Strategic Planning and Funding

60x30TX
Texas Higher Education Coordinating Board

AGENDA ITEM V-B
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Evaluation of the Space Projection Models

(In accordance with Rider 55, House Bill 1, General Appropriations Act, 84th Legislature, Regular Session)

May 2016

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Texas Higher Education Coordinating Board

Agency Mission

The Texas Higher Education Coordinating Board promotes access, affordability, quality, success, and cost efficiency in the state's institutions of higher education, through Closing the Gaps and its successor plan, resulting in a globally competent workforce that positions Texas as an international leader in an increasingly complex world economy.

Agency Vision

The THECB will be recognized as an international leader in developing and implementing innovative higher education policy to accomplish our mission.

Agency Philosophy

The THECB will promote access to and success in quality higher education across the state with the conviction that access and success without quality is mediocrity and that quality without access and success is unacceptable.

The Coordinating Board's core values are:

Accountability: We hold ourselves responsible for our actions and welcome every opportunity to educate stakeholders about our policies, decisions, and aspirations.

Efficiency: We accomplish our work using resources in the most effective manner.
Collaboration: We develop partnerships that result in student success and a highly qualified, globally competent workforce.

Excellence: We strive for preeminence in all our endeavors.

When citing this report, please cite as follows: Texas Higher Education Coordinating Board. (2016). Study of the space projection model in response to Rider 55. Austin, TX.

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Executive Summary

The Texas Higher Education Coordinating Board (THECB) was tasked by House Bill 1 (General Appropriations Act, 84th Legislature, Regular Session) to conduct a study of the space projection models for public general academic institutions (GAIs) and health-related institutions (HRIs) and to recommend changes to increase the accuracy of how the models predict square footage for these institutions. THECB staff conducted an in-depth analysis of relevant data, using as a reference point the actual performance of the institutions in their existing facilities. Using actual data to inform the study was logical. Care must be taken, however, to ensure predictions provide an appropriate buffer to allow for future growth since enrollments can increase from year to year, but the capital development process takes much longer.

In conducting the study, agency staff consulted with participating institutional stakeholders and carefully considered their input. Additionally, staff considered the written input of the 2011 General Academic Institutions Formula Advisory Committee (GAIFAC), which was charged with reviewing the models. The potential fiscal impact of proposed model adjustments was a key concern in the current stakeholder discussions, as well as during the GAIFAC considerations in 2011.

The current space models predict 25 million more square feet for the health-related and general academic institutions than their current actual space reported in fall 2015. In fall 2015, the GAI model predicted 38 percent more square feet than actually in use, and the HRI model predicted 45 percent more square feet than actually in use. These modifications, which are summarized on page 22 in appendix A, would reduce the space deficit from 25 million to 10 million square feet, or from 40 percent to 16 percent. The number of institutions with a space deficit would decrease from 47 to 38. Statewide, general academic institutions would have a remaining deficit of 6,089,403 (13 percent) and health-related institutions would have a remaining deficit of 3,767,566, or 26 percent.

In considering the recommendations in this report, it is important to draw a clear distinction between improving the accuracy and validity of the space model and impacting the infrastructure formula funding that institutions receive. The recommendations put forward in this study are not funding recommendations. Rather, this study is an attempt to account for how institutions' use of and need for space has changed since the current model was created in 1992.

While the recommended model predicts a lower statewide square footage total than the current model, this does not mean that formula funding should be reduced. As it is, state support only covers a portion of the actual expenses institutions incur in support of their physical plant. In fact, the THECB has recommended an increase in formula funding for the 2018-19 biennium to account for enrollment growth, inflation, and support for student completions to push forward the goals of the state's *60x30TX* plan. Higher education needs both accurate prediction models and stable funding to support affordable, high-quality education in appropriate facilities.

Overview

Since 1992, when the current space models were created to predict needed square footage, the higher education environment has changed significantly. Functions that once required a computer that would fill a room now can be accomplished on a handheld device, and entire libraries can be accessed on an electronic reader. With these and other changes, students can learn anywhere – not just in a classroom. Those advances, however, are not an indication of reduced fiscal need; in fact, the need for resources is greater than ever. The formula advisory committees have concluded their work and made recommendations for the 2018-19 biennium, and the Texas Higher Education Coordinating Board (THECB) has forwarded its position on funding levels. These recommended increases are necessary to reach the goals of *60x30TX.*

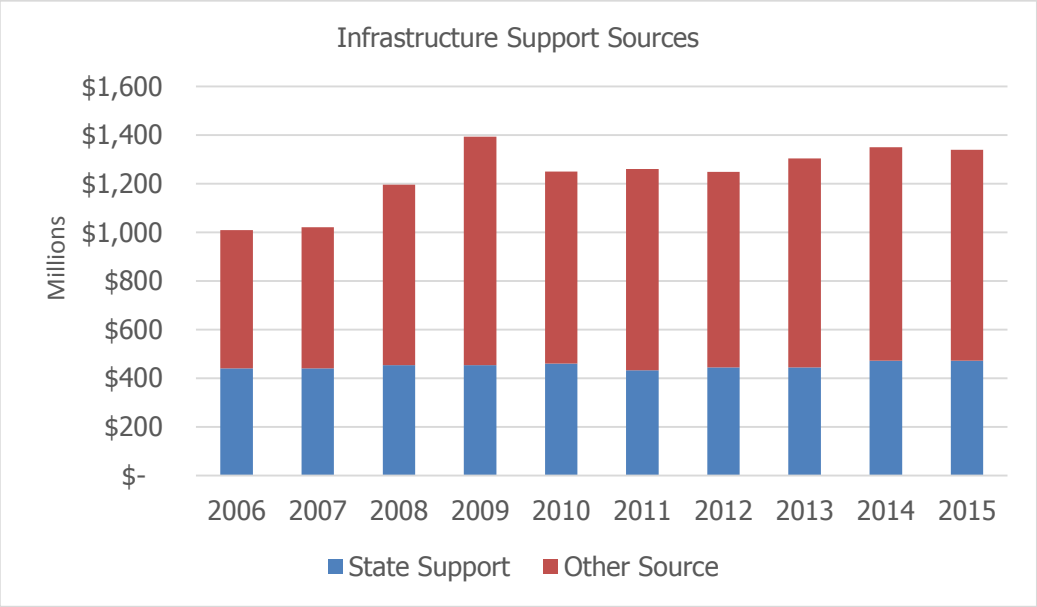
The THECB was tasked by House Bill 1 (General Appropriations Act), 84th Legislature, Regular Session, Article III, Higher Education Coordinating Board, Section 55 (p. III-56) to conduct a study of the space projection model and to recommend changes to increase the accuracy of the predictions. Rider 55 states:

> *Space Projection Model. Out of funds appropriated above, the Higher Education Coordinating Board shall conduct a study to review the space projection model and report the results of the study to the Legislative Budget Board and the Governor's Office no later than June 1, 2016. The study should provide an analysis of the methodology used in the model and consider the impacts of courses delivered online in the model. The study shall include recommendations to enhance the accuracy and validity of space projections determined by the model.*

This study is limited to general academic institutions and health-related institutions. Although the Texas A&M System (TAMUS) agencies have a space model, it was developed more recently. Further study is required to do a specific analysis of the TAMU agencies and veterinary medicine as part of the general academic institutions (GAI) model.

Background

The square footage (SF) predictions created by the space projection models have two primary functions: to determine the amount of space support funding an institution receives as part of the formula funding process and to assess compliance with space need standards in capital project reviews. Historically, the amount of funding appropriated for space support has only covered a portion of the actual expenditures for support and maintenance of the physical plant.



The original models were developed in 1992 with minor changes implemented in 2006. The 1992 models were developed using 12-year-old data, collected in 1980, on the actual use of space in institutions across the state, and the models were informed by the one used by the Council on Educational Planners International (CEFPI).

Recent Attempts to Update the Model

The General Academic Institutions Formula Advisory Committee (GAIFAC) in 2011 was given a charge to look at methods to update the model. Charge 5 directed the GAIFAC to "Study and make recommendations on modifications necessary to improve the predicted space calculation for the infrastructure formula." The GAIFAC recommended retaining the existing model for funding purposes and developing a separate model for evaluating capital projects. Additionally, the GAIFAC determined:

- The current model predicts more space than used by most institutions.
- Any change to the model would significantly redistribute funding.
- A follow-up workgroup should consider the effect of the changes in technology, distance education, library use, and other drivers.
- The workgroup should consider the use of faculty and staff full-time equivalents (FTEs) as a more accurate driver of space needs than the current use of expenditures.

In 2012, THECB staff assembled a stakeholder group to consider changes to the model. After three meetings, consensus was reached only on the idea that expenditures should be removed

from predicting office space. This echoed the sentiment of the GAIFAC, but provided little impetus to effect the necessary change.

Goals of the Study

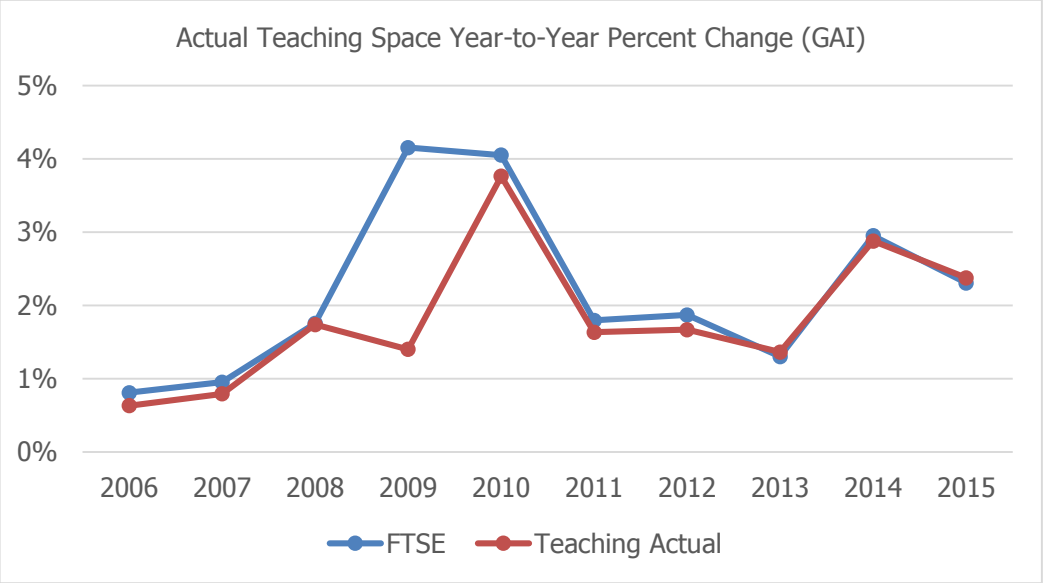
The primary goal, as stated in the rider, is to review the drivers of the models and recommend modifications to increase the accuracy of the predictions. This was not a study of the levels of funding required to operate and maintain the assets.

