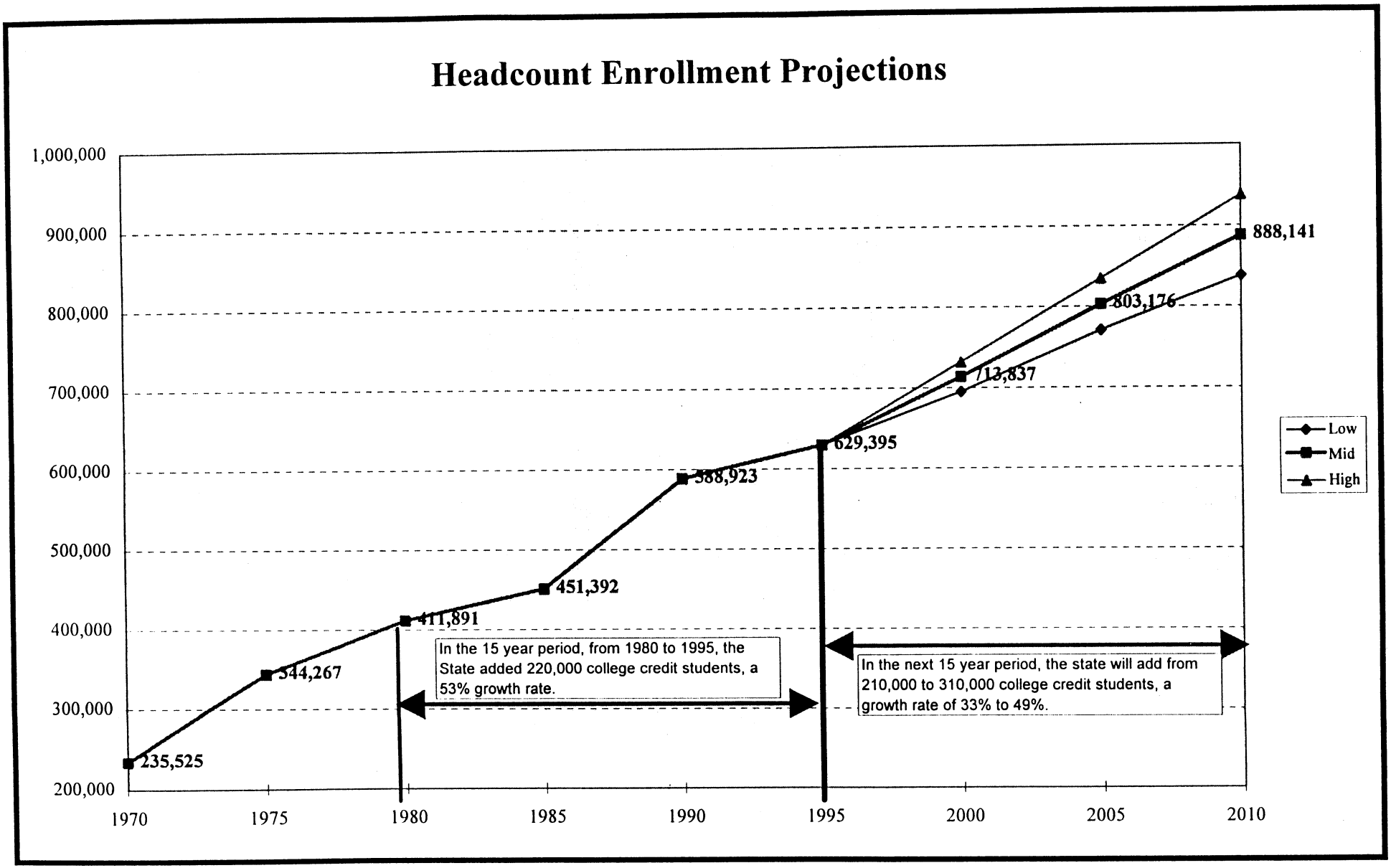
A college credit headcount for the number of additional undergraduate, graduate and professional students that are projected out to the year 2010 has been calculated using enrollment models. Current policies and practices regarding Florida postsecondary education were applied to the models for the projection calculations.

The Commission is completing work on its 1998 ***Master Plan for Florida Postsecondary Education***. The enrollment projections developed by the Commission will assist in providing a framework for the evaluation of a number of state policies and practices that directly influence postsecondary enrollments.

APPENDIX A

Enrollment Projections for 2010

Graph 1970-2010



A-1

Summary of 19 Projections

AvgIncr	AvgIncr	Regr TotSt	Total by Sector	HSGrad
20 Yr	854,337	897,574	876,533	45%
15 Yr	845,977	869,456	1,013,067	629395
11 Yr	845,422	912,887	986,435	912,623
7 Yr	780,914	708,432	1,069,064	
5 Yr	711,943	926,057	866,884	
3 Yr	685,589	1,026,790	1,063,059	

Regr Totst arranged from top by "Best Model" analysis.

Total by Sector arranged from top by "Best Model" analysis.

(Arranged Low to High)

	Total	**Method**
Low	685,589	AvgIncr
	708,432	TotSt
	711,943	AvgIncr
	780,914	AvgIncr
	845,422	AvgIncr
	845,977	AvgIncr
	854,337	AvgIncr
	866,884	BySector
	869,456	TotSt
Median	876,533	BySector
	897,574	TotSt
	912,623	HSGrad
	912,887	TotSt
	926,057	TotSt
	986,435	BySector
	1,013,067	BySector
	1,026,790	TotSt
	1,063,059	BySector
High	1,069,064	BySector

Average	**888,141**	w/o High, Low
SD	**99,482**	
Low	838,400	
High	937,882	

APPENDIX B

Description of Enrollment Model

POSTSECONDARY EDUCATION PLANNING COMMISSION
FLORIDA DEPARTMENT OF EDUCATION
224 COLLINS BUILDING
TALLAHASSEE, FL 32399-0400
(904) 488-0981

February 7, 1997

MEMORANDUM

TO: Interested Persons

FROM: John Huffman

SUBJECT: **Enrollment Projections**

This memorandum will briefly outline the process used to develop a state of Florida college credit Fall headcount enrollment projection in the year 2010 by sector and level. During the course of the next year PEPC will develop projections for non-college credit postsecondary enrollment.

The projection methodology presented here attempts to model the application of current policies to future demographic changes by examining the historical relationships of past and current policies on certain demographic characteristics.

We must caution that past relationships and trends are not necessarily perfect predictors of the future. However, as the Bureau of Economic and Business Research (BEBR) at the University of Florida has written, "since the future is intimately tied to the past, these (Florida population) projections will often provide reasonably accurate forecasts of future population change" (BEBR, Florida Population Studies, "Projections of Florida population by county, 1995-2020," February 1996, Vol. 29 No. 2, Bulletin No. 11).

A report prepared by MGT of America, Inc. for the Commission outlines the basic concepts underlying projection analyses. Therefore, this memorandum will not address many of those issues but will refer the reader to Enrollment Models for Florida Higher Education.

Generally, several projections are developed using various statistical techniques, time periods, predictor variables, trends, enrollment assumptions and units of analysis. These methods fall into five categories: 1. **"Rule of Thumb"**; 2. **Average Annual Increase**; 3. **Cohort Survival**; 4. **Sector Regression Analysis**; and 5. **State Regression Analysis**.

METHOD 1: The Rule of Thumb

The simplest method of estimating future enrollment is the "**Rule of Thumb.**" Basically, increases in high school graduates have a direct effect on increases in higher education enrollment. This can be expressed in a simple algebraic formula:

> *x* percent increase in high school graduates = *x* percent increase in higher education enrollment.

This relationship is consistent with the projections for California, Texas, Washington and the U.S. average (see Florida Higher Education at a Glance, page 4). In other words, the projected total higher education enrollment (public, private and two year, four year) for each of these states and the U.S., even after using many different complex equations, yields the same result as this simple formula.

This basic technique, while not specific enough for most planning purposes, yields a figure which can be used as a "ball park" estimate and as a "**rule of thumb**" to gauge the accuracy of more complex methods.

METHOD 2: Average Annual Increase

The second technique is the **Average Annual Increase** in enrollment, either in FTE or headcount. Once the **Average Annual Increase** is determined, simply add this number to the current base to get the next year's projection. Repeat these steps for the desired number of years.

An interesting caveat to this method concerns the number of years that are used to calculate the average annual increase. Is it appropriate to use three years? Five years? Or even twenty years? There is no rule to determine the correct period that should be used. For these projections, several trends were calculated for 3, 4, 5, 7, 11 and 20 years using a rolling average, and each produced substantially different results. This method is similar to the policies used by the SUS Enrollment Estimating Conference, which uses a three year average.

Using **Average Annual Increases**, however, does not take into account external factors, such as population, high school graduates, retention, etc. Instead, using **Average Annual Increases** to predict future enrollment assumes that there will be no change in these external factors. Thus, since Florida is experiencing fundamental demographic changes, this second method should not be used as a primary method of estimating enrollment, but may be able to give insight into changing *trends* in enrollment patterns.

METHOD 3: Cohort Survival

The third type of projection model is based on **Cohort Survival** (retention and graduation rates). This model most closely mirrors present policies and is very amenable to modeling variations of policies. This is the preferred method of forecasting future enrollment because of the ability to simulate actual and future enrollment patterns.

This technique requires a rather extensive data base, including retention and graduation rates by institution, by level and by cohort for at least a 10 year period, headcount to FTE ratios, enrollment by program type, program requirements (number of credit hours, internships, etc.). In order to simulate policy changes, we must specify the direct and indirect causal relationships among all variables that will be affected. A great deal of time and thought is required in specifying these relationships because of their complex nature.

Only data for the SUS at the undergraduate level is available that can be used to build a partial **Cohort Survival** model. This model, when applied to the SUS, yields results that are well within the range of the other, more complex techniques. As data from the CCS and the private sector institutions become more available, this model can be developed for all sectors and levels.

METHODS 4 & 5: Sector and State Regression Analysis

The fourth and fifth techniques are multivariate in nature and rely on the use of econometric modeling. Econometric modeling makes use of historical relationships between demographic variables and enrollment levels.

There are many regression techniques that can be used to estimate an econometric model, ie., MLE, OLS, ARIMA, WLS, distributed lag, GLS ARMA, etc (see Damodar Gujarati Basic Econometrics, Third Edition, 1995). The regression models developed for these projections use the simplest estimation process, namely OLS, or ordinary least squares.

A literature review of forecasting methods for the Criminal Justice Estimating Conference by the Office of Program Policy Analysis and Government Accountability (OPPAGA), details the advantages and disadvantages of several forecasting methodologies. OPPAGA concludes that regression models are "very easy to implement and cheap to maintain", "sufficiently reliable" and "typically outperform alternatives". However, regression models are also "difficult to develop", require "expert staff and large amounts of data", and "may fail to consider ... many interrelated political, socioeconomic, and demographic variables" (see attachment). Thus, with these notes in mind the current effort will use regression analyses in conjunction with other methods.

The regression equations developed for this project use several different variables to predict enrollment. Variables such as annual high school graduates, total state population, 18-44 year old population, 18-24 year old population, 0-44 year old population, lagged

measures of enrollment, lagged measures of the predictor variables, moving averages of enrollment, etc., are entered into an equation and the statistical relationship and strength of these variables is calculated.

The statistical relationships (coefficients) are then used to develop predictions for a given year in the future. The range of predictions is limited to the furthermost point in time in which estimates for the predictor variables are available. In the case of high school graduates the range is limited to the year 2010.

The face validity of these population groups is discussed in MGT's report. The CCS uses total population in their 6 year projection models. The SUS has used total population, 18-44 year old population and 0-44 year old population in various models that they have developed.

Numerous regression equations were estimated for each of these population categories and predictions generated from these equations. The SPSS program was used for the estimation of the parameters and Excel was used to calculate the projection. Copies of the data, equations and spreadsheets are available on 3.5" floppy disk.

Equations and projections were produced for both total state enrollment, enrollment by sector, and in the case of the SUS, projections by institution. There was a great deal of similarity in all of the projections. However, as MGT of America has pointed out, there is a tendency for the estimates to be slightly lower when the unit of aggregation is higher. In other words, the projections for total state enrollment are approximately 7-10% lower than the sector or institutional specific projections.

Since **Sector Regression Analysis** models produce statistically reliable results, these will be used as one set of projections. This method is appealing in that a detailed analysis of each level and sector is used to estimate future enrollment. An advantage of **Sector Regression Analysis** is that the forecast can detect and estimate changes in demographic shifts by sector. As we will see, this method is most consistent with current policy.

State Regression Analysis produces projections for total state enrollment which are similar to the method of using simple percentage growth in high school graduates. These methods are useful for some planning purposes, but are of limited use in determining the impact on operating and capital outlay budgets, and for the estimation of educational outcomes (e.g. degree production). Therefore, another step must be added to the process that forecasts enrollment by level and by sector.

Enrollment Projections by Level and Sector

There are several different assumptions that can be used to forecast enrollment by level and sector. It is important that these assumptions be conceptually consistent with the

procedure used to estimate total future enrollment. Since historical relationships based on enrollment trends and patterns have been used to project total enrollment, a similar process may be used to estimate the differences between levels and sectors.

One method for estimating relative enrollment by level and sector is to use the sector specific projections. Rather than using the actual projection, we calculate the projected relationship among levels and sectors *post hoc.* This procedure is somewhat cumbersome, yet captures the historical trends and relationships by level and by sector.

An alternative method of calculating sector specific forecasts is to estimate the impact of current policies on changing sector trends. An estimation of these effects is to examine changes in enrollment trends by sector as a function of the **Average Annual Increase**. As mentioned earlier, this method yields different relationships depending on the number of years which are used to calculate the change.

If a short time period is used (e.g. three years), we run the risk of making a generalization based on a possibly atypical trend. Yet, increasing the time period, for instance using a 20 year trend, could place too much emphasis on the enrollment and retention patterns, and higher education needs of a different generation.

