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AUTHOR Gonzalez, J. E.  
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## ABSTRACT

The purpose of a study of the cost of providing nonteaching educational services was to determine the per-pupil cost of commonly offered high-cost programs in regular and vocational education. Regular and vocational education program cost data were collected from nine Texas school districts representing a variety of geographic areas and district characteristics. Per-pupil costs of nonteaching educational services were calculated by summing base cost, outfitting cost, and consumable goods cost. The results were rank-ordered to determine high-cost programs in regular and vocational education. The study identified three readily accessible data sources, refined a data collection methodology, and developed an algorithm for analyzing the resulting program cost data. The most salient finding was that high-cost programs were typically taught in specialized instructional areas and/or required specialized equipment. Data suggested that, as instructional areas become more specialized, the base cost and outfitting cost increases; with increasing specialization, consumable costs also increase. (Appendixes include the data collection instrument and data grid.) (Author/YLB)

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## The Per-Pupil Cost of Regular and Vocational Education Programs

J. E. Gonzalez

Texas Center for Educational Research  
Austin, Texas

Running Head: Per-Pupil Cost Study

Correspondence: J. E. Gonzalez  
Texas Center for Educational Research  
P. O. Box 2947  
Austin, Texas 78768  
(512) 467-0222 (ext. 6314)

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The views expressed herein are those of the author.

## The Per-Pupil Cost of Regular and Vocational Education Programs

### Abstract

Studies of educational program cost differentials as specified in Section 16.202 of the Texas Education Code are conducted biennially. Under contract with the Legislative Education Board (LEB) and the Texas Education Agency (TEA), the Texas Center for Educational Research (the researcher) conducted a study on the cost of providing non-teaching educational services. Regular and vocational education program cost data was collected from nine Texas school districts representing a variety of geographic areas and district characteristics. Per-pupil costs of non-teaching educational services were calculated by summing base cost, outfitting cost, and consumable goods cost. The results were rank-ordered to determine high-cost programs in regular and vocational education. The study identified three readily accessible datasources, refined a data collection methodology, and developed an algorithm for analyzing the resulting program cost data. The results of the present study and of other studies mandated by Senate Bill 351(SB 351), 72nd Regular Session, were included in an LEB and LBB staff report to the Legislature (Dec. 1992).

### A. Statement of the Problem

In Texas public school funding formulas, the Basic Allotment represents the cost of educating a regular program student without any special educational needs. Since "it is widely recognized, however, that delivery of specialized courses to special types of students is more costly than offering the fundamentals to the average

student" (TEA-RFP: 701-92-024, p. 3), an upward adjustment in the form of a weight, is made to the Basic Allotment for non-average students in bilingual, gifted and talented, compensatory, special, and vocational education programs.

Under current law (SB 351), for the 1991-92 school year (the period during which the study was conducted), the Basic Allotment was set at \$2,200. Additional programmatic entitlements include: special education allotment (based on weighted full-time equivalents (FTEs)); vocational education allotment (based on FTEs times a program weight of 1.37); gifted and talented education allotment (based on students in average daily attendance (ADA) times a program weight of .12); compensatory education allotment (based on students on the National School Lunch Program times a program weight of .2, plus the number of pregnant student FTEs times a program weight of 2.41); and, bilingual education/ESL allotment (based on ADA times a program weight of .1), (TASB, 1992). Prior to the program weight adjustments, though, the Basic Allotment is first adjusted by the Cost of Education Index (CEI) and the Small District Adjustment (SDA), on a per-pupil basis.

For the 1991-92 school year, the total revenue for public education was estimated to be \$15.5B, with a 40% (\$6.3B) state share, a 7% (\$1.2B) federal share, and 53% (\$8B) share generated at the local-level (TEA: PEIMS Budget Data). Of these revenues, a total of \$8.8B were dedicated to operating expenditures for educational programs (\$5.9B for regular education, \$364M for vocational education, \$225M for bilingual/ESL education, \$1B for compensatory education, \$149M for gifted and talented education, and \$1.2B for special education).