Study Methodology

Using the Council of Educational Facility Planners International (CEFPI) standards for space planning as a check of external validity, staff compared the CEFPI methodology to the current models and any recommended changes. Importantly, the CEFPI methodology is a great tool for the programming of space but has limited direct use for the purpose of the models and the two key functions those models are expected to perform. Although CEFPI's methodology has limitations, because it is a nationally recognized model around which our model's structural characteristics were built, it still serves as an excellent reference point.

The next step was to assess the current models for predictive accuracy over time and examine institutional responses to changes in the demand on facilities. For example, changes in full-time-student-equivalent (FTSE) levels should result in changes to the amount of teaching space actually used, and changes in the number of faculty should result in changes to the amount of office space occupied. This concept can be illustrated by the institutional response to changes in FTSE, relative to the amount of teaching space on campus.

The graph below depicts the relationship between FTSE and teaching space at GAIs between 2006 and 2015. Note that the institutional response has been both direct and almost immediate. This graph suggests that using actual space as a guiding point is appropriate.



After the initial comparison of actual space to predicted space over time was complete, THECB staff conducted additional levels of analysis using time series analysis, regression analysis, and descriptive statistics. Various levels of data were analyzed, in some cases to the program and

student level.

To address online education, THECB staff reviewed the number of semester credit hours (SCH) taught online as a percentage of the total number of credit hours taught. The study focuses on SCHs affiliated with courses that are considered "fully online," which is a course that has 85 percent or more of the class activity performed in an online mode of instruction.

Following the initial study and analysis outlined above, THECB staff conferred with institutional stakeholders to gather input on the analysis and discuss potential recommendations. Staff carefully considered the input from institutions, as these stakeholders have a direct interest in the models, with a primary concern about the potential detrimental effects any change may have on overall funding levels and allocations across institutions. The stakeholders were not asked to vote to support these recommendations. However, all recommendations for change are the result of carefully considering institutional suggestions and concerns.

The next section of the report provides a review of the existing model. Each factor is discussed separately for general academic and health-related institutions (HRIs), as applicable. Recommendations for changes to the model follow, by factor and sector. The report concludes with an analysis of potential impacts of the proposed model – as they pertain to funding and the project review process – and a brief summary.

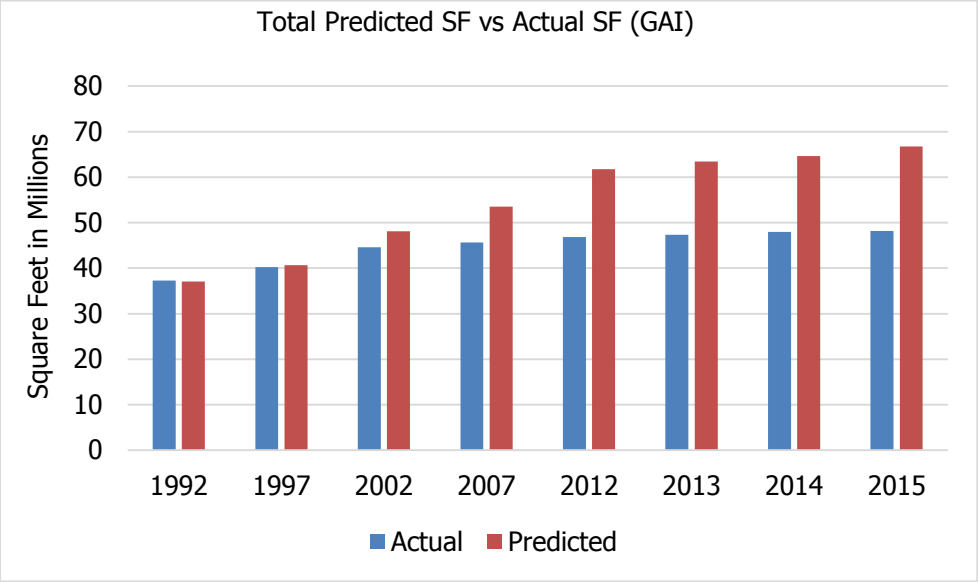
Current Space Models Factors and Analysis

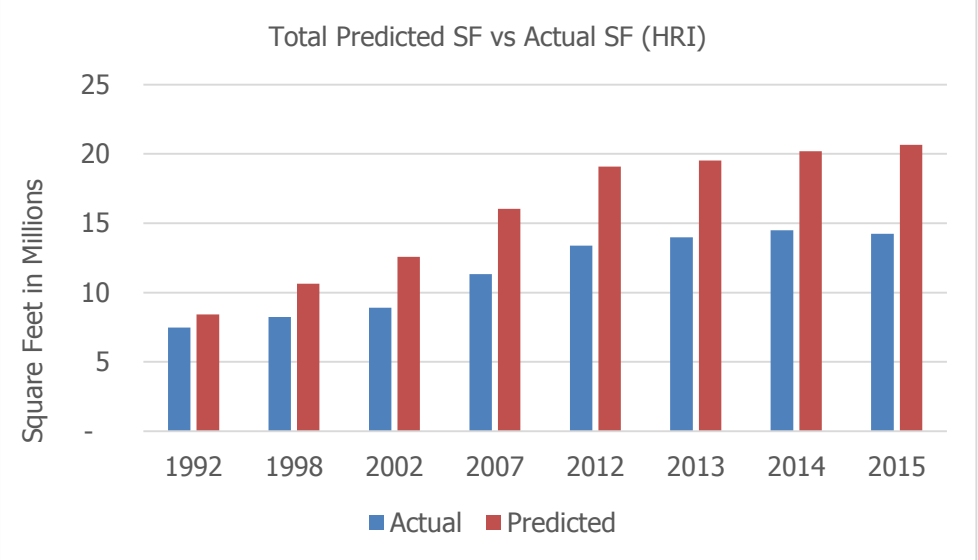
Overall

An overview of previous work, specifically the methodology used in creating the current models, indicated the initial methodology was sound. Over time the environment has changed, however, suggesting the coefficients need to be updated.

As appropriately stated by the GAIFAC in 2011, the model at the statewide level predicts much more space than is used. In fall 2015, the GAI model predicted 38 percent more space than actually was in use, and the HRI model predicted 45 percent more space than actually was in use. The models should predict more space than institutions currently have so that growth can occur. Increases in enrollment and research also may occur each year, but capital development to address those increases takes several years. But even considering the need for additional space to allow for growth, the amounts the models currently predict are excessive and indicate a need for correction.

Furthermore, the gap between "actual" and "predicted" is widening for both the GAIs and the HRIs. The graphs below show the start of the models' use in 1992 and then in five-year increments until 2012, when it shows the annual change. When the models were first implemented, minor differences existed between actual and predicted, and this is even the case when the models were first used as a funding mechanism in 1997. The gap, though, has grown substantially over time. To correct the models, the individual elements need to be examined.





Teaching Space

Teaching space includes space used for direct and indirect instruction. Classrooms, laboratories, meeting rooms, physical education spaces and exhibition rooms are included in this designation. Currently, this value is predicted using the number of full-time-student equivalents (FTSE), by program, for GAIs and the headcount, by program, for HRIs.

The Space Usage Efficiency metric, or SUE, is an assessment mechanism to determine the level of activity and demand on classroom and class laboratory resources. Three components are assessed for classrooms and class laboratories: utilization, demand, and percent fill. *Utilization* measures the hours per week rooms are used, regardless of whether the activity is conducted in

space designed for that use; *demand* measures the hours per week rooms would be used if the activities were conducted in the appropriately classified space; and *percent fill* measures the percentage of the capacity of rooms that are used. These data are displayed graphically by time of day and day of week.

Currently, students are being taught effectively in the existing square footage; however, the model predicts large space deficits. As stated earlier, although prediction above the actual is appropriate, if teaching spaces were taxed to the point that existing deficits seem to indicate, we would expect classroom use to be higher in hours per week (HPW), classrooms and class laboratories to be fully in use every weekday, and weekend offerings to be on the rise.

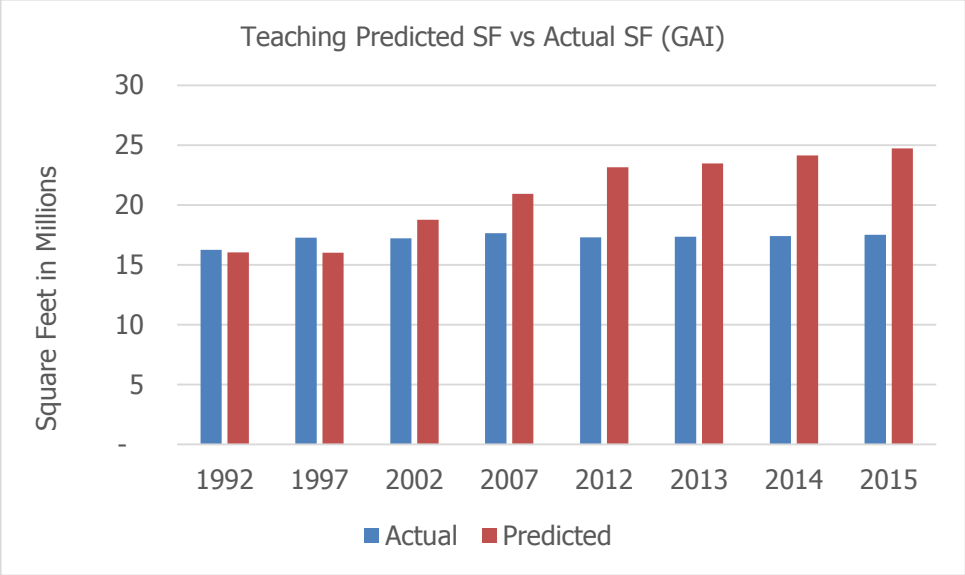
The Space Usage Efficiency (SUE) metric, indicates none of those scenarios are occurring. The graph of those data is shown in appendix D on page 33. As illustrated, the HPW has remained relatively constant. In fall 1997, classrooms were used statewide an average of 28.8 HPW, as compared to 29.1 HPW in fall 2015, and class laboratories were at 19.0 for 1997 and 22.6 for 2015. While these are increases, they are not to the magnitude expected. Additionally, we see day of week distributions showing a significant decrease in Friday activity, as compared to other days of the week.