A reasonable alternative is to use a time period to use a rolling average that most accurately captures current trends. Thus, a six year rolling average was computed for the most recent period (1989-1995) by sector, and this trend was extended to 2010. In other words, enrollment relationships by sector as a result of the **Average Annual Increase** for the six year period, was used to forecast enrollment in 2010 by sector. A six year rolling average has the advantage of modeling a dynamic changing process as a dynamic changing process. This is the most reasonable method and was chosen as the best approximation to *post hoc* calculation of enrollment by level and sector.

A final method of estimating the relationship of enrollment by level and sector should be mentioned. This technique applies present enrollment relationships by level and sector to future enrollment. This method, however, has the disadvantage of modeling a dynamic process as a static process. This method, moreover, is similar to taking a snapshot of a moving race car with a high speed camera and concluding, from the snapshot, that the car is not moving.

Additionally, there is not an official policy concerning percentage distribution between the public and private sectors and among undergraduate, graduate, and professional levels. There is no formal process that establishes an annual "state enrollment plan" that is a function of a single comprehensive policy. The nearest approximation is the concept that community colleges will be the primary point of entry for students who are beginning postsecondary education. Yet, this policy does not define "primary point" or "postsecondary", nor does it address the mix of upper division, graduate or professional enrollment.

Presently, sector share is determined *post hoc*. As such, distribution by level and sector is best modeled as a result of policies and enrollment trends, and not as a single policy.

Selecting The "BEST" Projection Model

This memorandum has outlined five methods of forecasting enrollment. Each of these methods has different advantages and disadvantages and none of them can be considered error free. In order to produce a forecast, we could choose one of these methodologies as the **BEST**. But which of these are the **BEST**?

Throughout the course of this project, the Commission Staff has estimated hundreds, perhaps thousands of projection models. Several have nearly identical statistical properties and have a high degree of face validity, but produce different forecasts.

The enrollment projection for the 2010 was developed using a technique very similar to the process used by BEBR to calculate county level population projections. That is, each of the five types of models, under different assumptions will contribute a total of ***nineteen*** projections to the final forecast. In order to ameliorate the effects of extreme projections, the highest and lowest projections will be dropped from the analysis. The average of the remaining seventeen projections will be taken, a standard deviation computed, and a range of enrollment for college credit higher education in Florida in 2010 will be produced.

The **Rule of Thumb** method estimates one point projection for total higher education in the state for 2010.

The **Average Annual Increase** method produces six models (one each for 3, 4, 7, 11, 15 and 20 year average increases) for total higher education in the state for 2010.

To this point, we have four state level projections, ***one*** from the **Rule of Thumb** method and a ***second***, ***third***, ***fourth***, ***fifth***, ***sixth***, and ***seventh*** from the **Average Annual Increase** method.

Unfortunately the **Cohort Survival** model cannot be used to calculate a total higher education forecast because there is insufficient data to yield a model for each sector. A partial model for the SUS can be estimated and used in assessing the reliability of the final projection.

Hundreds of models were generated using **Sector Regression Analysis.** For each sector, six models were selected based on an evaluation of theoretical specification, statistical significance of each variable and variance explained. For each sector, the six models were arranged based on the evaluation and were summed across sectors, yielding six aggregate models.

These aggregated, or state level models from the **Sector Regression Analysis** projections provides the ***eighth*** through ***thirteenth*** total state projections.

The process for **State Regression Analysis** is similar to **Sector Regression Analysis**, in that hundreds of models were estimated and the six best models were chosen based on theoretical specification, statistical significance of each variable and variance explained.

These six models from the **State Regression Analysis** produces the ***fourteenth*** through ***nineteenth*** total state projections.

The highest and lowest of these nineteen models are then dropped from the analysis. The mean and standard deviation of the remaining seventeen was calculated. The mean represents the **Medium** projection. One half of the standard deviation was added to the mean and one half subtracted from the mean to produce a "**range**" of projections (**Low, Medium,** and **High**).

The **Medium** forecast is the "most likely" scenario for higher education in Florida in the year 2010 and is the official projection for college credit enrollment by level and sector.

Commission Staff acknowledge the reality that past enrollment patterns, while good predictors of future trends, may not produce perfect forecasting scenarios. There are several indications that all of these techniques may underestimate actual changes in enrollment trends.

There are many factors and changes to policies that may lead to increased participation rates. The **Medium** forecast should be viewed as a conservative estimate of future enrollment.

Factors affecting future enrollment patterns are listed below:

1. Increasing the standards and graduation rates of high schools may result in more students being better prepared for higher education.
2. Distance learning technologies will make higher education accessible to those who are not now served. Thus, the potential pool of students will increase.
3. The increase in participation rates evidenced since the early 1980's may continue.
4. Changing economic and business conditions require higher levels of education. Thus, students who previously stopped their educational careers after the associate or baccalaureate degree will return for a higher or different degree.
5. National policies concerning tax breaks for college tuition.

6. National and state policies concerning welfare, workfare, job training and education.

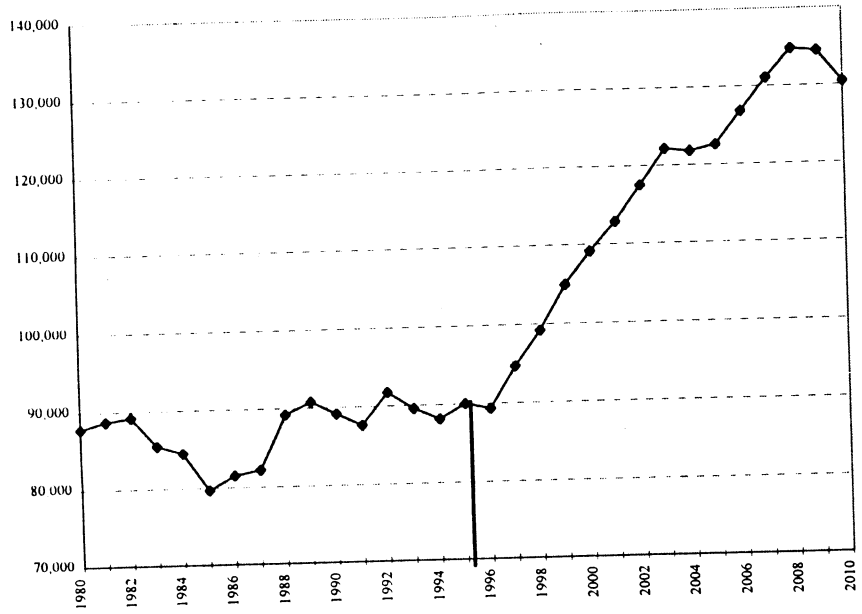
7. Time to degree policies will enable students to complete their degrees sooner and, for those continuing their education, more rapidly progress to the next level.

8. Annual budget incentives for each institution and sector may cause higher enrollments. For instance, performance based budgeting rewards institutions for granting degrees, a large percentage the current operating budget for instruction is based on the number of credit hours generated, the Florida Resident Access Grant is given on a per student basis without regard to need. In addition, improvements in retention and graduation rates will have the effect of increasing headcount and FTE enrollment at all levels.

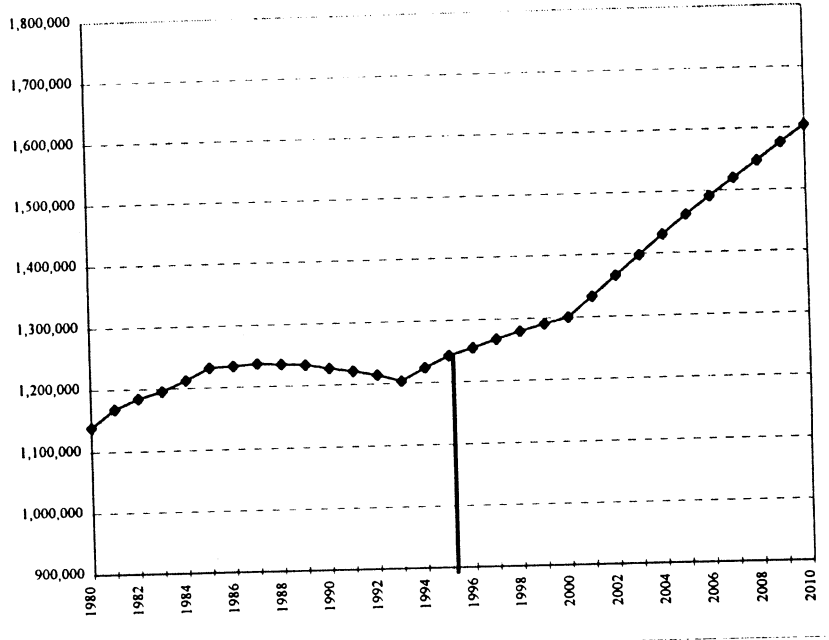
APPENDIX C

Population and Enrollment Projection Graphs

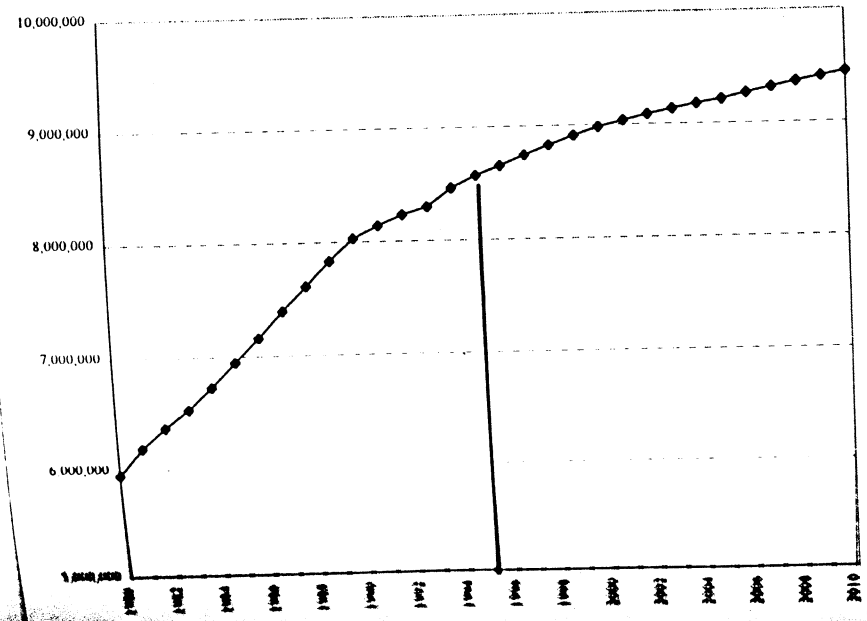
1980-2010 FL Pub HS Grads



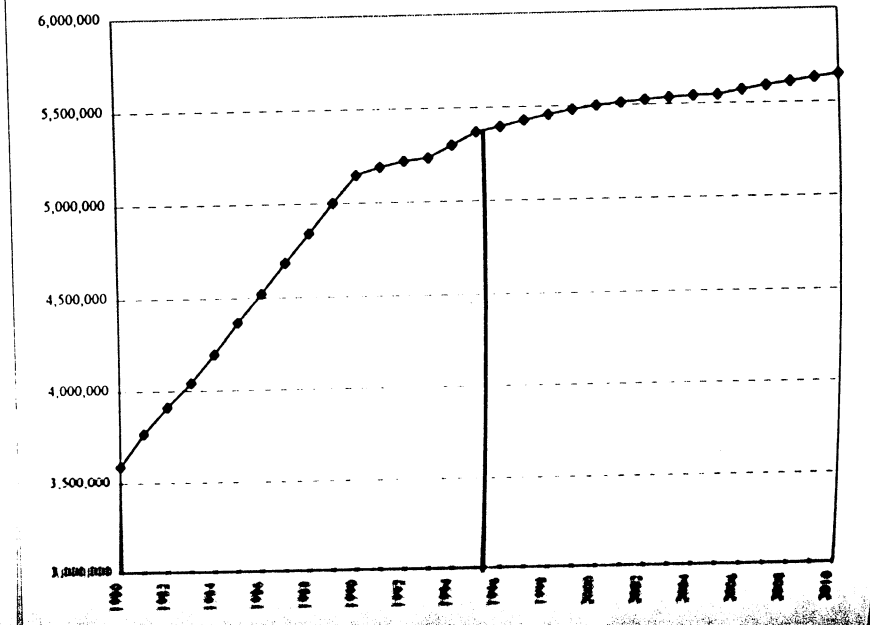
1980-2010 Florida 18-24 Yr Old Population



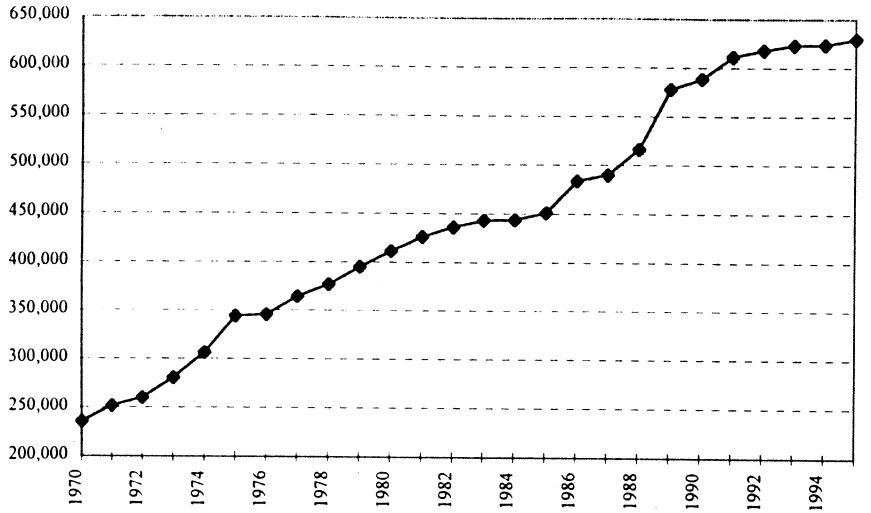
1980-2010 Florida 0-44 Yr Old Population