The biennial studies of program cost differentials as mandated by SB 351 are intended to provide current research-based information to be used in determining the expense of educational programs, expressed as program funding dollar amounts, and as weights to be applied to the Basic Allotment. The Study on Non-Teaching Services for the High-Cost Courses in the Regular and Vocational Education Programs (the Per-Pupil Cost of Regular and Vocational Education Programs Study) as funded by the LEB and TEA (Contract: 701-92-024), however, did not call for the calculation of program weights, instead the study called for the determination of the average per-pupil cost of non-teaching services for regular and vocational education programs, and an analysis of the cost variance across student and district characteristics.

#### B. Theoretical Framework

Although there is an existing body of literature related to the cost of education, the research effort called for in this study (determining non-teaching educational service costs) had not been undertaken before. The study was the first attempt at conducting this type of research in Texas. In Texas, previous studies of educational program costs have included teacher costs in the analysis. For example, in 1985-86 and again in 1987-88, the Accountable Costs Advisory Committee, a state-level advisory committee, used teacher salaries and an instructional cost proration approach to determine per-pupil instructional-related service costs.

In 1984-85 and again in 1987-88, the Price Differential Index Committee (PDI) developed a three-stage econometric model that separated the effects of district

personnel characteristics, wealth and tax effort characteristics, and uncontrollable characteristics that accounted for about 85 percent of the variation in teacher salaries. In SB 1019, 71st Texas Legislature, the PDI and the SDA were replaced with the CEI which is also based on the prediction of teacher salary (teacher salary accounts for the major share of school district general fund operating expenses).

Other cost studies found in the literature have focused on comparisons between regular education and occupational education programs; special education programs; and methods for estimating program costs. D. L. Smith (1989) surveyed Nevada school district administrative personnel and compared the cost of general education to occupational education, by full time equivalents (FTEs), and found that programs for occupational education students cost 63 percent more, per FTE, than programs for regular education students. In a study intended to estimate the per-pupil expense of providing special education programs, researchers (M.T. Moore; E. W. Strang; M. Schwartz; and M. Braddock, 1988) analyzed the cost of programs by staff, supplies, materials, equipment, transportation, and space associated with each program, and found that the cost ratio of special education to regular education was 2.3 to 1. T. S. Lyons and K. Forbis Jordan (1991) used the Resource Input Methodology (RIM) to develop expenditure indices for at-risk youth programs and services. The authors developed a classification system to identify prototype programs, estimate program expenditures, and assign per-pupil program weights.

### C. Summary of Methods and Procedures

Recommendations by the Accountable Costs Advisory Committees and the Price Differential/Cost of Education Index Advisory Committees are found in current Texas public school finance funding formulas. Among general findings of these committees is that teacher salaries are known to represent the largest cost associated with providing educational programs. By definition then, the Per-Pupil Cost Study (which excluded teacher salaries) focussed on the smallest cost associated with providing educational programs in regular and vocational education.

The present study utilized RIM (Lyons & Jordan, 1991) to identify the ingredients needed to determine non-teaching program costs. The study attempted to classify regular and vocational education programs conducted during the regular school year, by delivery system (standard classrooms, science laboratory/classrooms, specialized instructional areas, and gymnasiums); which would be further classified by type of cost: (1) non-teaching instructional (computers, supplies, special equipments), and (2) service delivery (plant maintenance, security, utilities). The classification scheme resulted in a service by course matrix that was used to develop a data collection instrument (see Appendix 1). Data would be collected in order to determine: (1) the cost to build and outfit instructional facilities; (2) the cost to maintain instructional facilities; (3) the daily operation costs of offering programs including consumable materials; and (4) the estimated cost of upgrading instructional facilities.

#### Conduct of the Study

The Per-Pupil Cost Study (by contract/budget constraints) was limited to nine

districts statewide. The data collection activity focused on senior high school regular and vocational education programs that taught commonly-offered courses (defined as courses taught in at least 50 percent of campuses statewide). School districts that participated in the study represented a variety of geographic areas and characteristics such as district size, wealth, and type (see Table 1).