The foundation of the teaching space metric – basing predicted space on student counts or FTSE – is fundamentally sound, and the overall methodology aligns fairly well with other metrics. Furthermore, determining a required amount of space based on the number of students using it makes sense, but the real question is the magnitude of impact each variable has on the predicted value.

General academic institutions (GAIs).

Teaching space is predicted based on the number of FTSE in each course by four different program areas. For undergraduate space prediction, a base amount of 45 SF per FTSE is used for all program areas, with additional square footage allocated in those areas requiring higher amounts of space, such as agriculture and performing arts. Program areas are stratified in four categories from highest to lowest with 90, 75, 60, or 45 square feet per FTSE allocated to each. An economies of scale coefficient is applied if an institution has over 15,000 FTSE, but this adjustment only occurs for those FTSE in the lowest space need category. For master's, professional, and doctorate FTSE, the same concept is applied with less square footage predicted per FTSE.

Since 1992, as mentioned, teaching space has not increased as much as expected. Whether by necessity or design, institutions have accommodated increased enrollments within the space available.

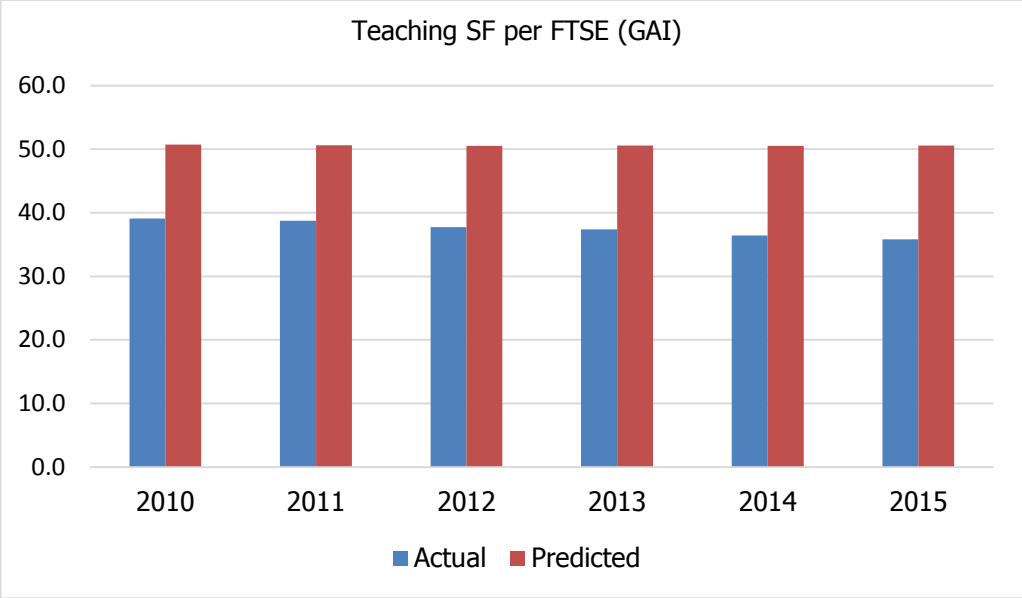


The current GAI model shows a 7,203,579 SF teaching space deficit. This amounts to a 41 percent difference between predicted and actual space.

A review of actual space used in each program area and the number of associated FTSE showed the actual space use averaged only 30.4 square feet (SF) per FTSE – far below the minimum currently predicted by the model.

	Program 1	Program 2	Program 3	Program 4
Percent of total use	8%	8%	31%	54%
Teaching Space in use (SF)	5,013,688	2,457,594	4,090,703	3,277,692
Teaching Space Per FTSE	134.61	63.73	27.26	12.50
Current model per FTSE (SF)	90	75	60	45

The only program area where predicted space is less than actual is program area 1, which accounts for only 8 percent of the overall use. Program area four accounts for 54 percent of the use, with only about one-fourth of the space modeled in use. In other words, 92 percent of the activity is done in significantly less space than the current model predicts.

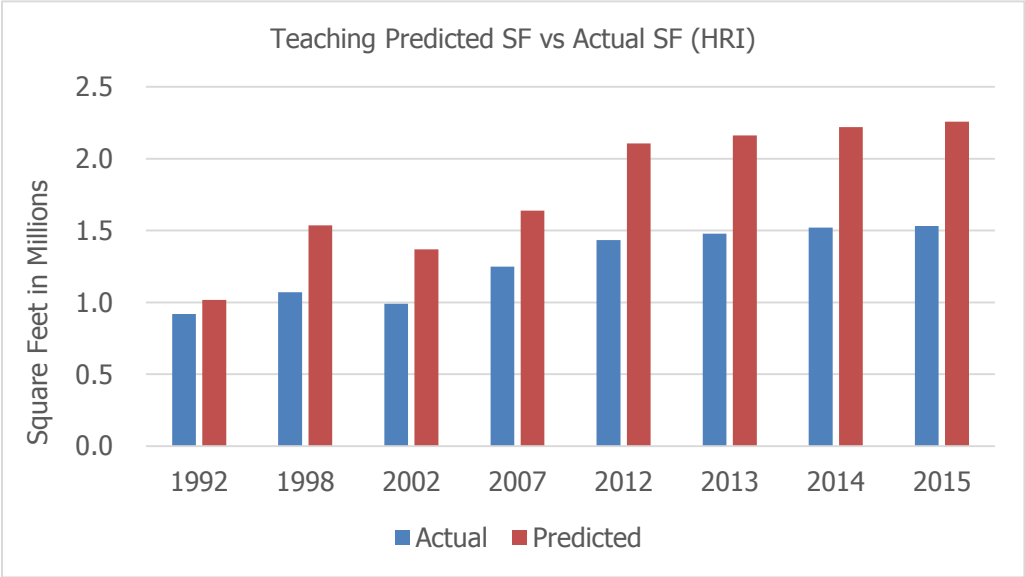


From a statewide perspective, the space used per FTSE is decreasing. Understandably, the predicted SF per FTSE remains relatively constant. It is difficult to say whether reduced actual space per FTSE is by necessity or design; perhaps, it is a combination of the two. Many factors may be contributing to this occurrence. Increased activity in online courses may be one of them.

A regression analysis was conducted that compared the change in FTSE, as it impacts the actual space used. Results of this analysis supported the conclusion that the variables used to predict the square footage should be changed.

Health-related institutions (HRIs).

Teaching space in HRIs is predicted using different coefficients based on the area of study. With the wide variance between individual HRIs and their differing missions and focus, it is not surprising this range is required. The model predicts 18 different amounts of square footage for various programs and levels, ranging from 120 SF to 30 SF. The model for HRIs differs in that headcount is used, as opposed to FTSEs for the GAIs.



When the model was initially developed and then used for formula funding, the difference between actual and predicted space was much smaller than the current difference. For HRIs, the deficit is 727,838 SF, which is a 48 percent variance.

Attempting to link the actual activity with one of the 18 categories of headcount is infeasible due to data limitations. To gather the necessary data to make this link would require a costly and extensive new data collection exercise. THECB staff did not think the cost warranted additional data collection but thinks some correction to the model is necessary.

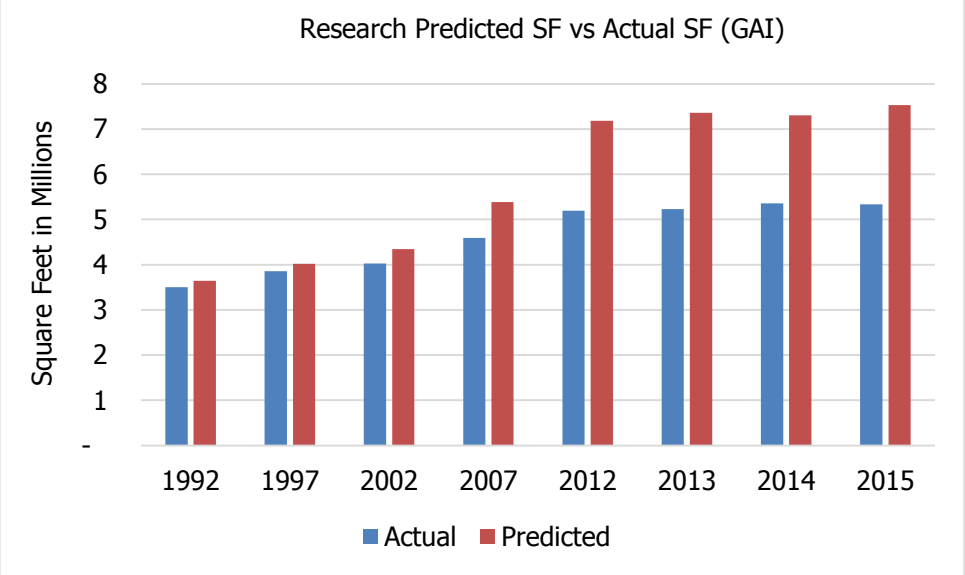
Research Space

Research space is space that is used for sponsored research projects. Of all the factors, this factor is most important in predicting space beyond the current amount in use. Institutions must have space available to win grants and contracts. To expand the research endeavor, some additional space is required. The challenge is how best to determine the additional space needed. The GAI model currently predicts 41 percent above the existing need, and the HRI model predicts 88 percent above the square footage currently being used.