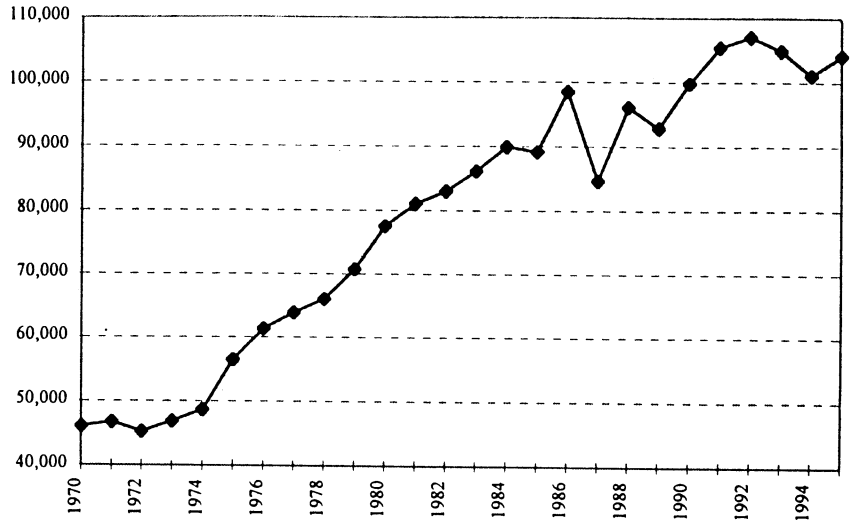
1980-2010 Florida 18-44 Yr Old Population



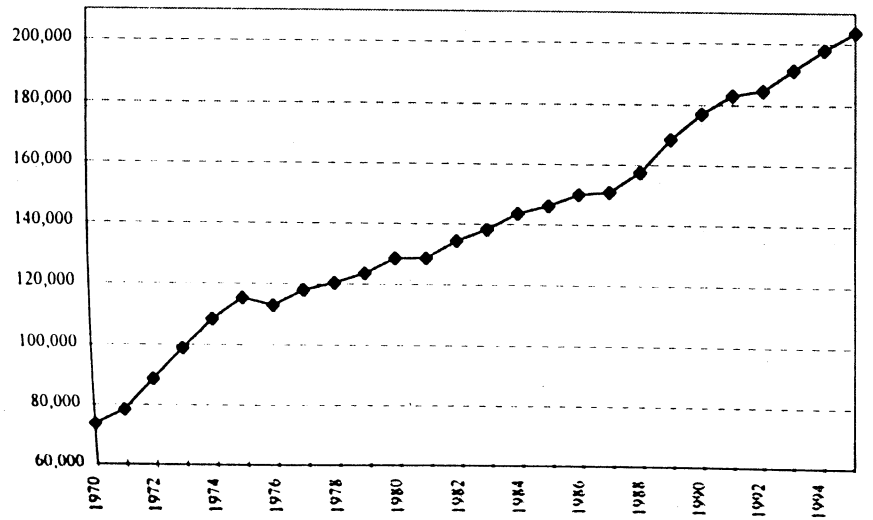
1970-1995 Total Fall Headcount Enrollment



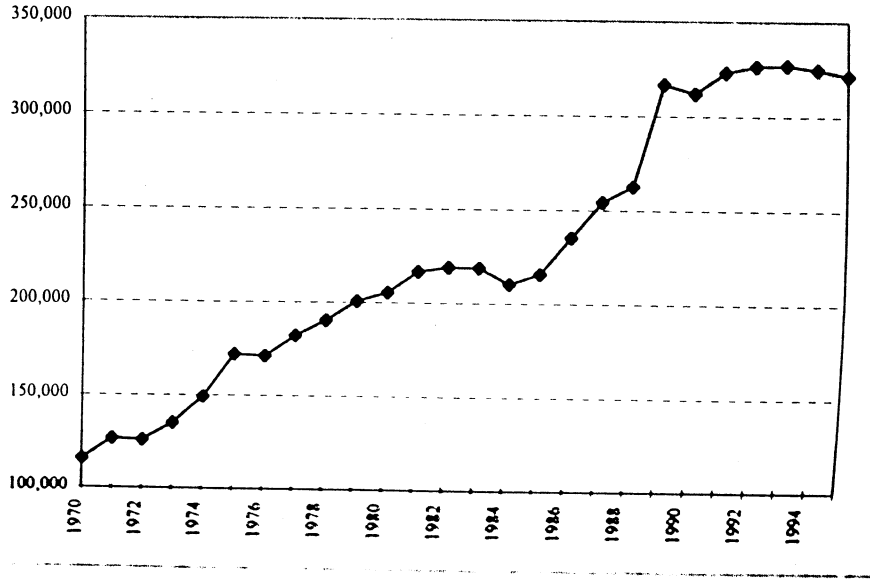
1970-1995 Private Headcount Enrollment



1970-1995 SUS Fall Headcount Enrollment



1970-1995 CCS Headcount, College Credit



APPENDIX D

Consultant Reports (Phase I, II and III): MGT of America, Inc.

ENROLLMENT MODELS FOR FLORIDA HIGHER EDUCATION

PRESENTED TO:

PROGRAM/PLANNING COMMITTEE
POSTSECONDARY EDUCATION PLANNING COMMISSION

PRESENTED BY:

MGT OF AMERICA, INC.
2425 TORREYA DRIVE
TALLAHASSEE, FLORIDA 32303

DECEMBER 2, 1996

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1.0 INTRODUCTION AND BACKGROUND

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

This report summarizes the results of a limited-scope consulting engagement that MGT of America, Inc., conducted for the Florida Postsecondary Education Planning Commission (PEPC or the Commission). The purpose of the project was to assess current practices used by the several higher education sectors in the state to project future enrollment levels. This activity was designed to serve as the initial step to be taken by the Commission in carrying out a more comprehensive assignment from the Florida Legislature to develop an enrollment projection model for the several sectors of the higher education community.

1.2 Project Background

Florida is one of the fastest growing states in the nation in terms of its resident population. Now the nation's fourth most populous state, Florida has grown from a rank of 9th in 1970 (when it had approximately 6.8 million residents) to a rank of 4th in 1990 (when it had over 12.9 million residents). The state's population growth was surpassed only by that of California in terms of actual numbers of additional residents and by Arizona and Nevada in terms of its percentage increase. The magnitude of this growth is summarized in Exhibit 1-1.

Such rapid and significant population growth has strained the state's ability to provide government services to its citizens. The state's programs for transportation, social services, corrections and environmental protection are all hard-pressed to expand their services to keep pace with population growth.

EXHIBIT 1-1
POPULATION GROWTH IN FLORIDA
AND OTHER EXPANDING STATES

Entity	Population			
	1970	1990	Increase	Percentage Increase
Top Ten States in Actual Growth				
California	19,971,000	29,760,000	9,789,000	49.0%
Florida	**6,791,000**	**12,938,000**	**6,147,000**	**90.5%**
Texas	11,199,000	16,987,000	5,788,000	51.7%
Arizona	1,775,000	3,665,000	1,890,000	106.5%
Georgia	4,588,000	6,478,000	1,890,000	41.2%
North Carolina	5,084,000	6,629,000	1,545,000	30.4%
Virginia	4,651,000	6,187,000	1,536,000	33.0%
Washington	3,413,000	4,867,000	1,454,000	42.6%
Colorado	2,210,000	3,294,000	1,084,000	49.0%
Tennessee	3,926,000	4,877,000	951,000	24.2%
Top Ten States in Percentage Growth				
Nevada	489,000	1,202,000	713,000	145.8%
Arizona	1,775,000	3,665,000	1,890,000	106.5%
Florida	**6,791,000**	**12,938,000**	**6,147,000**	**90.5%**
Alaska	303,000	550,000	247,000	81.5%
Utah	1,059,000	1,723,000	664,000	62.7%
Texas	11,199,000	16,987,000	5,788,000	51.7%
New Hampshire	738,000	1,109,000	371,000	50.3%
Colorado	2,210,000	3,294,000	1,084,000	49.0%
California	19,971,000	29,760,000	9,789,000	49.0%
New Mexico	1,017,000	1,515,000	498,000	49.0%
National Average	4,050,900	4,962,060	911,160	22.5%

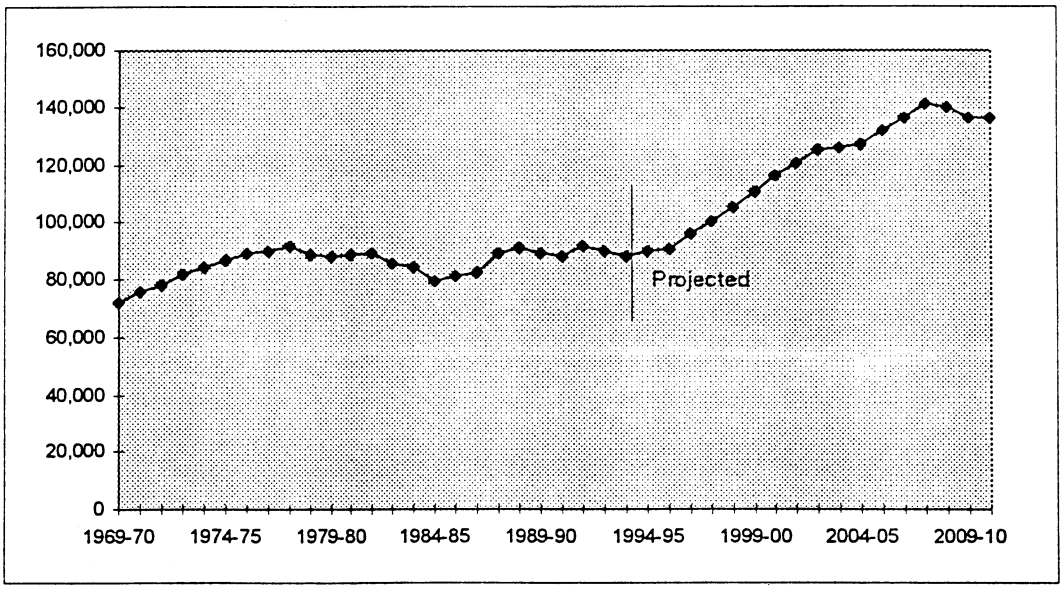
Perhaps the greatest strain related to population growth has been felt in the state's educational system. Since 1950, enrollment in the state's 67 school districts has grown from just under 500,000 to 2,000,000. Following the growth in the 1950s and 1960s caused by the "baby boom" generation, the state experienced a brief period of more stable enrollments from 1975 to 1985. However, enrollment began rapidly increasing again in the mid 1980s. This second wave of rapid growth has been termed the "baby boom echo" in recognition that many of today's new students are the offspring of the baby boom generation. As the first members of the so-called "echo" generation now reach their senior year in high school in 1996-97, the next impact of their presence will be felt in the state's colleges and universities.

Demographers in the Florida Department of Education (DOE) have been tracking this trend for a number of years and have developed an ongoing system for the projection of graduates, by year, from the state's public high schools. Their latest report, which was shared with the Commission during Fall 1996, indicates that a 56 percent increase in the number of high school graduates over the next 12 years is likely. A summary of the DOE tracking and projection of high school graduates is shown in Exhibit 1-2.

Higher education officials have been monitoring the growth in public school enrollments with increasing concern. Already strapped in responding to strong enrollment growth due to increases in the college participation rates of young adults, colleges and universities are ill-prepared to handle the additional growth that many expect will come with the increase in the size of the age cohort.

EXHIBIT 1-2
FLORIDA PUBLIC HIGH SCHOOL GRADUATES
ACTUAL 1969-70 TO 1994-95 AND
PROJECTED 1995-96 TO 2010-2011

Year	Actual Graduates	Year	Actual Graduates
1969-70	71,900		
1970-71	75,649	1991-92	91,726
1971-72	78,296	1992-93	89,646
1972-73	81,773	1993-94	88,220
1973-74	84,098	1994-95	90,062
1974-75	86,651	*Projected*	
1975-76	88,932	1995-96	90,617
1976-77	89,937	1996-97	96,070
1977-78	91,613	1997-98	100,361
1978-79	88,318	1998-99	105,158
1979-80	87,826	1999-00	110,232
1980-81	88,755	2000-01	115,792
1981-82	89,199	2001-02	120,581
1982-83	85,505	2002-03	125,468
1983-84	84,496	2003-04	125,844
1984-85	79,686	2004-05	126,821
1985-86	81,508	2005-06	131,648
1986-87	82,184	2006-07	135,956
1987-88	89,206	2007-08	141,157
1988-89	90,759	2008-09	139,947
1989-90	89,162	2009-10	136,208
1990-91	87,647	2010-11	136,038



Such concerns about the ability of the state's colleges and universities to respond effectively to the projected growth surfaced last year in the report of the Business - Higher Education Partnership, a group created by The Florida Council of 100, the State University System, the Community College System, and the Independent Colleges and Universities of Florida. After considering an earlier version of the DOE projections of high school graduates, the BHEP report (entitled The Emerging Catastrophe -- And How to Prevent It) cautioned that:

> . . . the higher education system will have 75,000 more qualified students seeking to be served by the latter half of the next decade. Alternative ways of calculating the added enrollment put it at a more conservative 50,000 to 60,000. Either way it is a surge. And if (as one might expect and hope) more high-school graduates come out well-prepared for advanced work and a higher proportion seek advanced training to enhance their career prospects, the pressure on the system will be that much greater.
>
> To repeat, what gives in this kind of crunch is access and quality. The pressure will be to slide off an open-door commitment to educate all qualified applicants. Or to shoehorn them in at the expense of quality as resources stretch thinner and thinner.