**Table 1**Description of Sites included in the Per-Pupil Cost Study

<u>District</u>	<u>Area</u>	<u>Students</u>	<u>Wealth</u>	<u>Type*</u>	<u>High School</u>
Amarillo	North	27,374	131,764	Otr CC	Amarillo
Anson	N.W.	827	74,001	N-M Stble	Anson
Arlington	N.E.	44,892	249,893	Maj SubU	Bowie
Conroe	East	23,214	163,371	Otr CC	McCulloch
Fabens	West	2,347	34,064	N-M Fst	Fabens
Katy	East	19,363	197,557	Maj SubU	Mayde Creek
North East	Central	39,859	248,351	Maj SubU	MacArthur
Round Rock	Central	19,623	166,822	Maj SubU	Round Rock
Webb	South	288	1,602,586	Rural	Bruni

\*From TEA: Snapshot '91, where Type: Otr CC=Other Central City, N-M Stble=Non-Metro Stable, Maj SubU=Major Suburban, Otr CC Sub=Other Central City Suburban, N-M Fst=Non-Metro Fast Growing, and Rural=Rural.

One high school from each of the nine districts was selected for the study, and the data collection instrument was sent to all sites in advance of a visit by the researcher. When school districts were visited during the Spring of 1992 (in sequence: Anson, Arlington, Webb, Fabens, North East, and Round Rock; data was collected by mail and FAX from: Conroe, Katy, and Amarillo), and personnel were asked to verify the information on the survey form that related to the cost and square footage of a high school, the researcher was usually provided with a copy of a "facilities data" report used for purposes of obtaining property insurance. This type of



report included printouts of building specifications, floor plans for schools, and appraisals of value. When district personnel were asked to verify the information on the survey form that related to the cost of "outfitting" a high school, the researcher was usually provided with the district's "fixed assets list."

The data collection instrument became a framework for discussion of materials that were easily/readily made available to the researcher. Yvonna S. Lincoln and Egon G. Guba describe this type of data collection activity as "naturalistic inquiry" and they defend this type of data collection methodology as appropriate when other methods are impractical or burdensome (Lincoln and Guba, 1985). The district's general ledger, the facilities data, the fixed assets list, and in some cases, plant maintenance/operations and energy department analysis became the sources of information used by the researcher to compile data for the study.

### Analysis

The following algorithm for calculating per-pupil cost was developed:

#### Step One:

in order to calculate the cost of each program, the researcher assumed that an individual program was taught in one of four particular structures: standard classroom; science/laboratory classroom; specialized instructional area; or gymnasium.

For each of the four structures, square footage was estimated, and based on the total square footage of the overall school structure (which according to the TEA facilities director, and based on a report from an

independent architectural firm, was adjusted by 30 percent to reflect the "dead" space required for circulation and maintenance), and on the annualized value of the overall structure (estimated by the researcher to be 20 years), the value for each structure was then divided by the average number of pupils in each program.

The result is an adjusted and annualized per-pupil cost for each of the four structures, which can then be translated into the base costs for individual programs.

#### Step Two:

For each individual program, taught in each of the four structures, the annualized value of the fixed assets (estimated by the researcher to be 10 years) for each of those structures, was then divided by the average number of pupils in each program.

The result is an adjusted and annualized per-pupil cost for the fixed assets for each of the four structures, which can then be translated into the outfitting costs for individual programs.

#### Step Three:

For each individual program, taught in each of the four structures, the annual budgets pertaining to consumable goods, etc., were then divided by the average number of pupils in each program.

The result is an adjusted and annualized per-pupil cost for consumable goods, etc., for each of the four structures, which can then be translated

into the consumable costs for individual programs.

Step Four:

The sum of the base cost, the outfitting cost, and the consumable costs totals the per-pupil cost of each individual program.

Step Five:

The total per-pupil cost of each individual program were then used to identify the "high-cost" programs in regular and vocational education.

Results

Please refer to Appendix 2 for the data that was used in the analysis. Compiled district averages were used in the calculations. In the case of English Language Arts, for example, which is taught in a regular education classroom of about 744 square feet, it was estimated that approximately 17 students would be in attendance. The annualized value of a regular education classroom (base cost) that serves 17 students was estimated to be approximately \$126 per-pupil (please see column 4). The annualized fixed assets for such a classroom (outfitting cost) were estimated to be approximately \$15 per-pupil (please see column 5). Based on budgeted amounts for English Language Arts (consumable cost), it was estimated that the per-pupil costs would total \$439 (please see column 7). The per-pupil cost of an English Language Arts class is therefore estimated to total \$580. Similar calculations were conducted for each program in regular education and vocational education.