General academic institutions

Research space for GAIs is predicted in one of two ways. The first is by modeling 9,000 SF per million dollars in research expenditures, adjusted for inflation to 1991 dollars (the data year used for the initial model). The second method is by modeling three SF per FTSE. The two methods are compared, and the one resulting in the greatest SF in research space is used.

As seen previously in the teaching space assessment, the model showed a close approximation to the actual research SF at inception and when first used for funding. Over time, a wide gap developed. Models like the CEFPI model predict, to some extent, based on the number of full-time-equivalent (FTE) faculty. Currently, the model predicts 248 SF per FTE faculty, and institutions are using 179 SF, a difference of 39 percent.



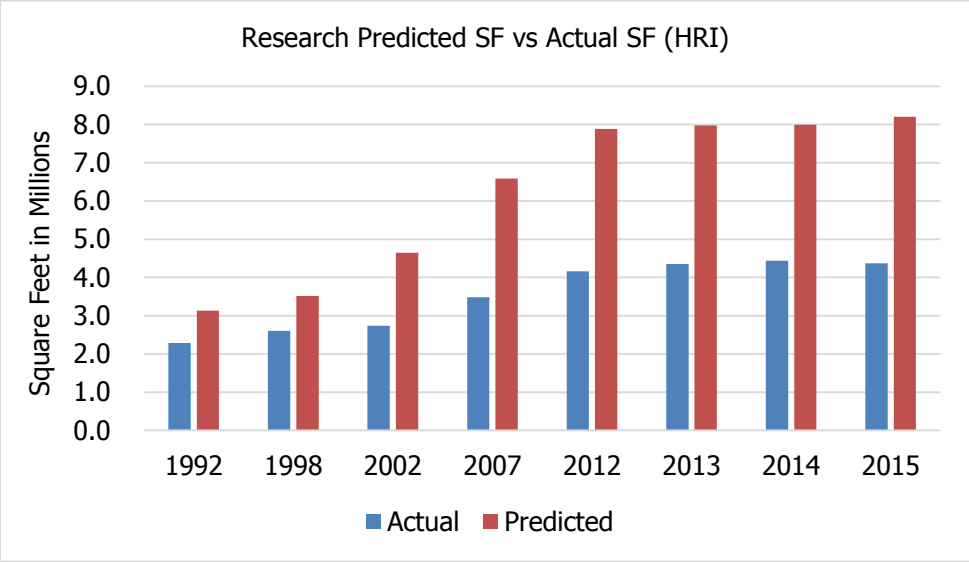
When considering the use of research expenditures to predict needed research SF, looking at current productivity is appropriate. Since 2010, institutions have averaged $253 in research expenditures per actual SF in use. The trend is stable with a high of $265 in 2015 and a low of

$242 in 2012. This average equates to 3,953 SF per million in unadjusted expenditures. The inflation adjustment results in a smaller SF prediction. We will discuss the use of inflation adjustments in our recommendations. Even so, the 9,000 SF per adjusted million is significantly more than demonstrated need and is probably more than what is necessary, even with the importance of having an adequate buffer for critical research expansion.

Health-related institutions (HRIs)

Research space for HRIs is predicted in a similar fashion to the GAIs, modeling 9,000 SF per million dollars in research expenditures, adjusted for inflation to 1991 dollars. The second method differs, as it is based on FTE faculty, instead of FTSE. Each FTE faculty reported by an institution models 250 SF, and the greatest amount yielded is used as the prediction. The use of both types of measure seems to be appropriate, although the coefficient may need to be updated.

Changes in the gap between the predicted and actual space are even more pronounced in the HRI research prediction.



There is an initial gap in research space, which has widened over time. Predicted values have leveled recently, but research expenditures have done the same. Research expenditures per square foot show a stable pattern over the last five years, with a high of $367 per square foot in 2011 and a low of $344 in 2013. If calculated to show square feet per million in expenditures, then we would model 2,801 SF per million in unadjusted expenditures.

Evaluating the square feet per FTE faculty with the second method of modeling results in an average of 430 SF per faculty FTE, with a high of 449 and a low of 411. Given that the model only predicts 250 SF per faculty FTE, it is not surprising almost all of the institutions predict using the first method of modeling based on research expenditures.

Office Space

Like research, office space is predicted in one of two ways. A significant difference between the HRI and GAI models is the manner in which the two use expenditures. These will be discussed separately.

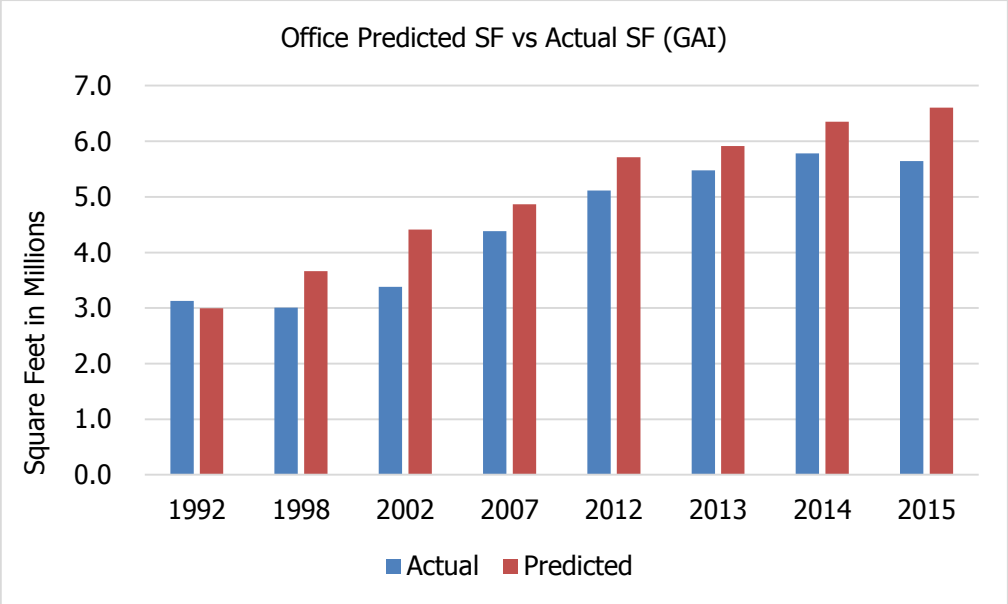
General academic institutions

In the first method, office space is predicted based on the number of FTE faculty, with staff being a constant of 1.8 staff per faculty for universities and 1.25 for technical and state colleges. Each

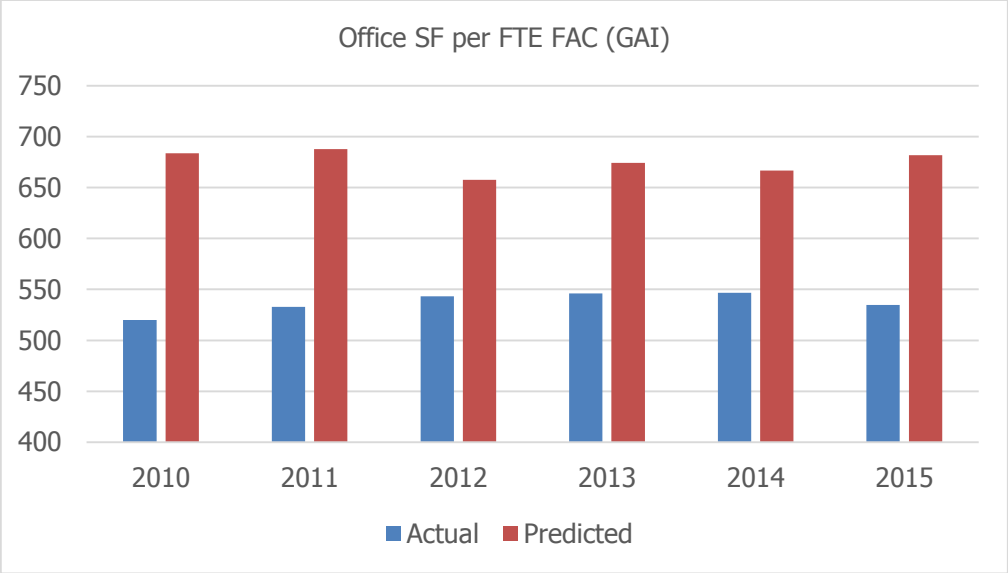
faculty member is allocated 190 SF and each staff 170 SF. There are no economies of scale predicted.

The second method uses Educational and General (E&G) expenditures, adjusted for inflation to 1991 dollars. For each million in adjusted E&G expenditures, 9,000 SF of office space is predicted. The larger of the two methods is the prediction.

Statewide, office space does not vary as much as the other factors. There was an office space surplus at inception, but this has turned into a deficit. This statewide number does not in itself raise suspicion, but looking at the wide variability between institutions is warranted. Using the 1.8 staff per faculty and the associated square footage modeled to each, 496 SF per FTE faculty is the result, which is lower than the actual square footage of 514 SF per FTE.



One institution uses over 1,000 SF per faculty and predicts over 1,300 SF. Contributing to this gap is the use of E&G expenditures as a principal prediction mechanism. If the FTE faculty count is used, the gap is minimized.