The report of the Business - Higher Education Partnership received considerable media attention around the state, including editorials calling for legislative action.

1.3 Assignment to PEPC

Although it acknowledged that the state's higher education system would be growing, the Legislature expressed reservations about the immediacy and magnitude of the problem. The Senate Committee on Ways and Means, in particular, challenged the conclusions of the BHEP report, noting that the higher education system serves more than recent high school graduates and that changes in state policy on "time-to-degree" should serve to mitigate some of the impact on college and university workload that might be created by increased numbers of high school graduates.

To assist it in better understanding the likely levels of future higher education enrollments, the Legislature included proviso language in the 1996-97 General Appropriations Act which directs PEPC to develop an enrollment projection model for Florida higher education. The complete text of that proviso is included in Exhibit 1-3.

EXHIBIT 1-3
PROVISO LANGUAGE DIRECTING DEVELOPMENT OF HIGHER EDUCATION ENROLLMENT PROJECTION MODEL

> In cooperation with the Board of Regents and the State Board of Community Colleges, the Postsecondary Education Planning Commission shall develop an enrollment projection model that will take into account recent high school graduates as well as flow through from community college and other transfers, and returning adults. A progress report, including project milestones and implementation dates, shall be submitted to the Legislature and the State Board of Education by December 2, 1996.

1.4 Overview of Report

This report, which serves as the progress report that is due on December 2, 1996, represents the first step in the Commission's response to the proviso language. In this report, we:

- discuss important concepts in enrollment analysis (chapter 2),
- consider how enrollment information is used to support state-level decision-making (chapter 3),
- present an enrollment profile by of Florida public higher education by sector (chapter 4),
- describe issues to consider in the design of a state-level enrollment projection model (chapter 5),
- summarize and assess current enrollment planning models used in Florida (chapter 6), and
- offer recommendations for next steps (chapter 7).

The report is scheduled for consideration and approval by the Commission at its December 12, 1996, meeting.

2.0 IMPORTANT CONCEPTS IN ENROLLMENT ANALYSIS

2.0 IMPORTANT CONCEPTS IN ENROLLMENT ANALYSIS

2.1 Introduction

Before beginning an assessment of enrollment analysis practices and the discussion of alternative projection methodologies, a review of several related topics should prove to be informative. In particular, we call attention to:

- different ways that are used to count students and the related terminology,
- an assortment of policy issues that must combine with demographic data in the analysis of enrollment outlook, and
- several broad conceptual alternatives in the design of analytic models.

Each of these topics is discussed below.

2.2 Alternative Methods of Enrollment Counting

When the general public hears reports about school enrollments, most probably visualize individual students who are attending classes. When they hear that enrollment is increasing, they likely assume that more students are enrolling. This concept of enrollment counting is known as "headcount enrollment." Stated simply, headcount enrollment is based on counting the number of heads in the classroom. Headcount students may be classified by their level (i.e., freshman, sophomore, junior, etc.), by their major field of study (e.g., psychology, engineering, etc.), course load (e.g., full- or part-time) and by their various demographic characteristics (e.g., race, gender, residency status, etc.).

A subset of headcount enrollment is the First-Time-in-College (FTIC) student. An FTIC student is one who not only is a new enrollee at the institution he or she is attending, but also one who has never attended another postsecondary institution.

Except in rare cases where an FTIC student is awarded a large number of college credits by examination, an FTIC student is a beginning freshman. Otherwise, FTIC students can also be counted by their major field of study, course load and demographic characteristics.

Most often, headcount enrollment is reported for a specific academic term, such as in Fall headcount enrollment. For some purposes, however, it is important to know how many different individuals enrolled during a particular period of time, such as an entire fiscal year. The concept of "Unduplicated Headcount Enrollment" responds to this requirement. Essentially, unduplicated headcount is the number of different individuals who enrolled at some point during the period in question. In some cases at the state level, the term unduplicated headcount also implies that an effort has been made to avoid double-counting those students who attended more than one institution during the period.

An equally important way of counting students, especially for those concerned with planning and budgeting, is based on the concept of a Full-Time-Equivalent (FTE) student. In planning and budgeting, the concern is often related to the amount of resources that will be required to serve the student. Recognizing that part-time students typically do not impose the same workload on an institution as their full-time counterparts (i.e., part-time students may take only one class at a time instead of four or five classes), the FTE concept attempts to equate the workloads of various students depending on student credit hours or other course load variables.

Thus, an FTE student is not a person at all, but rather a mathematical quotient that results from dividing the number of student credit hours by the presumed enrollment load of a full-time student. In Florida, 40 undergraduate or 32 graduate student credit hours are needed to yield one FTE student for funding purposes. Since

FTE students are not people, FTE enrollments can not be categorized by demographic characteristics or student level or major field of study. Instead, FTE enrollments are often categorized by the characteristics of the courses that produce the student credit hours, such as course level or course discipline.

2.3 *Interaction Among Enrollments and Policy Issues*

While demographic trends are critical variables to include in any enrollment projection model, various policy decisions also serve to proscribe the numbers of students who will enroll. That is, either state or institutional officials can exercise considerable control over enrollment levels based on the types of policy decisions they make about admissions criteria, program duplication, and pricing.

Some of the key policy areas that have the most significant impact on enrollment levels are:

- *Entrance Requirements* -- enrollment levels vary inversely with admissions standards (e.g., the lower the test score or high school grade point required, the more students who are eligible to enroll),
- *Time-to-Degree Regulations* -- enrollment levels can be expected to vary inversely with the strength of policies intended to shorten the time (and the number of credits) required to graduate,
- *Articulation Agreements* -- enrollment levels by sector can be affected by the ease with which students expect they will be able to transfer credits from one sector to another (e.g., from a community college to a state university),
- *FTIC Market Share Policy* -- enrollment levels by sector also can be affected by direct regulation, such as in current state policies in Florida that limit the number of FTIC students who can enroll in state universities,
- *Funding Policy* -- desired enrollment levels in Florida are established in the annual appropriations process, where economic conditions as well as demographic trends may influence the numbers of students to be enrolled,

- *Institutional and Program Access Policies* -- enrollment levels are influenced by the time and location of instructional programs, the availability of programs in demand, the pricing structure for tuition and fees, and the availability of student financial aid,

- *State Policy Toward Private Colleges* -- enrollment levels at independent colleges and universities are influenced by the existence of program contracts in high demand areas and by various targeted financial aid programs, such as tuition assistance grants, and finally

- *Non-Resident Student Policy* -- enrollment levels at virtually every public college or university in attractive states (such as Florida), or at institutions located near a state border, are affected by state policy on the enrollment of out-of-state students, either in the form of outright limits on the numbers who can be enrolled or through the rate levels for non-resident tuition.

A state's use of various enrollment-related policies often can be attributed to changes in the demographic situation in the state. More permissive policies can be found when or where enrollment demand is weak, and policies typically tighten when demographic trends are putting pressure on the system.

2.4 Analytic Methods

At least two different analytic concepts are useful in considering potential enrollment levels. The first, which we refer to as enrollment demand analysis, is related primarily to the consideration of demographic factors. It focuses on the number of students who might enroll in the future if no further policy restrictions are implemented or, in some cases, if policy barriers were removed.

The second concept, which we call enrollment projection modeling, is intended to take into account the impact of the various policy options described in the preceding section. Its focus is on determining the numbers of student who will actually enroll under different assumptions about policy decisions.

3.0 USE OF ENROLLMENT INFORMATION IN STATE-LEVEL DECISION-MAKING

3.0 USE OF ENROLLMENT INFORMATION IN STATE-LEVEL DECISION-MAKING

3.1 Introduction

The design of analytic models and the development of criteria for their assessment should take into account the purpose for which the resulting information is needed. In this section, we examine how enrollment information is used for policy analysis and decision-making at the state level in Florida. In particular, we consider the units of analysis, the timeframe(s) in question, and the level of needed aggregation of the enrollment data.

3.2 Operating Budget Request

Perhaps the most important annual use of enrollment information is in the development of the annual appropriation for operations. Enrollment levels are taken into account when the Governor and Legislature determine the level of state support needed by the State University System, the Division of Community Colleges and, to a lesser degree, the independent colleges and universities. Interestingly, the types of enrollment information considered for the three sectors differ from one another.

The appropriation to support the community colleges is based on prior year actual FTE enrollment by institution. In earlier years, projected rather than prior year actual information was used. Due to rapidly fluctuating enrollment levels -- both up and down -- a conversion was made to the prior year actual approach to provide greater budget stability.

The appropriation to support the state universities requires the determination of assigned FTE for the year covered by the budget. Assigned FTE enrollment is

determined by institution by level. The enrollment planning process involves negotiations among the staffs of the State University System, the DOE, the Governor and the Legislature. The assigned FTE enrollment, in essence, is a blend between projected FTE enrollment, based on negotiated planning assumptions regarding FTIC market share and other policies, and resource availability projections.

Finally, the appropriations for programs that involve the independent colleges and universities also take enrollment-related information into account. Assumptions about enrollment demand underlie decisions about contracted programs and Florida Resident Access Grants (FRAG).

3.3 Capital Outlay (Facilities) Budget Request

A second major funding-related use of enrollment information is in determining the needs for fixed capital outlay appropriations. Fixed capital outlay appropriations are used primarily to construct and renovate facilities on college and university campuses.

Unlike the requests for annual appropriations for operations, the enrollment information needed for the capital outlay budget process spans many years. This arises from the time required to plan, design and construct a new or improved facility. State budget planners need to be assured that future enrollment levels will continue to justify the need for the facility when it is completed and in years beyond.

The specific enrollment information needed for capital outlay planning and budgeting is in terms of FTE enrollments by institution, and for those institutions that operate from multiple sites, by location.

3.4 Access Policy Analyses

The appropriations process is not the only reason that enrollment information is needed at the state level. Another important use of enrollment data is in the analysis of various master planning decisions, particularly those involving desired levels of student access to educational programs.

Each of the major state-level agencies involved with higher education in the state (PEPC, the Board of Regents, and the State Board of Community Colleges) is responsible for developing plans for meeting the educational needs of Florida's citizens. Plans might include the establishment of new degree programs, new centers, new campuses, or even new institutions. Plans also might encompass the development of new delivery systems (such as distance learning) or special financial arrangements (such as contracts with private colleges to provide a certain number of slots for Florida residents in high demand program areas).

In fulfilling their respective responsibilities, these agencies need information about the population of potential students, including the number in various age categories, their race/ethnic and gender characteristics, their educational attainment levels, and their county of residence. The agencies also need data describing students who are actually enrolled. With information about both the target population and the students currently enrolled, performance indicators can be developed to assess progress toward meeting state goals and objectives.

4.0 ENROLLMENT PROFILE OF FLORIDA HIGHER EDUCATION

4.0 ENROLLMENT PROFILE OF FLORIDA HIGHER EDUCATION

4.1 Introduction

As a basis for analyzing potential enrollment demand and for designing an enrollment projection model, we need to develop a better understanding of the current makeup of the student body in Florida higher education. In this chapter, we analyze enrollment by:

- age,
- race and ethnicity,
- student level, and
- program type (for community college students only).

We close by inspecting the sources of new students for the state universities and community colleges.

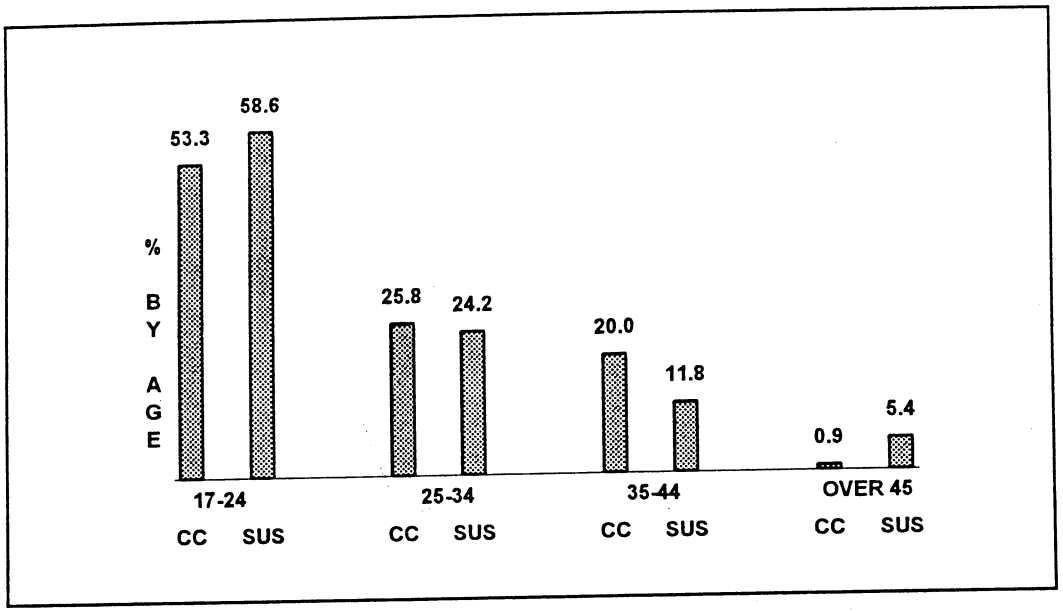
4.2 Analysis of Enrollment By Age

Due to the concern about the impact of the projected increase in new high school graduates on college enrollments, our first analysis concerns the distribution of students by age. If the colleges and universities are already heavily reliant on younger students, a sharp increase in this population would be felt immediately by higher education.

Exhibit 4-1 compares credit enrollments by age category for the community colleges and state universities (note: SUS data include both undergraduate and graduate students). In both sectors, just over half of students in Fall 1994 were in the 17-24 year old age bracket. Interestingly, the universities reported a slightly higher proportion of their students (nearly 59 percent) in this category than did the colleges

(53 percent). The two sectors have similar proportions in the 25-34 year old category. In the two oldest age brackets (35-44 and 45 and over years of age), the colleges had the larger proportion of 35-44 year olds while the universities reported more than 5 percent in the 45 and over group compared to less than 1 percent for the colleges.