List of High-Cost Departments

The results of the analysis are summarized in Table 2, which presents a rank-ordered

list of the per-pupil costs of high-cost programs in regular and vocational education.

**Table 2**

Per-Pupil Cost of High-Cost Programs in Regular and Vocational Education

Regular Education:

<u>Subject Area</u>	<u>Cost</u>
Fine Arts	\$1,351
Business Education	\$1,216
Driver Education	\$830
Science	\$618
English Lang. Arts	\$580
Physical Education	\$502
Mathematics	\$434
Social Studies	\$272
Other Language	\$226
Military Science	\$193
Health Education	\$118
Computer Science	n/a

Vocational Education:

<u>Subject Area</u>	<u>Cost</u>
Occupation Experience	\$3,694
Trade and Industrial	\$1,134
Office Education	\$627
Industrial Technology	\$476
Agri Science	\$358
Home Economics	\$355
Health Occupation	\$291
Marketing Education	\$228
Career Investigation	n/a

**D. Results and Conclusions**

The study determined the per pupil cost of commonly-offered high-cost programs in regular and vocational education. The combination of missing data and the wide range of values in the data that was collected, though, limits discussion of results. The study built a picture of current average per-pupil cost of non-teaching service delivery for programs in regular and vocational education. The most salient finding in this study is that high-cost programs are typically taught in specialized instructional areas and/or that require specialized equipment. The data suggests that as instructional areas become more specialized, the base cost and outfitting cost increases. With increasing specialization consumable costs also increase.

The study was not able to determine non-teaching costs, differentiated into

instruction-related costs (computers, supplies, special equipment, and assistant staff) and service delivery costs (plant maintenance and security, utilities, administration, etc.). The study was also not able to analyze the cost variance across student and district characteristics. Should this study be replicated with more complete data, the actual per-pupil costs of high-cost programs will certainly differ, but the relative rank-order of program cost should stay the same.

#### E. Educational Significance of the Study

This study is significant from a methodological perspective. While alternative methodologies have been utilized in past cost of education research efforts, the present study identified three readily accessible sources of program cost information, refined a data collection methodology, and also developed an algorithm for calculating per-pupil costs (for a full description of the conduct of the study as presented to the LEB and TEA, please refer to: Clark & Gonzalez, 1992).

This study may also prove to be significant from a policy perspective. While it has been shown in previous research that the majority of the cost of regular and vocational education is related to instructional salary, this study identified and calculated the non-instructional per-pupil costs associated with educational programs. The results of the present study and of other studies mandated by SB 351, 72nd Regular Session, were included in an LEB and LBB staff report to the Legislature, on public education special cost studies (December, 1992, pp. 2.24-2.27).

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**APPENDIX 1**  
**Data Collection Instrument**

The Study of Non-Instructional Costs of High-Cost Courses in Regular Education and  
Non-Instructional Costs of Vocational Education

REVISED DATA COLLECTION INSTRUMENT

In an attempt to determine:

- (1) the cost to build and outfit instructional facilities
- (2) the cost to maintain instructional facilities
- (3) the daily operation costs of offering courses including consumable materials
- (4) the estimated cost of upgrading instructional facilities

The information to be collected relates only to:

- (1) senior high school regular and vocational education programs
- (2) "commonly-offered" courses taught in at least 50% of state campuses

This study will focus on four types of instructional areas:

- (1) standard classrooms
- (2) science/laboratory classrooms
- (3) specialized instructional areas
- (4) gymnasiums

Please refer to the "High-Cost Courses Preliminary Report" for additional information.

Please return to:

J. E. Gonzalez  
Texas Center for Educational Research  
P.O. Box 2947  
Austin, Texas 78768-2947  
(512) 467-0222  
FAX: (512) 467-6927



**For an Average Standard Classroom:**

Size: square feet \_\_\_\_

Form: rectangle \_\_\_\_ or other shape \_\_\_\_ (specify: L \_\_\_\_ x W \_\_\_\_ )  
windows \_\_\_\_, doors \_\_\_\_, etc.

Vertical Teaching: \_\_\_\_ linear feet of chalkboard  
\_\_\_\_ linear feet of tackboard, etc.

Service Area(s): student: shelves  
cabinets, etc.  
teacher: lockable teacher's locker with shelf, rod and hook  
shelves  
cabinets, etc.  
material: shelves  
cabinets, etc.