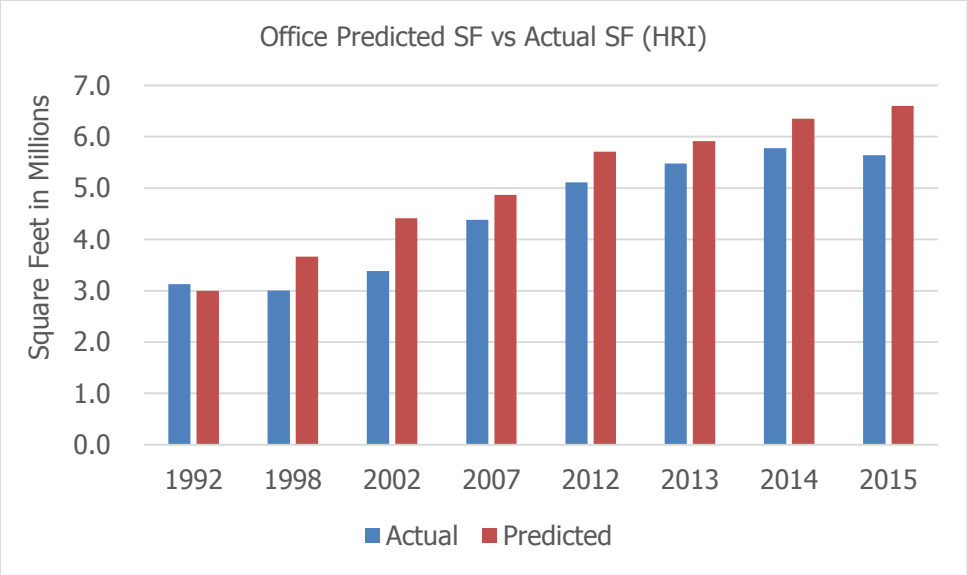


The trend is stable when we use FTE to predict office space. The CEFPI model has a similar metric, using the values of 170 SF for four-year institutions and 185 SF for major research institutions.

The stakeholder group requested THECB staff to conduct a survey to verify the ratio of staff to faculty. FTE data from the State Auditor's Office (SAO) was reduced by non-E&G staff (auxiliary, off-site correction care, and hospital/clinical). Faculty FTE count reported via the CBM 008 report was integrated, and new ratios were determined. For those institutions that responded (36 of 44), the statewide FTE ratio was 2.0 staff per faculty. Therefore, the ratio of 1.8 used in the model is too low and an adjustment to 2.0 is warranted. Institutional ratios reported in the survey varied from a low of 0.98 to a high of 4.1.

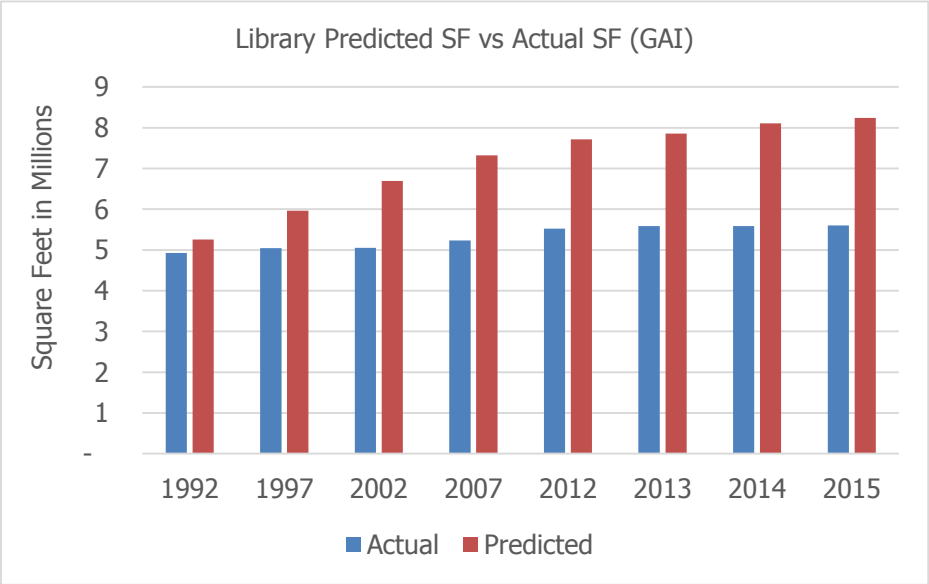
Health-related institutions

Health-related institutions follow the same pattern as the GAIs in regard to the use of FTE faculty and associated ratios. The difference is the HRIs use actual headcount data reported in the Legislative Appropriations Request (LAR) to determine the staff-to-faculty ratio. Another key difference is the way E&G expenditures are used to determine office space. Where the GAI model predicts 9,000 SF per adjusted million in expenditures, the HRI model predicts 1,600 per million. If the method using the dollar amount is higher, the average of the two methods is used. The reduced allocation per million, coupled with the averaging, keeps the gap small.

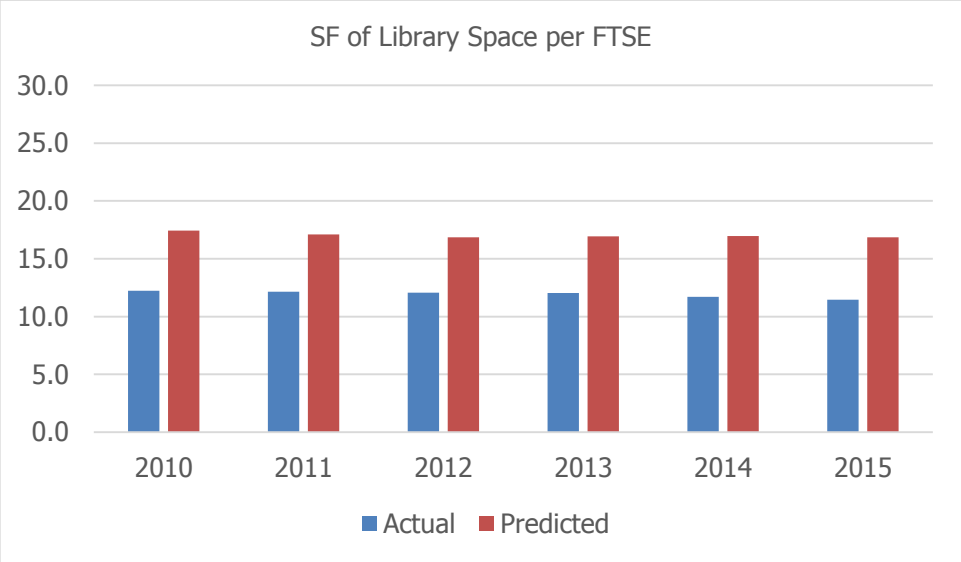


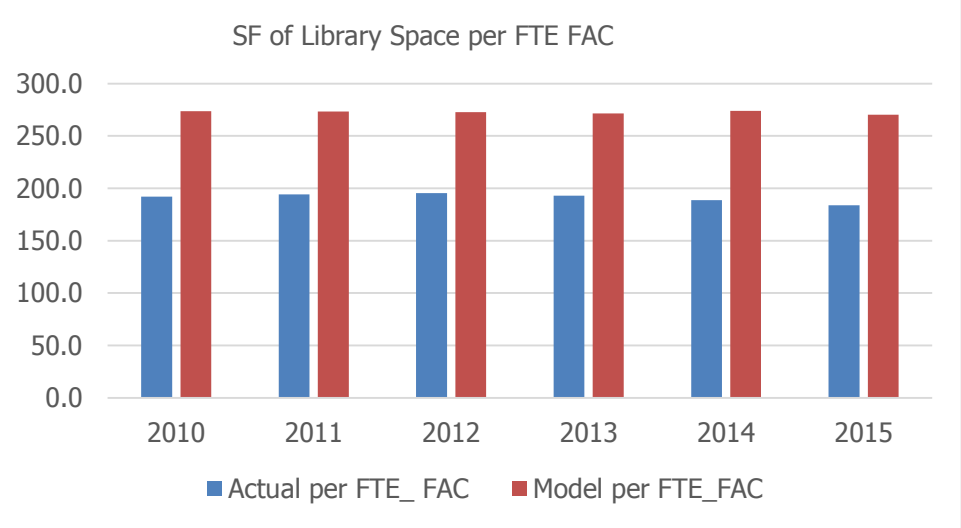
Library Space

For GAIs, library space is predicted using 18 factors, with an additional factor for law libraries. A similar, yet slightly less complex method, is used for the state and technical colleges. For this study, the two groups are examined collectively.



Since 1992, the gap in library space has widened. With so many variables, it is hard to determine which ones need to be modified. A simpler and more accurate method would be to use the numbers of users (i.e., FTSE and FTE faculty). As seen in the charts below, the gap is fairly stable when FTSE or FTE faculty are used.


SF of Library Space per FTSE
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2010
2011
2012
2013
2014
2015
Actual
Predicted


SF of Library Space per FTE FAC
300.0
250.0
200.0
150.0
100.0
50.0
0.0
2010
2011
2012
2013
2014
2015
Actual per FTE_ FAC
Model per FTE_FAC

Clinical Space

Clinical space is predicted for HRIs only, by simply using the actual clinical space reported on the facilities inventory. At the request of the stakeholder group, THECB staff attempted to find a way to predict the amount of space required, instead of using actual space. Initial attempts proved unsuccessful due to the wide range among institutions. Since the primary users of clinical space seem to be residents, staff attempted to find a correlation between the number of residents and the amount of space used. The data showed a range of 53 to 420 SF per resident, with a mean of 161 and a standard deviation of 123.6. Regression analysis had a very low measure of correlation, so it did not help.

Staff discussed results with stakeholders, and the discussion turned to the number of non-residents and others that may use the clinical space. Stakeholders, however, could not specify the number, nor does the THECB have data available for this purpose. Extensive study and additional data collection would be required to develop a predictive tool.

Support Space

Support space is calculated for all sectors by summing the other four factors in the models and creating a 9 percent add-on as an estimation of projected support space. Being a function of other factors, attempting to assess this factor, per se, is not possible. Proposed adjustments to this factor must be reviewed in light of the other changes.