EXHIBIT 4-1
ANALYSIS OF CREDIT ENROLLMENT BY AGE



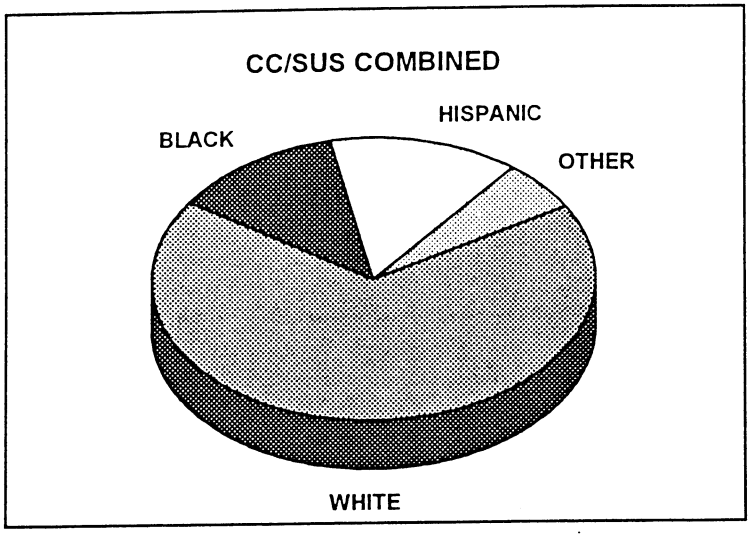
4.3 Analysis of Enrollment By Race / Ethnicity

Much of the projected increase in high school graduates will come from members of minority populations. This makes an understanding of the college attendance patterns of these populations critical in forecasting future enrollments in higher education.

As shown in Exhibit 4-2, the distribution of credit enrollments by race or ethnicity is relatively similar between the state universities and community colleges. Slightly over two-thirds of all students consider themselves to be white, about 12-13 percent report they are black, and a slightly larger proportion (12-14 percent) are Hispanic. Only in the

"other" category (to include Asians and Native Americans) do the two sectors differ, with the universities reporting a higher proportion of their students coming from this group.

EXHIBIT 4-2
ANALYSIS OF CREDIT ENROLLMENT BY RACE/ETHNICITY



DISTRIBUTION BY RACE/ETHNICITY

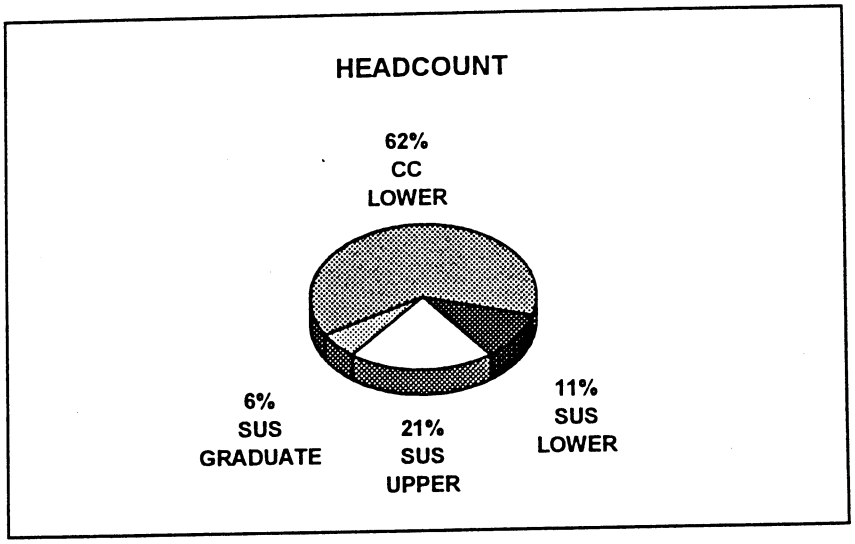
GROUP	CC	SUS	COMBINED	HS GRAD
WHITE	67.5	68.0	67.7	61.2
BLACK	13.0	12.0	12.6	21.8
HISPANIC	14.6	12.4	13.8	14.3
OTHER	4.9	7.6	5.9	2.7
TOTAL	100.0	100.0	100.0	100.0

Importantly, Exhibit 4-2 also provides information that enables an analysis of the relative likelihood that members of the various race/ethnic groupings are to enroll in a college or university. White and Other students are relatively over-represented in higher education compared to their share of high school graduates (68 percent versus 61 percent for white students and 6 percent versus 3 percent for other students). Blacks, on the other hand, only comprise about 13 percent of collegiate enrollments compared to having 22 percent of high school graduates. Hispanics show near equal representation among college students and high school graduates.

4.4 Analysis of Enrollment By Student Level

The vast majority of all students in Florida public higher education are classified at either the freshman or sophomore level. The patterns differ between the two sectors, of course, with all community college headcount enrollments (by definition) at the lower division but only 29 percent of SUS students at this level. The distributions of both headcount students by student level and FTE students by course level are illustrated in Exhibit 4-3.

EXHIBIT 4-3
ANALYSIS OF CREDIT ENROLLMENT BY STUDENT LEVEL



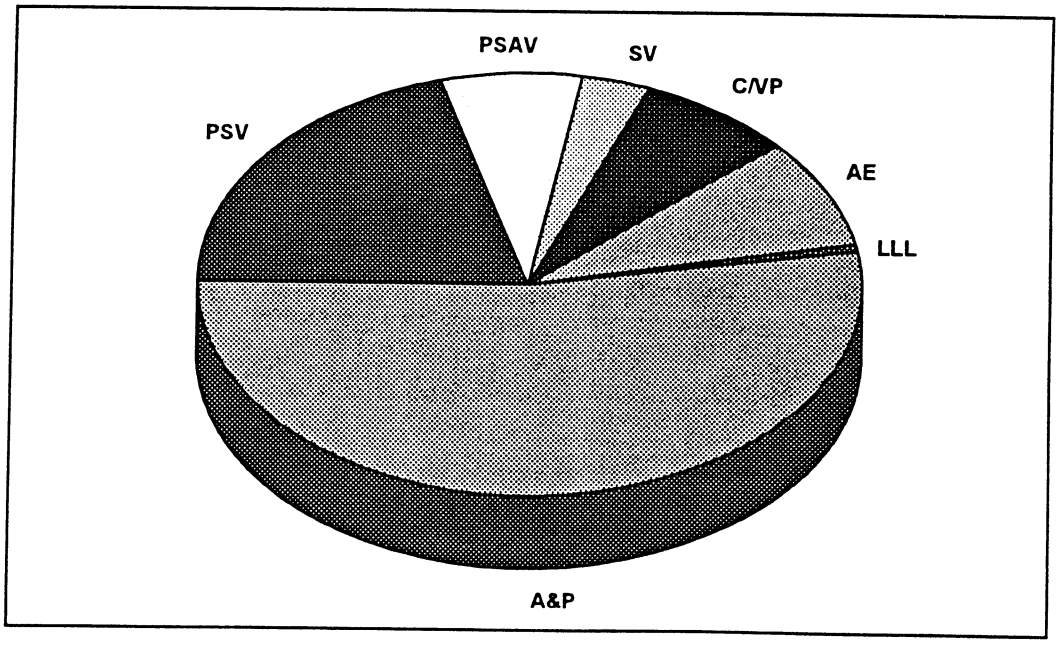
LEVEL	HEADCOUNT		FTE		HEADCOUNT PER FTE	
	CC	SUS	CC	SUS	CC	SUS
LOWER	321,566	54,764	195,603	32,913	1.64	1.66
UPPER		106,248		66,181		1.61
GRADUATE		29,956		19,260		1.56
TOTAL	321,566	190,968	195,603	118,354	1.64	1.61

The exhibit also analyzes the number of headcount students required to yield an FTE student for each of the two sectors. In both cases, about five headcount students are needed for every three FTE students.

4.5 Analysis of Community College Enrollment By Program

In our conversations with SUS officials, we learned of their concerns that community college transfer students with AA degrees have been diminishing as a source for students in recent years. To assess the current situation, we analyzed community college headcount enrollment by program of study. As seen in Exhibit 4-4, slightly over one-half of the current community college students are pursuing an advanced and professional (A&P) program of study. The remainder are distributed across six other types of programs, with the largest other single group, postsecondary vocational, accounting for over 20 percent. (It should be noted that only a portion of the A&P enrollments are pursuing the associate of arts degree, which is the principal major for college transfer students.)

EXHIBIT 4-4
ANALYSIS OF COMMUNITY COLLEGE ENROLLMENT BY PROGRAM



4.6 Sources of New Students

To further place into context the potential impact of increasing numbers of current high school graduates, we examined the sources of new students in the two public sectors. For the community colleges in Fall 1994, just over one-fourth (27 percent) of their new enrollments were FTIC students. The remaining 73 percent had attended some other institution (including state universities, Florida private colleges, out-of-state institutions, and other community colleges) before enrolling in their current community college.

A significantly different picture was found for new students in the SUS for that same semester. Nearly half (45 percent) of all new students were FTICs. Thirty-seven percent were community college transfers, and the remaining 18 percent came from other sources.

When FTIC students were compared to total enrollments in the two sectors, we find that 11% of all community college students in Fall 1994 were FTICs while this group accounted for 8% of all state university students. That is, only about ten percent of all students are recent high school graduates, so a 10 percent increase in high school graduates in a single year would likely yield only a 1 percent increase in total higher education enrollment during the next year.

5.0 CONSIDERATIONS IN THE DESIGN OF A STATE-LEVEL ENROLLMENT PROJECTION MODEL

5.0 CONSIDERATIONS IN THE DESIGN OF A STATE-LEVEL ENROLLMENT PROJECTION MODEL

5.1 Overview

The basic concept in most enrollment projection models is to create a relationship between known quantities in the external environment, such as the population of a certain age that is believed to provide the source of students, and future enrollment levels. The models take the general form of:

Population in Target Age Groups	X	College Participation Rate	=	Projected Enrollment Level

The major tasks in the development of a model then are to specify what types of enrollment information is needed, identify sources of information about the target population, and then establish the statistical relationships between the two.

5.2 Specification of Variable(s) to be Projected

In the development of an enrollment projection model at the state level, a number of initial design questions must be addressed. The responses to these questions dictate the types of information needed and the statistical relationships to be tested.

The ultimate goal of most enrollment models is to determine the FTE (rather than headcount) enrollment to be served. In many cases, the goal is to estimate the FTE enrollment in various subsets, such as graduate enrollment, engineering enrollment, etc. The first step in the design of an enrollment projection model is to develop a clear understanding of the level of detail at which the projections are needed. A model that needs only to forecast the number of headcount students in total for the entire state will

be considerably less complex than one whose purpose is to identify the likely FTE enrollments by program, by level, and by institution.

As noted earlier, an FTE student is not an actual person but rather is a concept based on dividing student credit hours by a defined full-time load factor. The data used to make projections, however, is usually counts of people in various categories. Thus, at some point in the projection model, a conversion of people to credit hours is needed. The basic choice is whether to rely on a one-step approach where a relationship between a known external population and student credit hours can be established, or whether to lay out several steps such as where the external population yields headcount students who then convert into FTE enrollment. The multi-step approach permits isolation of more policy alternatives (e.g., changes in the college participation rate).

A third issue, when the purpose is to develop a detailed set of projections, concerns whether to first estimate the total enrollment and then allocate that total into the various detailed categories, or whether the projection model should be designed as an aggregation of a series of individual projections (e.g., add together separate projections of freshmen, sophomores, etc.). Generally speaking, models which sum individual projections are more likely to overstate the total future enrollment.

5.3 Selection of Predictor Variables

The next major step in the process is to determine which variables should be used to predict future enrollment levels. Common predictor variables for higher education enrollment models include recent high school graduates, population in certain age groups, population in a particular geographic area, and current college and

university enrollments. A number of different issues must be taken into account in determining which variables to select.

An important consideration is the strength of the historic statistical relationship between the potential variables and enrollment levels. Eventhough recent high school graduates are commonly believed to be the source of new college enrollments, recent graduates might not be as accurate a predictor as the 18-21 year-old population. To determine which to use, statistical analysis (usually some type of correlation analysis) is needed. The variable which tends to track changes in enrollment best over time becomes the preferred choice.

Another concern in the selection of predictor variables is the issue of face validity. For an enrollment model to enjoy credibility, observers must believe instinctively that a strong relationship should exist between the predictor variable and enrollment. Even if historically there is a stronger statistical relationship between college enrollment and dog licenses than there is between enrollment and high school graduates, high school gradates would likely be the preferred choice.

A practical consideration is the availability of projected data for the predictor variable for future years. If the proposed predictor variable is high school graduates, for instance, then the enrollment forecaster would need to be assured that he or she had access to projections of future high school graduation levels in order to project college enrollments. Even though the strength of the economy is often thought to have impact on community college enrollments, the difficulties in economic forecasting make future economic conditions a less desirable predictor variable for use in an enrollment model.

A final issue relates to the quality of the data for the predictor variable. If problems exist in reporting values for the predictor variable in a consistent manner from

year to year, then the validity of the past statistical relationship comes into question. For instance, the use of the local young adult population as a predictor variable might be problematic in an area with a significant level of migrant population that is known to be difficult to count accurately.