Mechanical: \_\_\_\_ # of electrical outlets on each wall (voltage?)  
\_\_\_\_ Clock, and \_\_\_\_ P. loudspeaker?  
\_\_\_\_ coaxial cable for television and institutional loop?  
\_\_\_\_ etc.(eg. telephone)

Estimate the average age of this standard classroom: \_\_\_\_\_

At the time of construction, estimate the cost of this standard classroom: \_\_\_\_\_

Estimate the annual (12 month) cost of utilities and maintenance for this standard classroom. \_\_\_\_\_ utilities  
\_\_\_\_\_ maintenance (please specify):

Given the age of this standard classroom, will this classroom have to be "upgraded" in any fashion over the next five years \_\_\_\_\_, or over the next ten years \_\_\_\_\_?

By your definition, "upgrading" this standard classroom will include:

- new fixtures
- new wiring
- new lighting
- new other (Please specify):

Please detail the location or placement, square feet or linear feet, or description, etc.:

**Estimate the average age of this Science/Laboratory classroom: \_\_\_\_\_**

**At the time of construction, estimate the cost of this Science/Laboratory classroom:**

Estimate the annual (12 month) cost of utilities and maintenance for this Science/Laboratory classroom:

\_\_\_\_\_ utilities  
\_\_\_\_\_ maintenance (please specify):

Given the age of this Science/Laboratory classroom, will this classroom have to be "upgraded" in any fashion over the next five years \_\_\_\_\_, or over the next ten years \_\_\_\_\_?

**By your definition, "upgrading" this Science/Laboratory classroom will include:**

new fixtures  
new wiring  
new lighting  
new other (Please specify):

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**Estimate the cost to upgrade this Science/Laboratory classroom:**

Please detail the location or placement, square feet or linear feet, or description, etc.:

Estimate the average age of this Specialized Instructional Area:

Estimate the annual (12 month) cost of utilities and maintenance for this Specialized Instructional Area: \_\_\_\_\_ utilities  
\_\_\_\_\_ maintenance (please specify): \_\_\_\_\_

Given the age of this Specialized Instructional Area, will this Specialized Instructional Area have to be "upgraded" in any fashion over the next five years \_\_\_\_\_, or over the next ten years \_\_\_\_\_?

By your definition, "upgrading" this Specialized Instructional Area will include:

- new fixtures
- new wiring
- new lighting
- new other (Please specify):

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**Estimate the cost to upgrade this Specialized Instructional Area:**

**Please detail the location or placement, square feet or linear feet, or description, etc.:**

Estimate the cost to upgrade this Gymnasium: 20

## Part Two:

Relating to each of the four types of instructional areas detailed in your responses to Part One Questions on pp. 2-5, please list and cost fixtures for:

## (1) Standard Classroom

List of Fixtures (#)	Unit Cost	Additional Fixtures (#) list:	Unit Cost
Student Desks _____	_____		
_x_ Tables _____	_____		
Chairs _____	_____		
Teacher Desk _____	_____		
Teacher Table _____	_____		
Teacher Chair _____	_____		
Wastebasket _____	_____		
Pencil Sharpener _____	_____		
_x_ Bulletin Boards _____	_____		
_x_ Liquid Chalkboard _____	_____		
__ Drawer Files _____	_____		

## (2) Science/Laboratory Classrooms

List Fixtures

Detail Costs

please specify fixtures and costs for Biology, Chemistry, Physical Science, etc.

please attach information on separate pages.

## (3) Specialized Instructional Areas

List Fixtures

Detail Costs

please specify fixtures and costs for Art, Band, Journalism, etc.

please attach information on separate pages.

## (4) Gymnasiums

List Fixtures

Detail Costs

(and equipment)

please attach information on separate pages.

## Part Three:

Data from TEA was used to identify the following courses as "commonly-offered" courses taught in at least 50% of high school campuses.

For each of the following regular and vocational education courses, please indicate

(1) the TYPE of room that is required for conducting the class

where           1=standard classroom,  
                  2=science/laboratory,  
                  3=specialized instructional area,  
                  4=gymnasium, or n/a;

(2) indicate the Average Number of Students in each course; and,

(3) indicate and cost the Additional Consumable materials that are required to conduct this course.