Multi-Campus Adjustment

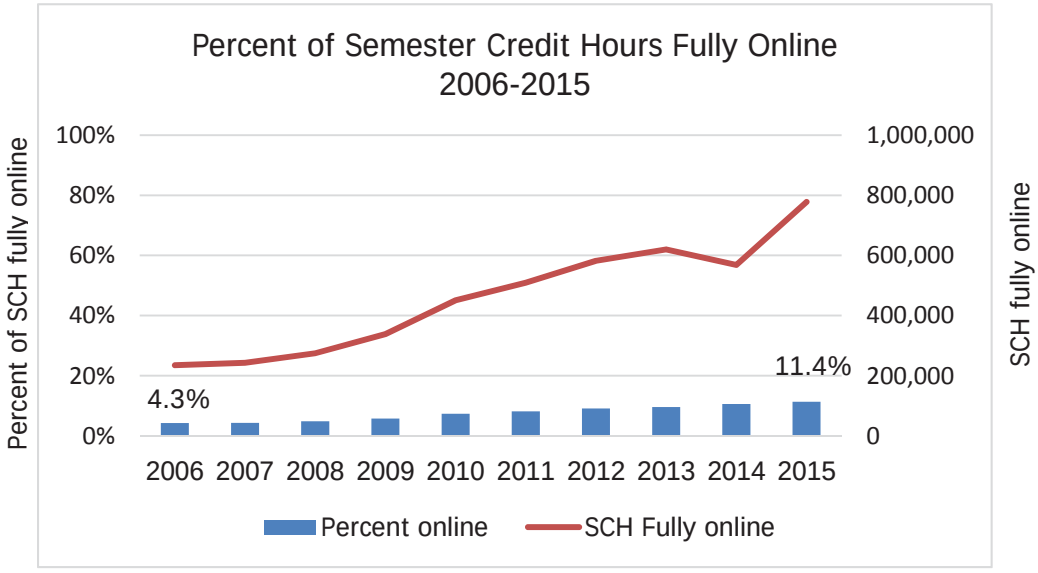
The multi-campus adjustment, used by HRIs only, is applied to those institutions that have instructional programs that are carried out on branch campuses recognized by the Texas Legislature. For each qualifying remote campus, the model includes 100 percent of the first 10,000 SF and 25 percent of additional SF. This results in a minor additional amount of square footage for eligible institutions.

Impact of Online Education

Online education is one of the most significant changes to the higher education environment since 1992, especially in regard to space modeling. Many believe that online courses do not require any space, but they do.

Online education comes in many forms. One type is "hybrid" courses, and these vary too. Hybrid courses are often a mix of traditional and online activity, so it's clear that they require space. The question becomes how much and what type? Even courses that are fully online are often "attended" by students who are full-time resident students at the institution. These students need space to meet to complete online-directed work. Institutions have repurposed space to meet those changing demands.

This study focuses on those courses considered "fully online," defined as 85 percent or more of classwork is conducted virtually. As the chart below shows, the number of these courses has increased significantly. In fall 2006, 4.3 percent of all semester credit hours taught were considered fully online. This increased to 11.4 percent in fall 2015. Indeed, there is a need to consider the difference in space need, and some correction is necessary.


Percent of Semester Credit Hours Fully Online
2006-2015
Percent of SCH fully online
SCH fully online
100%
80%
60%
40%
20%
0%
1,000,000
800,000
600,000
400,000
200,000
0
4.3%
11.4%
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015
Percent online
SCH Fully online

Recommendations

The goal of the study is to use available data to create more accurate and equitable models. Stakeholder input was sought and carefully considered. The recommendations reduce the space deficit to a more realistic level, which would improve the ability of the THECB to assess compliance with space need standards when reviewing capital projects, and would better inform the Legislature when it considers requests for tuition revenue bonds.

An important issue raised by stakeholders is the potential impact of the new models on funding for E&G Space Support. The new models would redistribute funds; this is unavoidable. They should not, however, be used as a basis for reducing total funding. Institutions must continue to operate and maintain their current facilities. The THECB recommends an increase in funding for E&G Space Support, as detailed in its report, "Formula Funding Recommendations for the 2018-19 Biennium."

Before discussing the specific recommendations, it's important to address the question some may have about why we don't go back to the old way of using actual space instead of predicted space. There are several problems with using actual space. First, institutions would be incentivized to build, regardless of their need for space, because they would get more formula funding. This would eliminate the incentive for efficiency. Second, some institutions have access to financial resources that others do not have, such as the Available University Fund and donor contributions. If funding were based on actual square footage, institutions that have the financial resources to build would get a bigger share of E&G Space Support funding, which would hurt smaller institutions. Third, the THECB would lose an important tool in reviewing capital projects, and the Legislature would lose an important tool in evaluating tuition revenue bond requests.

Teaching Space

General academic institutions.

The recommendation, which is supported by regression and time series analysis, is to predict 40 SF per FTSE for all GAIs, other than the Texas State Technical Colleges (TSTCs), and 165 SF per FTSE for the TSTCs. This higher number is reflective of the unique programs at these colleges.

This model adjusts for economies of scale. Institutions would be classified as small (less than 15,000 FTSE), medium (15,000-30,000 FTSE), or large (greater than 30,000 FTSE). Small institutions would have no adjustment, medium institutions would have a 2 percent adjustment, and large institutions would have a 3 percent adjustment.

Predicted teaching space is adjusted also for online education. The relative allocation among types of rooms in the current model is appropriate.

Room Type	Square Feet per FTSE
Classroom	11
Class Laboratory	8
Special Class Laboratory	3
Self Study Laboratory	3
Physical Education, etc.	10
Assembly, etc.	5
Service Space	5
Total	45 SF

The types of spaces most immediately impacted from a course being placed online would be classrooms and class laboratories, which represent 44 percent of the predicted amount of space. Staff recommends using an adjustment factor of 50 percent. Once the teaching space is predicted, 50 percent of the predicted square footage would be adjusted by the percentage of courses reported fully online. Hybrid and other types of online courses would receive full predicted space.

Health-related institutions

It is impractical to use a single number for the HRIs because of their complexity and uniqueness. The data, however, indicate an adjustment is required to bring the predicted total closer to the demonstrated need. After consulting with stakeholders, THECB staff chose to reduce all program areas within the existing model by 10 percent.

Research Space

General academic institutions

The current model does not reflect needs in research space. The correlation between FTSE and research space is weak; therefore, this metric should be dropped. The use of three-year average research expenditures should be continued; however, the inflationary adjustment should be revised. Staff recommends an adjustment from 9,000 SF per inflation adjusted million with a base year of 1991 to 4,150 SF per adjusted million with a base year of 2013. This yields a value that more accurately reflects current need.

Health-related institutions

The model recommended for the HRIs would take the larger of two methods. One is 4,150 SF per inflation adjusted million in research expenditures with a base year of 2013, which is the same as the recommendation for the GAIs. The other is 250 SF per FTE faculty, which is reasonable given the quantity of research produced when viewed on a per FTE basis.

Office Space

General academic institutions

The 2011 GAIFAC recommended the consideration of using faculty and staff full-time equivalents, instead of educational and general (E&G) expenditures. The need for office space is more strongly correlated to faculty and staff than E&G expenditures. Institutions may increase expenditures without increasing the number of employees. Regardless of how the funds are expended, they would predict the need for additional office SF.

The current model uses a staff to faculty FTE ratio of 1.8. Staff recommends using the results of a recently conducted survey of institutions to set the ratio. A base ratio of 2.0 would be used for institutions with ratios below 2.0, and a cap of 5.0 would be applied. Currently, the highest ratio is 4.1.

Health-related institutions

Currently, both GAI and HRI models use E&G expenditures to predict office space, but they are used differently. For the HRIs, using E&G expenditures limits the number of predicted square feet and provides a leveling factor, which helps to create parity for the smaller institutions. For this reason, the smaller institutions use this approach as the final predictor. For the larger institutions, use of E&G expenditures is averaged with the amount predicted via faculty and staff FTE. Therefore, staff recommends retaining the current methodology with the following minor adjustments:

- First, the base year needs to be reset to 2013, and the use of 1991 data should be discontinued. Accompanying this change is a need to adjust the SF per million predicted from 1,600 to 950.

- Second, an overall average staff to faculty FTE ratio should be used based on data collected from all institutions' Legislative Appropriations Requests (LAR), instead of the current practice of only collecting data from certain institutions' LARs. The minimum would be the average, and institutions with higher ratios would use the higher number. This more accurately reflects individual need while encouraging efficiencies. Staff recommends a cap of 5.0 staff to faculty FTE ratio.

Library Space

The linkage between the need for library space and the number of FTSE is unmistakable. Staff recommends 15 SF per FTSE. This narrows the gap, but still predicts a library space deficit of 1.9 million SF, which seems appropriate. For institutions with a law school, a 5 percent adjustment is added.

Clinical Space

Attempts to predict clinical space have not been successful, as discussed previously, because data is limited and the need for space varies widely depending on the type of practice. Therefore, staff recommends the continued use of actual SF. The need for clinical space is driven partially by market demand; therefore, institutions need the flexibility to respond quickly.

Support Space

Staff recommends retaining the current calculation, which is 9 percent of the sum of the other predictions.

Multi-campus Adjustment

Staff recommends retaining the current calculation, which predicts a relatively small amount of space.

Potential Impacts

Funding

THECB staff understands the rider does not direct an analysis of potential impacts but feels the study would be incomplete without such a discussion.

The funding for space support is dependent on the square footage predicted in the models. Any change to the models would impact funding distributions among institutions and could potentially impact funding levels. The impact on funding levels was of particular concern to the institutional stakeholders, and this concern is shared by THECB staff. Current E&G space support funding only pays a portion of the costs of operating and maintaining campus facilities. The following discusses what the impact of the proposed model would have been if applied to 2016-2017 biennial funding. There are two ways to consider what that fiscal impact would have been: rate-based and level-based funding.

Rate-based funding

For the 2016-2017 biennium, general academic institutions were funded at $5.55 per square foot, and health-related institutions were funded at $6.65 (except M.D. Anderson and UT Health Science Center at Tyler, which were funded at $6.26). If the square footage predicted by the proposed models was used, and the rates funded for the 2016-2017 biennium were the same, overall funding levels for the biennium would have decreased by $114.8 million for the GAIs and $27.8 million for the HRIs, for a total reduction of $142.7 million.

Level-based funding

For the health-related institutions, the infrastructure portion of formula funding was $265,414,098, and for the general academic institutions, the E&G space support amount funded was $727,673,378. The modified square footage, if applied to these funded amounts, would result in a redistribution of funding. Institutions are concerned about this possibility, too. This was an important consideration throughout this review process. Back-casting of these data show the largest reduction for any institution to be $9.6 million, which is an 8.3 percent reduction, for the biennium in the GAI sector and $2.7 million, which is a 4.6 percent reduction, in the HRI sector. Stakeholders expressed the desire for a hold harmless consideration for those institutions facing a potential loss.