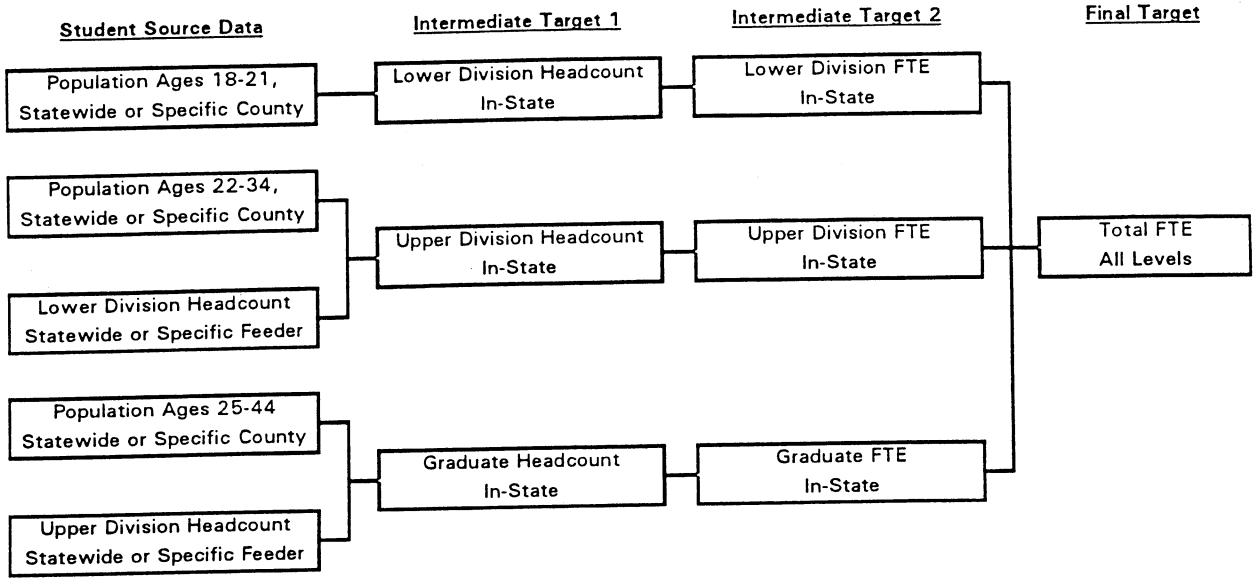
5.4 Flexibility to Reflect Policy Change

Since one of the common uses of a state-level enrollment model is to assess the potential impact of policy changes, the design of the model needs to permit the analyst to manipulate the policy variables whenever possible. A number of related policy questions have been debated in Florida in recent years, such as FTIC market share for the state universities, time-to-degree limits, etc. Using the time-to-degree issue as an example, an enrollment model that would permit adjusting the ratio of headcount students per FTE would be more useful in projecting the impact of that policy change than one that derives FTE directly from target age population.

5.5 Description of Typical Enrollment Projection Models

The typical state-level enrollment model achieves a reasonable balance among all of the design alternatives discussed above. Most often, the goal is to project FTE enrollment by level. This might be done by first projecting headcount enrollment by level using several different predictor variables for each level. The design of a model recently considered for state-level use in a rapidly growing western state is illustrated in Exhibit 5-1.

EXHIBIT 5-1
TYPICAL DESIGN OF ENROLLMENT MODEL



6.0 SUMMARY OF CURRENT MODELS USED IN FLORIDA

6.0 SUMMARY OF CURRENT MODELS USED IN FLORIDA

6.1 Community Colleges

In their presentation to the Program/Planning Committee, officials of the State Board of Community Colleges (SBCC) described their current approach to enrollment projections. The SBCC "official" model projects total FTE enrollment for each of the 28 colleges based on the total population in the college's service area. Different projections are prepared for budget and capital outlay purposes. The differences in the two projections relate to state policy on which students are eligible for state support. For example, the enrollment projection used for the budget excludes non-fee paying inmates, fee waivers and similar situations.

The "official" SBCC model relies on official actual and projected population data obtained from other agencies of state government. The model uses 3-6 years of historic data to project 6-10 years ahead. The total projected enrollment for each college is then allocated by program area based on current proportions.

The individual colleges are asked to review and approve the projections prepared by SBCC staff. As an alternative, the colleges are provided an opportunity to recommend the results of any locally developed model as a substitute for the results of the "official" state model. About half of the colleges choose this alternative, which also requires a statement of rationale explaining why the local model is expected to be more sensitive to changes in local conditions than the state model.

6.2 State Universities

SUS officials report that the BOR does not have an "officially approved" enrollment projection model. The absence of an "official" model is related to their

philosophy that future enrollment levels are limited by annual funding decisions rather than bring the direct result of demographic factors.

The lack of an "official" projection model does not imply that the state universities are not concerned with enrollment planning. As a matter of fact, the SUS has conducted numerous projections of potential enrollment demand. The important distinction is that enrollment demand is different than projected enrollment with the difference relating to whether the state is willing to commit the appropriate resources to serve the potential students.

In their presentation to the Program/Planning Committee, SUS officials shared the results of their recent enrollment demand analyses. Their models use various combinations of the following predictor variables:

- high school graduates,
- community college graduates,
- population,
- SUS headcount enrollment
- SUS FTE enrollment,
- other transfers, and
- retention rate information.

6.3 *Independent Colleges and Universities*

No formal mechanism currently exists to develop a consolidated enrollment projection for the state's independent colleges and universities. Instead, each college addresses enrollment planning issues according to its own needs.

Officials of the Independent Colleges and Universities of Florida (ICUF) have expressed interest, however, in being involved in a state-level approach to enrollment

planning. They believe most of their members would be willing to adjust the current mix between in-state and out-of-state students under a state policy that encouraged greater use of private college resources in serving Florida citizens. They further cited the results from a survey several years ago that identified potential spaces for up to 5,000 additional Florida residents in the independent colleges.

6.4 Assessment

One of the objectives for the current assignment was to determine whether any one or some combination of the existing enrollment projection models used by the several sectors might serve as the basis for the PEPC-sponsored enrollment projection model required by the proviso language. Even though each of the current approaches has its unique strengths in responding to the particular needs of the respective sector, we do not find any of the current approaches to be adequate to respond to legislative intent for a PEPC model.

The "official" model used by the SBCC, of course, is designed only for the types of students served by the community college system. The fact that about half the colleges substitute locally developed projections for the state estimates further speaks to its limitations for broader application. In recent years, the SUS has not even claimed to have an "official" model. Finally, the independent colleges and universities have no single model or mechanism in place which can be considered as a candidate for statewide application.

We believe that the Commission will need to undertake the development of its own enrollment projection model to respond effectively to the requirements of the proviso language. Representatives of the several sectors have expressed support of this approach and have indicated a desire to be involved in the developmental effort.

7.0 RECOMMENDATIONS

7.0 RECOMMENDATIONS

7.1 Overall Recommendation

Based on our interpretation of the legislative proviso, our understanding of the current requirements for credible enrollment projection information at the state level, and our assessment of the capacity of current models to respond to those needs, we recommend that the Commission proceed with the development of an:

> . . . enrollment projection model that will take into account recent high school graduates as well as flow through from community colleges and other transfers, and returning adults . . .

Once developed, we believe that the continuing refinement and maintenance of the model should become an ongoing responsibility of the Commission.

7.2 Specific Recommendations

In support of the general recommendation above, we further offer seven specific recommendations as follows:

1. Authorize the Executive Director to convene an Enrollment Model Advisory Committee to be comprised of individuals representing the state universities, the community colleges, and the independent colleges and universities as well as staff from the legislature and the Commissioner's and Governor's offices.

2. Ask the Enrollment Model Advisory Committee to identify all known requirements for enrollment projection information at the state level, describing to the extent possible the exact level of specificity and the timeframe for which the information is needed.

3. Develop a general framework for the enrollment projection model which outlines potential predictor variables, intermediate levels of reporting, and final targets.

4. Compile data as necessary to establish the strength of statistical relationships between the potential predictor variables and past enrollment levels.

5. Refine the general framework as necessary and confirm the final design of the model.

6. Prepare an "official" enrollment projection for Florida higher education using the new model.

7. Use the "official" enrollment projection as an integral part of the master plan update.

7.3 Proposed Implementation Milestones and Schedule

The enrollment model should require approximately six months to design, test and fully develop. We suggest the following schedule and milestones:

January, 1997	Convene initial meeting of Enrollment Model Advisory Committee
January, 1997	Identify all known requirements for enrollment projection information at the state level
January, 1997	Develop a general framework for the enrollment projection model
February, 1997	Compile data to select predictor variables
March, 1997	Confirm the final design of the model
April, 1997	Prepare an "official" enrollment projection for Florida higher education

EXTERNAL EVALUATION REPORT OF THE PEPC ENROLLMENT PROJECTION MODEL

1.0 Introduction

The purpose of this brief report is to provide the Commission with an external assessment of recent staff efforts toward the development of a comprehensive enrollment planning model. The Commission intends to use the staff enrollment projections to guide its master planning activities and to respond to a legislative proviso that directed it to develop an enrollment projection model.

In preparing this report, we have reviewed materials provided by the Commission staff and have participated in separate meetings where staff shared preliminary versions of the model and its results with representatives of the state universities, the community colleges and the independent colleges. We have not attempted to replicate any of the detailed calculations, but we have reviewed the results for reasonableness.

In the remainder of this report, we provide a brief background, describe a set of evaluation criteria, review the staff approach, assess their efforts to date, and offer conclusions and recommendations.

2.0 Background

During the past few years, a growing debate has evolved about the capacity of the state's postsecondary education system to respond to the likely growth in the number of college applicants that is expected to come with the projected increase in high school graduates. Florida Department of Education projections suggest that the number of high school graduates should increase by more than 56 percent in the coming 12 years. Higher education officials have been monitoring the growth in public school enrollments with increasing concern. Already strapped in responding to strong enrollment growth due to increases in the college participation rates of young adults, the colleges and universities are ill-prepared to handle the additional growth that many expect will come with the increase in the size of the age cohort.

Such concerns about the ability of the state's colleges and universities to respond effectively to the projected growth surfaced publicly last year in the report of the Business - Higher Education Partnership, a group created by The Florida Council of 100, the State University System, the Community College System, and the Independent Colleges and Universities of Florida. After considering an earlier version of the DOE projections of high school graduates, the BHEP report (entitled The Emerging Catastrophe -- And How to Prevent It) cautioned that:

> . . . the higher education system will have 75,000 more qualified students seeking to be served by the latter half of the next decade. Alternative ways of calculating the added enrollment put it at a more conservative 50,000 to 60,000. Either way it is a surge. And if (as one

> might expect and hope) more high-school graduates come out well-prepared for advanced work and a higher proportion seek advanced training to enhance their career prospects, the pressure on the system will be that much greater.

The report of the Business - Higher Education Partnership received considerable media attention around the state, including editorials calling for legislative action.

Although it acknowledged that the state's higher education system would be growing, the Legislature expressed reservations about the immediacy and magnitude of the problem. In particular, they challenged the conclusions of the BHEP report, noting that the higher education system serves more than recent high school graduates and that changes in state policy on "time-to-degree" should serve to mitigate some of the impact on college and university workload that might be created by increased numbers of high school graduates.

To assist it in better understanding the likely levels of future higher education enrollments, the Legislature included proviso language in the 1996-97 General Appropriations Act which directs PEPC to develop an enrollment projection model for Florida higher education. The complete text of that proviso states:

> In cooperation with the Board of Regents and the State Board of Community Colleges, the Postsecondary Education Planning Commission shall develop an enrollment projection model that will take into account recent high school graduates as well as flow through from community college and other transfers, and returning adults. A progress report, including project milestones and implementation dates, shall be submitted to the Legislature and the State Board of Education by December 2, 1996.

As an initial step in responding to the proviso, the Commission engaged the services of an external consultant to review the existing enrollment projection models being used by the several sectors and, as necessary, to develop a general strategy for undertaking a more comprehensive enrollment planning effort. At its December meeting, the Commission heard from its consultant, approved a status report, and forwarded that report to the Legislature and the State Board of Education.

The consultant's report concluded with seven recommendations for the next steps the Commission should take in its consideration of the enrollment issue. In general, these recommendations called for the Commission staff to lead a collaborative effort with the sectors to develop a comprehensive enrollment projection model that would serve as the "official" enrollment projections for Florida higher education. Further, the consultant recommended that the Commission use these projections as the basis for analyzing growth issues and strategies in the upcoming revisions to the master plan.

3.0 Evaluation Criteria for Enrollment Models

The phase 1 report included a discussion of various considerations in the design of an enrollment projection model. From this discussion, six criteria for assessing current or proposed models can be inferred:

- face validity
- statistical significance
- data quality and availability
- statewide focus
- policy orientation, and
- level of specificity.

Each of these topics is summarized below.

Face Validity. The issue of face validity concerns whether the predictor variables enjoy credibility with interested parties. For instance, since recent high school graduates are generally believed to become a primary source of new college students, the use of this measure as a predictor variable appears to make sense. Other potential variables, such as the number of deaths, would fall short in this regard.

Statistical Significance. Once a number of potential predictor variables are identified, the historic strength of the statistical relationship between each of them and past enrollment levels should be ascertained. Only those variables that have demonstrated a high level of predictive value over time should be adopted.

Data Quality and Availability. A matter of great practical concern is whether reliable, consistently defined data for the predictor variables is available over time. Of critical importance is the availability of information for the predictor variable for the same timeframe for which enrollments are to be projected.

Statewide Focus. When developing a projection model that is intended to produce information aggregated to the state level, a choice exists over whether to develop a single model for the state as a whole, or whether to develop separate models for each sector or institution and then aggregate. Generally speaking, the single model approach avoids the risk of double-counting potential students through uncoordinated decisions about future market share.

Policy Orientation. In many ways, the enrollment issue before the Commission and other state leaders is one of enrollment planning more than one of enrollment projection. The ideal enrollment projection model should permit the analyst to simulate the impact on future enrollments of potential changes in state policies, such as shortened time to degree requirements, creation of new institutions, etc.

Level of Specificity. The final concern is whether the model is capable of producing enrollment projections at the desired level of specificity. For state-level decision-making in Florida, information about both headcount and full-time-equivalent (FTE) enrollment by level is needed.