	<u>TYPE</u>	<u>Average Students</u>	<u>Additional Consumable/Cost</u>
<u>Regular Education:</u>			

## English Language Arts

English I  
English II  
English III  
English IV  
Correlated Language Arts I  
Correlated Language Arts II  
Correlated Language Arts III  
Correlated Language Arts IV  
Adv. Journ: Yearbk/Lit Mag I  
Reading Improvement  
Journalism  
English for Spk of Oth Lang I  
Intro to Speech Comm

## Mathematics

Algebra I  
Pre-Algebra  
Geometry  
Algebra II  
Fundamentals of Mathematics  
Consumer Mathematics  
Informal Geometry  
Trigonometry  
Computer Mathematics I  
Calculus

	<u>TYPE</u>	<u>Average Students</u>	<u>Additional Consumable/Cost</u>
Science			
Earth Science			
Life Science			
Physical Science			
Biology I			
Chemistry I			
Intro Biology			
Physics I			
Intro Physical Science			
Biology II			
Social Studies			
U. S. History			
World History Studies			
U. S. Government			
World Geography			
Economics w/ Emph Free Enterpr			
Health Education			
Health Education			
Physical Education			
P.E. I			
P.E. Equivalent			
P.E. II			
P.E. III			
Other Languages			
Spanish I			
Spanish II			
French I			
Fine Arts			
Band I			
Art I			
Theater Arts I			
Band II			
Band III			
Band IV			
Art II			
Choral Music I			

	<u>TYPE</u>	<u>Average Students</u>	<u>Additional Consumable/Cost</u>
Business Education			
Typewriting			
Accounting			
Personal Business Management			
Adv Typewriting/Word Process			
Military Science			
Computer Science			
Driver Education			

Vocational Education:

Industrial Technology			
Intro Industrial Technology I			
Home Economics			
Comprehensive Home Economics			
Life Management Skills			
Food Science and Nutrition			
Individual and Family Life			
Parenting/Child Development			
Trade & Industrial			
Agricultural Science and Technology			
Intro to World Agriculture			
Wildlife and Recreation MGT			
Intro to Agricult Mech			
Marketing Education			
Office Education			
Health Occupation			
Career Investigation			
VEH Occupation Exp			



APPENDIX 2  
Data Grid

Composite ISD High-Cost Course/Department Cost Data  
Preliminary Analysis on "Averaged" Data  
Sorted Within Program by Total per-pupil Cost

	Avg Room Sq. Ft.	Avg No. of Sids.	p/p Base Cost	Avg Fixed Assess	p/p Outfitting Cost	Budget	Consumable Cost	p/p Total Cost
<u>Regular Education</u>								
Fine Arts	1,338	26	140	13,373	478	20,544	734	1,351
Business Education	984	20	146	5,960	303	15,067	766	1,216
Driver Education	567	25	66	1,729	69	17,367	695	830
Science	1,160	27	128	3,610	136	9,380	354	618
English Language Arts	744	17	126	268	15	7,611	439	580
Physical Education	10,282	68	440	2,239	33	1,988	29	502
Mathematics	724	22	96	854	39	6,578	299	434
Social Studies	705	24	85	238	10	4,329	178	272
Other Language	707	21	97	317	15	2,431	114	226
Military Science	1,000	27	108	1,729	64	554	21	193
Health Education	788	26	89	158	6	618	24	118
Computer Science	0	0	0	0	0	0	0	0
<u>Vocational Education</u>								
Occ Experience	6,260	16	601	23,578	1,474	25,904	1,319	3,694
Trade and Industrial	2,972	20	228	7,800	390	10,321	516	1,134
Office Education	1,033	20	79	4,371	219	6,578	329	627
Industrial Technology	1,414	30	72	3,543	118	8,576	286	476
Agri Science	6,596	50	203	2,731	55	6,375	127	385
Home Economics	1,914	22	137	1,118	52	3,578	166	355
Health Occupation	1,400	20	108	38	2	3,637	182	291
Marketing Education	1,061	20	82	698	35	2,225	111	228
Career Investigation	0	0	0	0	0	0	0	0

	Adj Sq. Ft.	Annualized Value
HS Structure	135,711	397,022
Vocational Bldg	18,556	28,519

27

25