Project Review

Not as pressing a concern for stakeholders, but still worthy of discussion, is the potential impact on the project review process and compliance with established space standards. Neither the current models nor the proposed ones impede capital development. Institutional governing boards are authorized to approve capital projects per the Texas Education Code (TEC 61.0572 and 61.058). Approval by the THECB is not required. These models, however, are used by THECB staff to review capital projects to determine compliance with space need standards. The individual factors are not used in assessing compliance; only the overall space predicted, as compared to total actual, is used.

Using the existing methodology, seven GAI institutions have space surpluses, and no HRIs have surpluses. Implementing the recommended changes would place 14 GAIs in a surplus category and no HRIs in a surplus category. If an institution with a surplus constructs facilities, that institution would be considered not in compliance with the space need standard. In the event of non-compliance, the THECB will notify the Governor, Lieutenant Governor, the Speaker of the House of Representatives, and the Legislative Budget Board. Actions taken, if any, are at the discretion of those parties.

Summary

Higher education has changed considerably since the space projection models were developed in 1992. For example, online courses, which require less space, have become popular. The models, however, haven't been updated to reflect those changes. As a result, the current models predict 25 million more SF than actual for GAIs and HRIs. As a point of comparison, in 1992 the models predicted about the same SF as actual. If the space deficits predicted by the current models were real, classroom usage would be very high, but this is not the case.

The recommendations in this study were developed after extensive data analysis and careful consideration of stakeholder input. If the Legislature instructs the THECB to adopt these changes, the total space deficit would decrease from 25 million SF to 10 million SF, which would still give institutions room to grow. These adjustments would help the THECB review capital projects and would improve the Legislature's ability to review requests for tuition revenue bonds.

The new models, however, should not be used as a basis for decreasing state support for public higher education. Institutions must continue to grow to meet the goals of *60x30TX.* This growth will require more state funding. The THECB's report, "Formula Funding Recommendations for the 2018-19 Biennium," details the increases required for the next biennium, including increases for E&G Space Support.

Appendix A – Summary of Proposed Changes

Summary of Space Model Changes (General Academic Institutions)					
Teaching	Research	Office	Library	Support	Multi-Campus Adjustment
Current: Space allocated by FTSE, program area, and level, adjusted for economies of scale.	Current: 9,000 SF per inflation adjusted million in research expenditures or 3 SF per FTSE, whichever is highest.	Current: 3,500 SF per million in E&G expenditures or 190 SF per FTE faculty/170 SF per FTE staff (constant is 1.8 staff per faculty), whichever is highest	Current: Combination of factors such as volumes, programs, users, and collections. Law library separately calculated.	Current: 9 percent of the sum of other factors	Not Applicable
Change: 40 SF per FTSE for general academic institutions, 165 per FTSE for TSTC. 50% of modeled amount adjusted for online courses. Adjusted for economies of scale based on institutional size: Large - >30,000 FTSE Medium - 15,000 - 30,000 FTSE Small - <15,000 FTSE	Change: 4,150 SF per million in research expenditures (inflation adjusted to 2013).	Change: 190 SF per FTE faculty and 170 SF per FTE staff. Staff calculated using most recent FTE survey. Base FTE staff ratio of 2.0, cap of 5.0.	Change: 15 SF per FTSE with a 5% add-on for law libraries	No Change	Not Applicable

Summary of Space Model Changes (Health-Related Institutions)					
Teaching	Research	Office	Clinical	Support	Multi-Campus Adjustment
Current: Space allocated by HC, program area, and level.	Current: 9,000 SF per inflation adjusted (to 1991) million in research expenditures or 250 SF per FTE faculty, whichever is highest.	Current: 1,600 SF per million in E&G expenditures or 190 SF per FTE faculty/170 SF per FTE staff (faculty ratio based on LAR). If E&G expenditure method is higher, it is used. If the per FTE number is higher, use the average of the FTE and E&G expenditure calculation.	Current: Reported actual is the predicted SF	Current: 9 percent of the sum of other factors	Current: For approved sites, 100 percent of the first 10,000 SF and 25 percent of the remaining SF
Change: 10% reduction to current variables by program area. No change to methodology	Change: 4,150 SF per million in research expenditures (inflation adjusted to 2013) or 250 SF per FTE faculty, whichever is highest.	Change: Reset base year for inflation adjustment to 2013. Adjust amount allocated per million in expenditures to 950 SF to account for changes.	No Change	No Change	No Change

Appendix B – Change Comparison in Square Feet

Fall 2015	Actual	Total		Surplus (deficit)	
Model Comparison		Current	Proposed	Current	Proposed
Institutions		Predicted	Predicted	Surp/def*	Surp/def*
UT-Arlington	1,964,867	3,044,712	2,535,478	(1,079,845)	(570,611)
UT-Austin	8,112,357	10,492,643	7,819,999	(2,380,286)	292,358
UT-Dallas	1,583,879	2,855,852	2,243,620	(1,271,973)	(659,741)
UT-El Paso	1,576,608	2,373,137	1,840,870	(796,529)	(264,262)
UT-Rio Grand Valley	1,611,208	2,350,580	1,911,513	(739,372)	(300,306)
UT-Permian Basin	314,927	395,081	283,451	(80,153)	31,477
UT-San Antonio	1,680,186	2,713,423	2,281,047	(1,033,236)	(600,861)
UT-Tyler	440,415	690,291	569,892	(249,876)	(129,477)
TAMU	5,399,543	7,562,270	5,806,374	(2,162,728)	(406,831)
TAMU-Galveston	226,778	309,284	236,217	(82,506)	(9,440)
Prairie View	878,066	936,728	711,559	(58,662)	166,507
Tarleton	817,855	1,010,876	860,553	(193,021)	(42,698)
TAMU-Corpus Christi	783,325	1,067,912	898,765	(284,587)	(115,440)
TAMU-Kingsville	800,955	897,218	728,727	(96,262)	72,228
TAM-International	367,397	596,732	489,765	(229,336)	(122,368)
West Texas	829,624	785,581	614,694	44,043	214,930
TAMU-Commerce	659,597	902,150	727,041	(242,553)	(67,444)
TAMU-Texarkana	121,423	167,067	121,773	(45,644)	(350)
TAMU-Central Texas	121,122	178,428	137,331	(57,306)	(16,209)
TAMU-San Antonio	215,681	293,915	244,821	(78,234)	(29,140)
UH	3,280,985	4,828,903	3,900,574	(1,547,919)	(619,590)
UH-Clear Lake	536,507	684,716	597,961	(148,209)	(61,454)
UH-Downtown	451,298	903,108	731,084	(451,810)	(279,786)
UH-Victoria	141,523	295,127	219,369	(153,605)	(77,846)
Midwestern	456,096	523,631	419,800	(67,536)	36,295
North Texas	2,238,926	3,260,220	2,711,411	(1,021,294)	(472,485)
North Texas-Dallas	140,038	190,475	153,194	(50,437)	(13,157)
SFA	986,613	1,174,390	1,003,239	(187,777)	(16,626)
Texas Southern	782,458	1,084,763	811,150	(302,305)	(28,692)
Texas Tech	2,913,828	4,513,104	3,709,434	(1,599,276)	(795,606)
Angelo	596,357	645,293	536,488	(48,936)	59,869
Texas Woman's	885,641	1,239,513	1,041,477	(353,872)	(155,835)
Lamar	734,747	1,058,240	788,270	(323,493)	(53,523)
Sam Houston	1,264,935	1,699,614	1,415,518	(434,679)	(150,583)
Texas State	1,936,678	3,292,226	2,993,172	(1,355,549)	(1,056,495)
Sul Ross	303,622	226,852	169,603	76,770	134,019
Sul Ross-Rio Grande	72,555	64,254	42,468	8,301	30,087
TSTC-Harlingen	396,223	369,160	676,863	27,063	(280,640)
TSTC-West Texas	269,589	120,243	145,952	149,346	123,637
TSTC-Marshall	179,465	83,918	118,553	95,547	60,912
TSTC-Waco	736,154	447,349	654,677	288,805	81,477
Lamar-IOT	126,625	223,167	187,014	(96,542)	(60,389)
Lamar-Orange	143,886	161,249	120,900	(17,362)	22,986
Lamar-Port Arthur	134,686	181,361	128,512	(46,675)	6,175
TOTALS	48,215,244	66,894,756	54,340,173	(18,679,512)	(6,124,929)

* - Not adjusted for projects currently under construction

Fall 2015		Actual	Predicted		Surplus (deficit)	
Model Comparison			Current	Proposed	Current	Proposed
FICE	Institutions		Predicted	Predicted	Surp/def*	Surp/def*
000030	UT-SMC	2,727,445	3,980,000	3,506,532	(1,252,555)	(779,087)
104952	UT-MB-Galveston	1,884,655	2,088,423	1,856,394	(203,767)	28,261
011618	UT-HSC-Houston	2,041,120	3,296,797	2,878,832	(1,255,677)	(837,712)
000040	UT-HSC-San Antonio	1,855,541	2,150,826	1,875,910	(295,285)	(20,369)
025554	UT-MD Anderson	2,731,900	4,936,885	4,022,823	(2,204,985)	(1,290,923)
000404	UT-HSC-Tyler	137,316	198,964	187,574	(61,648)	(50,258)
000089	TAMU-SHSC	820,785	1,340,225	1,213,478	(519,440)	(392,693)
000130	North Texas HSC-Fort Worth	472,131	781,842	690,525	(309,711)	(218,394)
000412	Texas Tech-UHSC	1,206,364	1,417,043	1,418,541	(210,680)	(212,177)
000862	Texas Tech-UHSC-El Paso	355,730	471,074	456,832	(115,343)	(101,102)
	Total	14,232,988	20,662,079	18,107,441	(6,429,091)	(3,874,454)