These criteria will be considered in our assessment of staff efforts to date toward developing the PEPC enrollment projection model.

4.0 Summary Description of Staff Approach

The staff paper that summarizes their enrollment planning efforts to date describes five different projection methods that were considered:

- rule of thumb (which in this case assumes a linear relationship with high school graduates),
- average annual increase,
- cohort survival,
- sector regression analysis, and
- state regression analysis.

The paper also describes the collaborative approach where information about preliminary approaches and results were shared with sector representatives for critique before refined information was presented to the Commission.

The staff paper develops a composite projection for the year 2010 that draws on 19 separate results based on four of the five methods (the cohort survival model was dropped due to data shortcomings). In essence, the staff approach calls for eliminating the two extreme observations (the highest and the lowest) and then adopting the simple average of the remaining 17 observations as the most likely or "medium" estimate. The staff method further yields "high" and "low" estimates by calculating one-half standard deviations above and below the average or medium estimate. This approach, using multiple observations and setting a range, closely parallels common practices for developing population projections.

The high, medium and low projections each suggest that a significant increase in enrollment can be expected by the year 2010. In particular, the projections show:

- low estimate -- 838,400, an increase of 209,005 or 24.9% over 1995 levels,
- medium estimate -- 888,141, an increase of 258,746 or 29.1%, and
- high estimate -- 937,882, and increase of 308,487 or 32.9%.

While any of these numbers are substantial, the reader is cautioned to recognize that this growth represents an average annual increase in the 2.0-2.5% range, a rate that seems manageable based on past experience in Florida.

5.0 Assessment

To assess the staff projections, we first considered the criteria outlined above in section 3 of this paper. With one or two exceptions, which can be addressed in further work, the staff model matches the criteria well. Based on the criteria:

- face validity -- the variables used in the nineteen models (high school graduates, population of traditional college age, total population, etc.) all seem reasonable to consider in forecasting college enrollments,
- statistical significance -- the r^2 statistic (a measure of correlation) is quite high across most of the 19 models,
- data quality and availability -- the models are based on projections (produced by the Bureau of Economic and Business Research and the Department of Education) that are widely accepted in state policy circles,
- statewide focus -- 13 of the 19 models are designed to yield an aggregate state-level projection,
- policy orientation -- 6 of the models (the average annual increase options) reflect the cumulative impact of past state policy decisions, but none readily permit simulation of future policy choices, and
- level of specificity -- the models yield headcount projections, but do not yet predict FTE enrollment.

The latter concern (related to FTE enrollment) will require further attention if the PEPC model is to be used to inform strategic decisions in the state master plan.

A second concern, noted by staff in their report, is that the current projection methodology does not encompass all postsecondary education in the state. Due to time and data constraints, the model does not yet consider the enrollment of postsecondary students in area vocational-technical centers. Staff is encouraged to carry through with their plan to extend the model during the coming year to include this population.

6.0 Conclusions

Our assessment indicates that the Commission has made substantial progress toward developing an "official" enrollment projection model that can be used in its own master plan and by others in addressing broad questions of educational access in the state. The method developed by staff is basically sound and reliable within the limitations noted by staff.

If anything, we believe that the current methodology may serve to understate future enrollment demand. Six of the nineteen methods that were consolidated for the

final projection (5 of the 17 after adjustment for statistical outliers) are based on the average annual increase method. As the staff paper notes, this method "does not take into account external factors, such as population, high school graduates, retention, etc." That is, this method does not even directly address the contention that the projected growth in high school graduates will lead to increased demand for college enrollment. Further examination reveals that these six observations are all below the "medium" or average projection. If these observations were excluded, the medium projection would increase by an additional 33,509 headcount students.

Despite this concern, the main message is clear. Florida's system of postsecondary education can be expected to face demands from several hundred thousand additional students between now and 2010. For most long-range, strategic decisions, minor adjustments to this projected number are likely to make little difference. If new campuses or programs are needed to serve some portion of a projected 250,000 increase in enrollment, they probably will still be needed to serve a 225,000 or a 275,000 increase. The bigger challenge now before the Commission is to develop a master plan for responding to significant growth rather than to entertain debate over relatively minor differences in projection methodologies.

7.0 Recommendations

During the next few months, we recommend that the Commission staff continue its efforts to refine its enrollment projection models and, especially, to work toward a technique for translating headcount enrollment growth into FTE growth. Further, we suggest that at least some attention be directed to the relative magnitude of postsecondary enrollments served by the area vocational-technical centers so their important role can be considered in the strategic plan.

Although the staff report suggests a possible distribution of enrollment growth across sectors based on certain assumptions, resolution of this issue must rely more on policy choices than statistical analysis. During the development of the master plan, we recommend that the Commission consider the feasibility of alternative distributions and work with the sectors to determine the most cost-effective means for allocating the projected enrollment growth.

PHASE THREE

FLORIDA POSTSECONDARY EDUCATION

PLANNING COMMISSION

ENROLLMENT PLANNING MODEL PRESENTATION

OCTOBER 16, 1997

MGT of America

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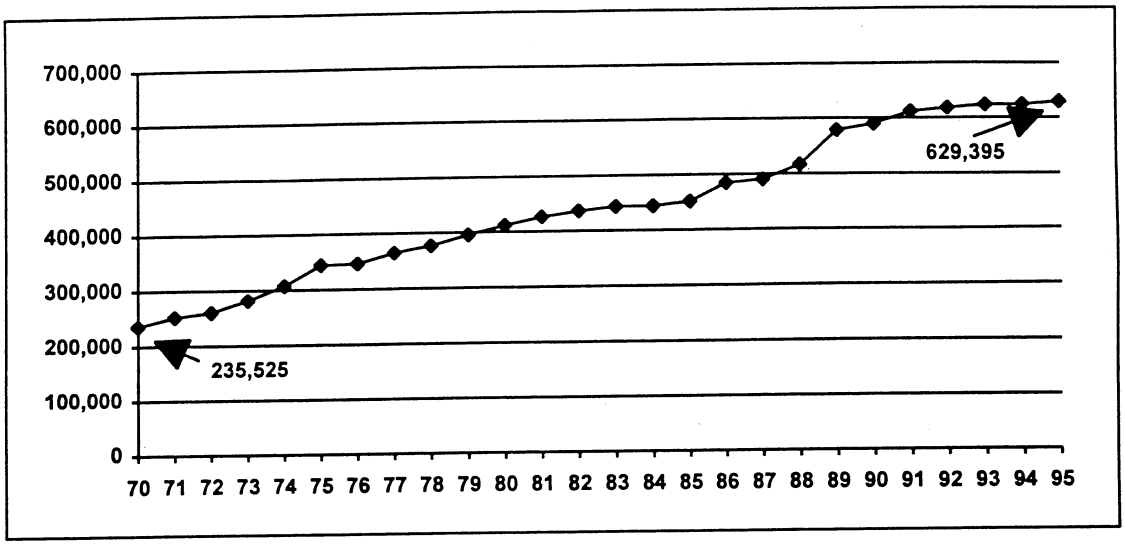
ISSUE BACKGROUND

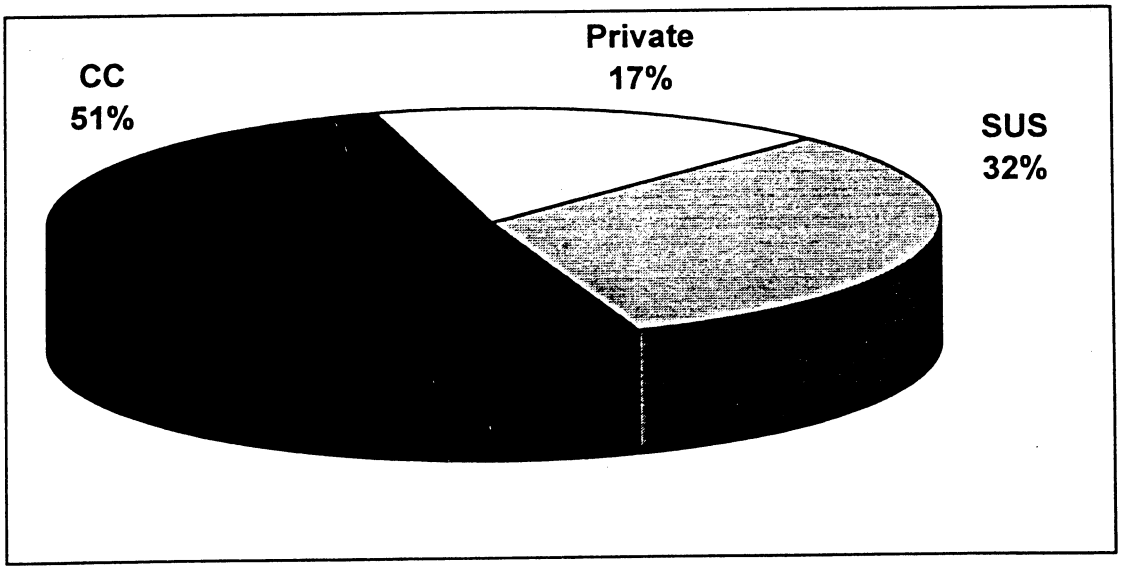
- Florida Enrollment Trend (Exhibit 1)

EXHIBIT 1
TREND IN STATEWIDE HEADCOUNT ENROLLMENT
FALL 1970 TO FALL 1995



- Current Enrollment Mix (Exhibit 2)

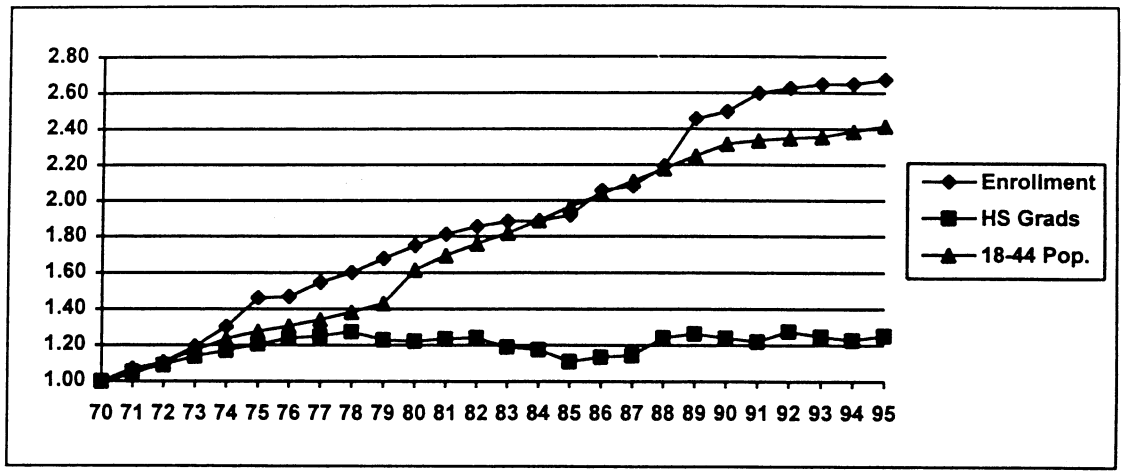
EXHIBIT 2
CURRENT DISTRIBUTION OF HEADCOUNT ENROLLMENT BY SECTOR



ISSUE BACKGROUND (continued)

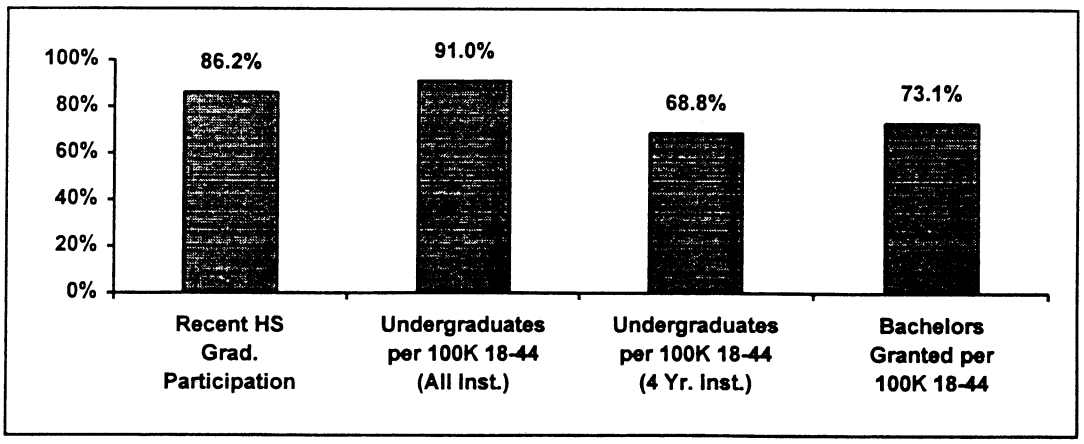
- Some Past Drivers of Enrollment Growth (Exhibit 3)
  - Population
  - High School Graduates

EXHIBIT 3
GROWTH IN STATEWIDE HEADCOUNT ENROLLMENT, HIGH SCHOOL GRADUATES AND 18-44 POPULATION: 1970 to 1995
(Indexed to 1970)



- Some Potential Factors Contributing to Florida's Relatively Low Level of Baccalaureate Production (Exhibit 4)