Appendix C – Potential Fiscal Impacts

Institution	2016-2017 Infrastructure formula	Adjusted rate 2016-2017 Infrastructure formula	Redistribution using adjusted rate	Percent Change
UT-Arlington	$32,497,419	$33,405,377	$907,958	2.8%
UT-Austin	$115,589,391	$106,003,676	($9,585,715)	(8.3%)
UT-Dallas	$29,335,321	$29,330,427	($4,894)	(0.0%)
UT-El Paso	$25,711,462	$24,573,894	($1,137,568)	(4.4%)
UT-Rio Grande Valley	$26,563,059	$25,636,963	($926,096)	(3.5%)
UT-Permian Basin	$4,071,798	$3,597,279	($474,518)	(11.7%)
UT-San Antonio	$29,961,304	$30,797,041	$835,737	2.8%
UT-Tyler	$6,808,068	$7,273,050	$464,983	6.8%
TAMU	$77,634,227	$75,222,510	($2,411,717)	(3.1%)
TAMU-Galveston[1]	$5,115,587	$5,294,064	$178,476	3.5%
Prairie View	$10,425,353	$9,736,029	($689,324)	(6.6%)
Tarleton	$10,642,476	$11,255,396	$612,920	5.8%
TAMU-Central	$1,814,262	$1,783,400	($30,862)	(1.7%)
TAMU-CC	$12,551,685	$13,120,227	$568,543	4.5%
TAMU-Kingsville	$9,502,655	$9,687,758	$185,104	1.9%
TAMU-San Antonio	$3,375,841	$3,491,425	$115,584	3.4%
TAMI	$6,916,756	$6,873,494	($43,262)	(0.6%)
WTAMU	$8,149,015	$7,786,432	($362,583)	(4.4%)
TAMU-Commerce	$9,255,568	$9,490,908	$235,340	2.5%
TAMU-Texarkana	$1,940,676	$1,746,110	($194,566)	(10.0%)
UH	$51,086,755	$51,058,274	($28,481)	(0.1%)
UH-Clear Lake	$7,245,375	$8,070,923	$825,548	11.4%
UH-Downtown	$10,843,704	$10,213,554	($630,151)	(5.8%)
UH-Victoria	$3,659,177	$3,163,925	($495,252)	(13.5%)
Midwestern	$5,730,515	$5,505,211	($225,304)	(3.9%)
UNT	$35,617,452	$35,627,705	$10,253	0.0%
UNT-Dallas	$1,996,490	$2,089,945	$93,455	4.7%
SFA	$12,766,438	$12,990,560	$224,121	1.8%
TSU	$11,759,393	$10,463,195	($1,296,197)	(11.0%)
TTU	$49,556,981	$49,848,761	$291,780	0.6%
Angelo	$6,485,475	$7,166,653	$681,178	10.5%
TWU	$13,626,407	$13,848,047	$221,640	1.6%
Lamar	$11,779,379	$10,247,640	($1,531,740)	(13.0%)
Sam Houston	$18,255,698	$19,003,939	$748,241	4.1%
TXST	$36,841,758	$41,141,799	$4,300,041	11.7%
Sul Ross	$2,824,592	$2,563,444	($261,148)	(9.2%)
Sul Ross-Rio Grande	$391,477	$316,432	($75,045)	(19.2%)
TSTC-Harlingen	$4,997,493	$9,826,376	$4,828,883	96.6%
TSTC-West Texas	$1,688,387	$2,235,274	$546,887	32.4%
TSTC-Marshall	$908,718	$1,575,985	$667,266	73.4%
TSTC-Waco	$5,363,194	$8,911,000	$3,547,806	66.2%
Lamar-IOT	$2,147,816	$2,236,081	$88,264	4.1%
Lamar-Orange	$1,809,897	$1,618,559	($191,338)	(10.6%)
Lamar-Port Arthur	$2,428,884	$1,844,635	($584,249)	(24.1%)
Total	**$727,673,378**	**$727,673,378**	**$ 0**	**0.0%**

[1] Includes adusted net square feet of 155,309 for TAMU-Galveston's Marine and Maritime Academy Infrastructure.

Institution	2016-2017 Infrastructure formula	Adjusted rate 2016-2017 Infrastructure formula	Redistribution using adjusted rate	Percent Change
UT-SMC	$ 52,864,580	$ 52,100,844	($763,736)	(1.4%)
UT-MB-Galveston	$ 27,363,898	$ 27,582,722	$218,824	0.8%
UT-HSC-Houston	$ 42,889,268	$ 42,774,336	($114,932)	(0.3%)
UT-HSC-San Antonio	$ 29,597,624	$ 27,872,694	($1,724,930)	(5.8%)
UT-MD Anderson	$ 58,991,976	$ 56,303,398	($2,688,578)	(4.6%)
UT-HSC-Tyler	$ 2,270,154	$ 2,625,284	$355,130	15.6%
TAMU-SHSC	$ 16,826,104	$ 18,030,130	$1,204,026	7.2%
North Texas HSC-Fort Worth	$ 10,832,190	$ 10,259,976	($572,214)	(5.3%)
Texas Tech-UHSC	$ 17,732,098	$ 21,077,002	$3,344,904	18.9%
Texas Tech-UHSC-El Paso	$ 6,046,206	$ 6,787,712	$741,506	12.3%
Total	**$ 265,414,098**	**$ 265,414,098**	**$ 0**	**0.0%**

Appendix D – Statewide Space Usage Efficiency (SUE)

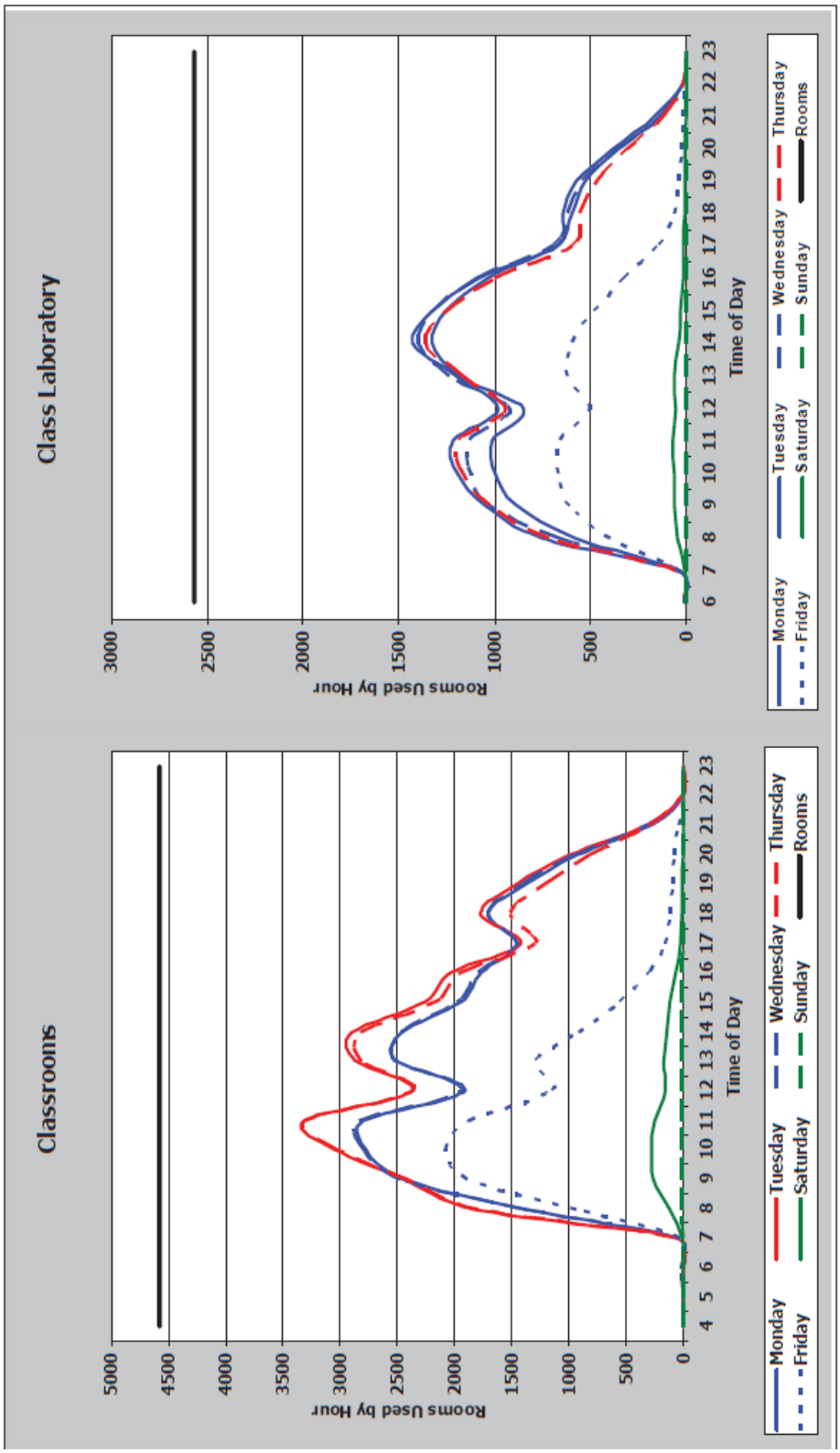
Institution	Overall Score	Classroom Score	Class Lab Score
Statewide	158	75	83

Classroom						
	Demand	Weighted Score	Utilization	Weighted Score	Average Percent Fill	Weighted Score
	41	27	32	16	68%	32

Classroom Weighted Scoring						
Score (weight = 9)		Score (weight = 8)		Score (weight = 8)		
45 or >	36	38 or >	32	65% or >	32	
38 - 44.9	27	34 - 37.9	24	55 - 64.9	24	
31 - 37.9	18	30 - 33.9	16	45 - 54.9	16	
< 31	9	< 30	8	< 45%	8	

Class Laboratory						
	Demand	Weighted Score	Utilization	Weighted Score	Average Percent Fill	Weighted Score
	34	27	25	32	72%	24

Class Laboratory Weighted Scoring						
Score (weight = 9)		Score (weight = 8)		Score (weight = 8)		
35 or >	36	25 or >	32	75% or >	32	
30 - 34.9	27	20 - 24.9	24	65 - 74.9	24	
25 - 29.9	18	15 - 19.9	16	55 - 64.9	16	
< 25	9	< 15	8	< 55%	8	



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Texas Higher Education Coordinating Board

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