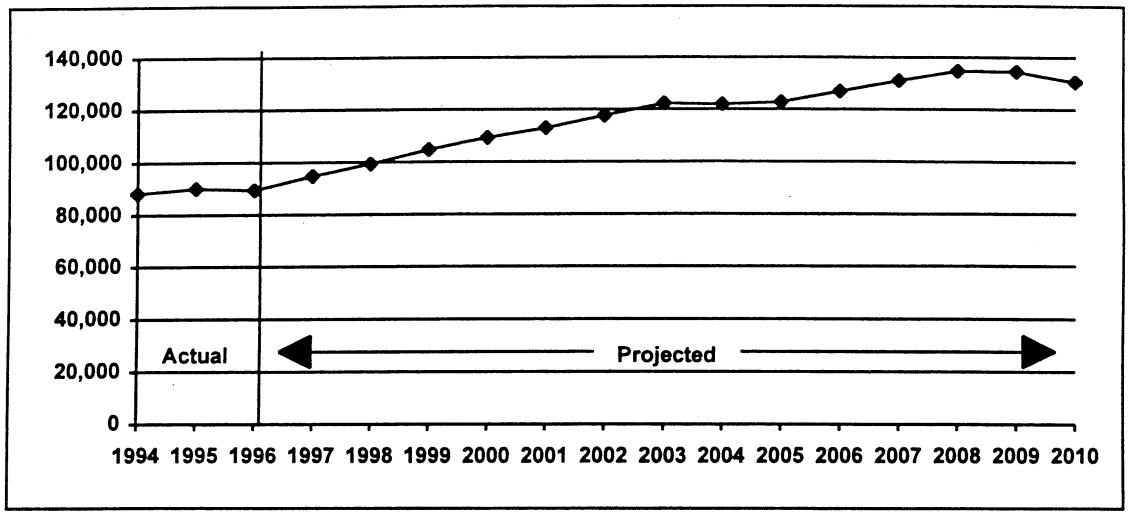
EXHIBIT 4
SELECTED MEASURES OF UNDERGRADUATE PARTICIPATION AND ATTAINMENT: FLORIDA AS A PERCENT OF THE NATIONAL AVERAGE



ISSUE BACKGROUND (continued)

- Recent DOE Projections of Florida Public High School Graduates (Exhibit 5)

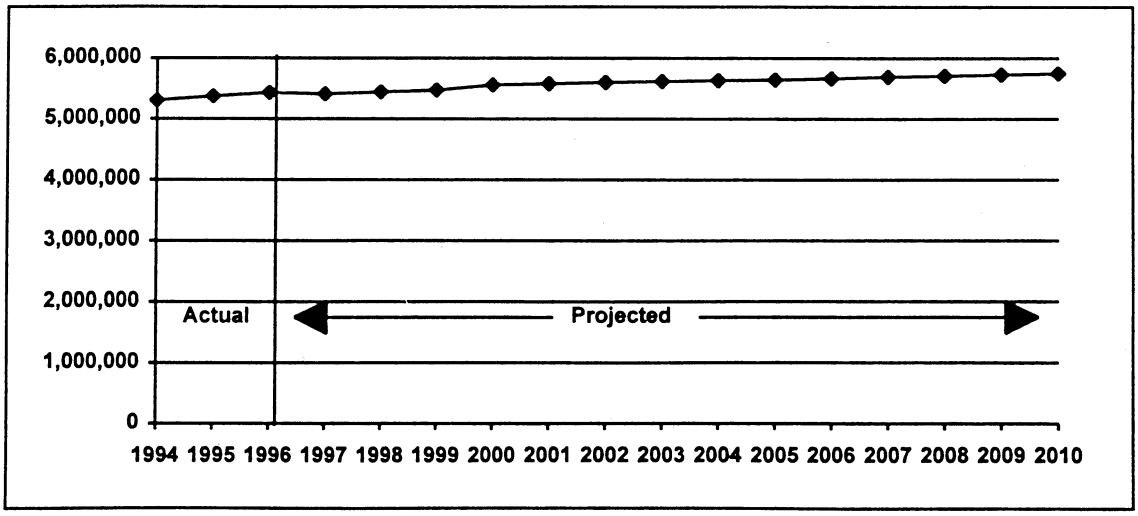
EXHIBIT 4
PROJECTIONS OF FLORIDA PUBLIC HIGH SCHOOL GRADUATES
1996 TO 2010



Source: Florida Department of Education, December 1996.

- Recent Projections of 18-44 Population in Florida (Exhibit 6)

EXHIBIT 6
PROJECTIONS OF FLORIDA RESIDENTS AGED 18-44
1996 TO 2010



Source: UF Bureau of Economic and Business Research, April 1997.

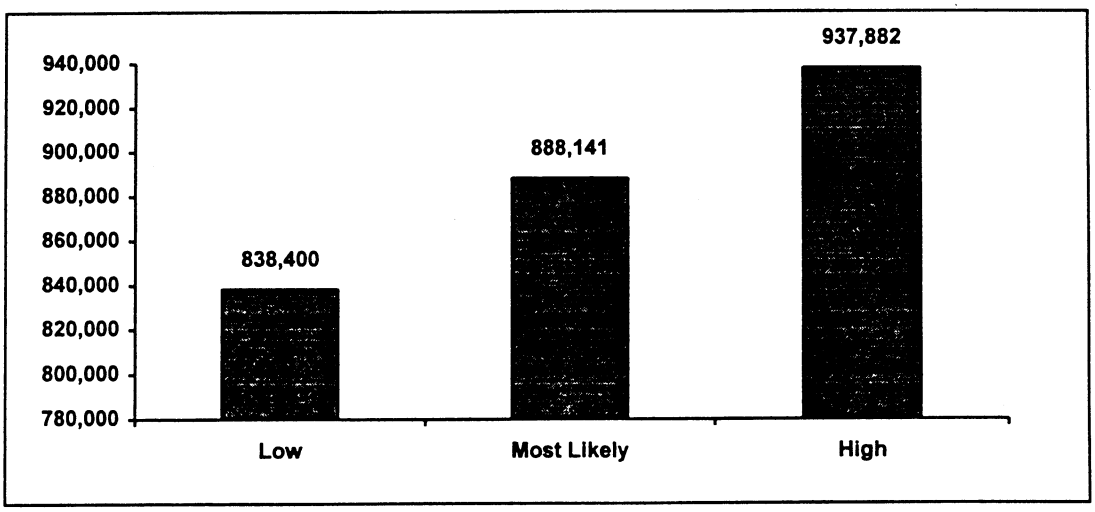
ISSUE BACKGROUND (continued)

- Business-Higher Education Partnership Report
  - Report by state business and education leaders cautioned that the failure to address the likely growth in enrollment demand would have a negative impact on both access and quality.
- 1996 Proviso Language
  - Directed PEPC to develop an enrollment projection model taking into account recent high school graduates, transfer students, and returning adults in cooperation with the Board of Regents and State Board of Community Colleges.
- Previous MGT Study
  - Phase One - Assessment of Current Enrollment Projection Practices
  - Phase Two - Evaluation of PEPC Enrollment Projection Model

PEPC ENROLLMENT MODEL

- Key Design Features
  - Five different methods explored:
    - ⇒ "Rule of Thumb"
    - ⇒ Average Annual Increase
    - ⇒ Cohort Survival
    - ⇒ Sector Regression Analysis
    - ⇒ Statewide Regression Analysis
  - Several scenarios tested under each method.
  - Average of all method and scenario combinations is the most likely estimate (Exhibit 7).

EXHIBIT 7
LOW, MOST LIKELY, AND HIGH PROJECTIONS OF HEADCOUNT ENROLLMENT IN 2010
PEPC STAFF ENROLLMENT MODEL

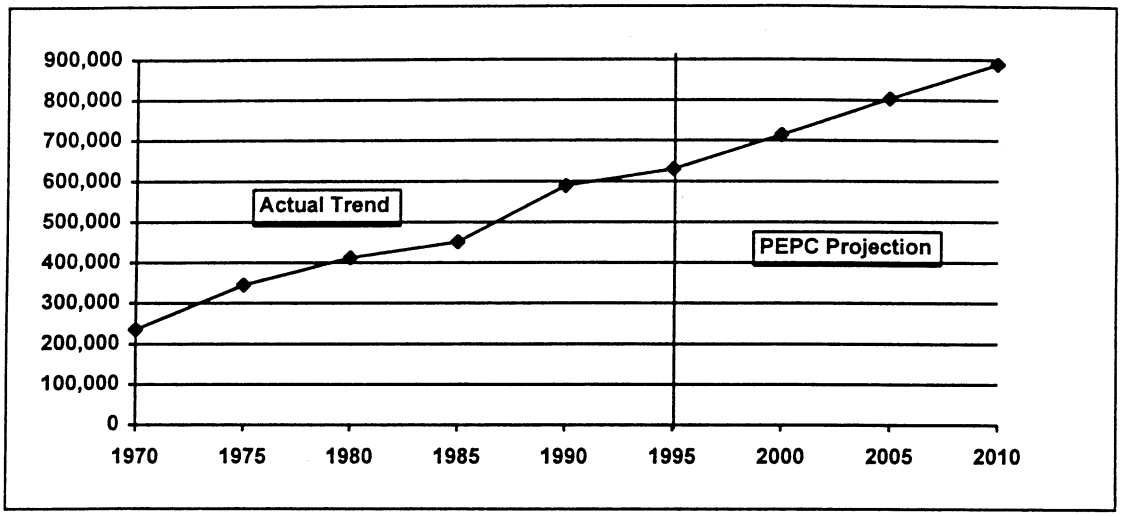


- Most Likely Estimate
  - Headcount enrollment in 2010 is projected to be 888,141 -- an increase of 258,746 over 1995 levels (+41%).

PEPC ENROLLMENT MODEL (continued)

- Comparison to Long-Term Trends (Exhibit 8)

EXHIBIT 8
COMPARISON OF AVERAGE HEADCOUNT ENROLLMENT PROJECTIONS TO LONG-TERM TRENDS



CURRENT MGT ASSIGNMENT

- Review and Reconstruct Staff Estimates
- Assess Alternatives for Responding to Growth

REVIEW OF STAFF ENROLLMENT PROJECTION

- MGT Approach
  - Verify PEPC staff work
  - Analyze additional relevant information
- Results of Audit
  - Base data verified
  - Obtained more recent population projections (April 1997)
  - Results of median outcome model were confirmed within 1.0 percent of the PEPC estimate using more recent population projections (Exhibit 9).
  - The best fit model from additional regression analyses using different subsets of years is also within 2.0 percent of the original PEPC estimate (Exhibit 9).
  - Growth in 18-44 population appears to be key driver of enrollment growth (see Exhibit 3)

EXHIBIT 9
SUMMARY OF THE RESULTS OF MEDIAN OUTCOME ENROLLMENT PROJECTION MODEL SCENARIOS IN 2010

Enrollment Projection Model	Projected Headcount	Difference From PEPC	Percent Difference
PEPC "Most Likely Estimate"	888,141	-	0.0%
MGT Update of PEPC Estimate	879,097	(9,044)	-1.0%
"Best Fit" of 16 Additional Analyses	871,528	(16,613)	-1.9%

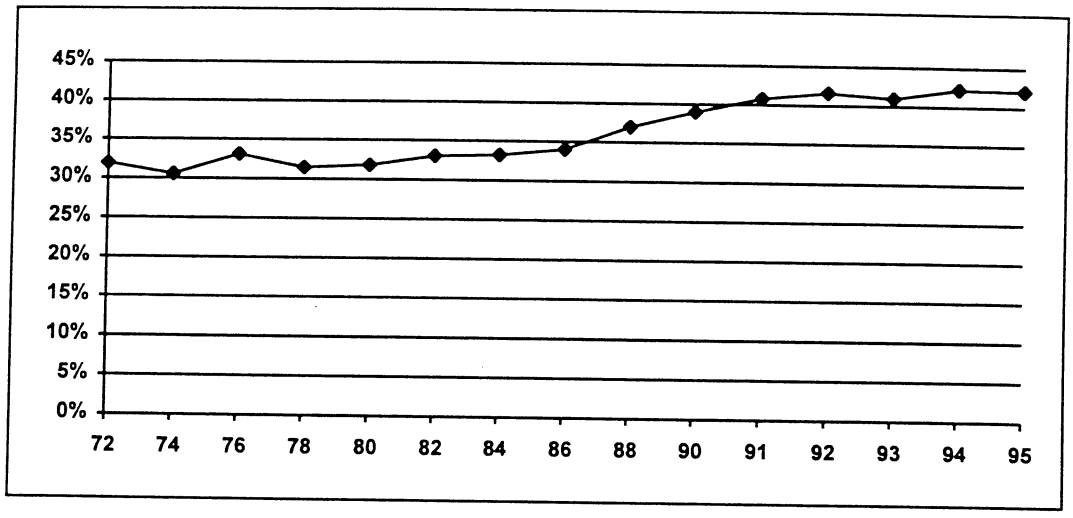
REVIEW OF STAFF ENROLLMENT PROJECTION (continued)

- Analysis of Additional Information

  - Florida Prepaid Tuition Program data indicate that 198,400 beneficiaries could seek enrollment in the SUS as FTIC's after 1997.

  - National data indicate a general upward trend in the college participation rate of high school graduates since the late 1970s (Exhibit 10)

EXHIBIT 10
PERCENTAGE OF HIGH SCHOOL GRADUATES AGED 18-24 ENROLLED IN COLLEGE: 1972 TO 1995



Source: National Center for Education Statistics, "Condition of Education 1997".

  - Midrange staff projection is in line with actual enrollment trend between 1970 and 1995 (see Exhibit 8).

- **MGT Conclusion: Midrange staff projection is reasonable and supportable.**

POSSIBLE STATE RESPONSES TO ENROLLMENT GROWTH

- Initial Listing of Possible Responses
  - Make the 10 state universities larger
  - Establish a "middle tier" state college system
  - Authorize selected baccalaureate degrees to be offered by individual community colleges
  - Increase the amount and use of university facilities on community college campuses
  - Increase the state subsidy provided to those persons wishing to attend private colleges and universities in Florida
  - Substantially increase the use of instructional technology and distance learning
  - Other alternatives (?)
- Proposed Criteria for Assessing Possible Responses
  - Capacity
  - Ability to Improve Baccalaureate Production Rate
  - Cost
  - Quality
  - Time to Implementation
  - Flexibility
  - Geographic Access
  - Other Criteria (?)
- Next Steps