A Study of the Differential Prediction of Community College Grade Point Average

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A STUDY OF THE DIFFERENTIAL PREDICTION OF COMMUNITY COLLEGE GRADE POINT AVERAGE

by

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CHAPTER I

INTRODUCTION

The 136-year history of the public junior community college movement is rooted in the private two-year college, the first being Monticello College (1835) and the second, Susquehanna University (1858) (Sack, 1959). From the time of its inception to the present, the community college movement has been subject to change, influenced mostly by the needs of students and society. Traditionally, formal education has been directed toward the prestigious occupations of ministry, law, and medicine. The Morrill Act of 1862 and the early land-grant colleges significantly changed this perspective and focused on the needs for educating students for the practical and necessary occupations of agriculture and technologies.

As the complex nature of our industrial society increased, more and more emphasis was placed on skills required to enter the job market. Industrialization had a profound influence on the community college movement; short courses were offered in business, secretarial skills, auto mechanics, machine technologies, and health services, to mention a few. The contemporary community college is viewed by many as a flexible institution designed to meet the educational needs of the post-high

school population by offering courses and services in the following five areas:

1. Liberal Arts and Science course--usually the first two years of college--designed to transfer to a senior school.

2. Vocational and Technical programs in trades, industry, agriculture, and semi-professional fields.

3. Non-credit courses for adults on a non-transfer basis.

4. Individual student services, including guidance and counseling, assistance in career selection.

5. Efforts to meet the cultural, civic, recreational, and other needs of the community (Blocker et al., 1965, p. 33).

The community college espouses a philosophy far broader and more directed to the student needs than do most schools of higher education. It is little wonder that community colleges have experienced rapid growth in the states that have higher technical and educational needs.

The Carnegie Commission on Higher Education, in its special report and recommendations of June 1970, projected future enrollment in community colleges based on three assumptions.

> Assumption A.--The proportion of undergraduates in the two-year college will remain the same as that of 1968 (29 percent).
>
> Assumption B.--Of the future growth in enrollment, 60 percent will be absorbed in the two-year college. (This 60 percent figure has been exceeded in four states during the past five year period.)

> Assumption C.--The future annual increase in the percentage of undergraduate enrollment in the two-year colleges in each state will be the same as that estimated for each state from data for the past five-year period.

The three projections of two-year college enrollment--including degree-credit and non-degree credit enrollment--range from 3,100,000 to 4,400,000 in 1980 (Carnegie Commission, 1970).

Table 1 presents the differences in projected enrollment based on projections B and C.

TABLE 1

Enrollment in Two-Year Institutions of Higher Education, Actual 1968 and Projected to 2000, in Numbers and as a Percentage of Total Undergraduate Enrollment and Total Enrollment in Higher Education

Year	Number		Percent of Undergraduate Enrollment		Percent of Total Enrollment	
	Projection B	Projection C	B	C	B	C
1968	1,870,000	1,870,000	29	29	25	25
1975	3,560,000	3,110,000	38	33	32	28
1980	4,430,000	3,740,000	41	35	34	28
1985	4,280,000	3,610,000	42	35	33	27
1990	4,380,000	3,690,000	42	35	33	28
1995	5,340,000	4,400,000	44	36	35	29
2000	6,620,000	5,340,000	46	37	36	29

Source: Carnegie Commission on Higher Education

The 1980 projected figures indicate that the student enrollment in two-year programs will more than double what

they were in 1968, and by the year 2000 they will more than triple the 1968 enrollment figure.

The projected enrollment for public two-year colleges in the State of Michigan follows the more conservative estimate of Assumption C for the year 1980 (Michigan Department of Education, 1969), as can be seen in Table 2.

Table 2 presents the actual and projected enrollment figures for the State of Michigan for selected years.

The actual enrollment figures for the years 1963 to 1967 and the projected enrollment figures for the years 1970 to 1980 indicate clearly that only the public two-year college in Michigan is increasing its percentage of total enrollment. Both the private and the public four-year schools reflect a reduction in percentage of total enrollment. The continued expansion of the public two-year school seems to influence the enrollment figures for private schools more than it does for public four-year schools. Fall enrollment figures for public two-year schools for 1970 indicate the 1969 estimates err on the conservative side. Instead of having 109,200 students enrolled, there were 125,533 students, an under-estimate of 16,353 students. In 1969 it was estimated that the 1970 two-year public schools of higher education would enroll 27.5 percent of the total students enrolled in schools of higher education. Actually, the 1970 enrollment was 31.7 percent, an underestimation of 4.2 percent

TABLE 2

Credit Enrollment Projections in Michigan Institutions of Higher Education

Based on 1963-67 Actual Enrollments
and 17-24 Age Groups

Year	Public 4-Year		Public 2-Year		Private		Total Enrollments	
	Number	Percent of Total Enrollment	Number	Percent of Total Enrollment	Number	Percent of Total Enrollment	Number	Ratio of Total Enrollment to Number 17-24 Age Group
Actual								
1963	128,228	61.6	38,692	18.6	41,290	19.8	208,210	.236
1964	143,822	61.6	46,557	20.0	43,146	18.5	233,525	.253
1965	166,782	61.6	57,363	21.2	46,773	17.3	270,918	.284
1966	176,331	59.6	69,504	23.5	50,070	16.9	295,905	.294
1967	187,565	59.1	78,660	24.8	51,241	16.1	317,466	.301
Projected								
1970	228,880	57.6	109,200	27.5	59,200	14.9	397,300	.330
1975	298,200	55.1	175,900	32.5	67,100	12.4	541,200	.390
1980	344,100	53.6	227,900	35.5	70,000	10.9	642,000	.450

(HEGIS, 1967 to 1971).

Inasmuch as the public two-year schools of higher education in Michigan are increasing in student enrollment, it would be beneficial to take a close look at certain student characteristics in hopes of better understanding student needs and potentials, so future programs will be designed to better serve them and society.

Lake Michigan College (LMC)

The community college of particular interest to this study is Lake Michigan College, Benton Harbor, Michigan. LMC was established in 1946 as an educational extension of the Benton Harbor Public School District. At that time it was called the Benton Harbor Junior College and was supported by the same tax subscription district as the K-12 program. College classes were originally held in the high school from 4:00 P.M. to 11:00 P.M. In 1954 the Board of Education renamed the Junior College, the Community College and Technical Institute.

In 1959 a new facility was built to house the growing community college. About $200,000 was earmarked for a new science building on campus. In 1962 the Whirlpool Foundation financed and built the Louis Cassius Upton Memorial Technical Center. The building was finished and occupied in June of 1963. In the same year the electorate of Berrien County voted to establish and support a county-wide

community college district. Plans were made to relocate the rapidly expanding community college to new and larger facilities designed to accommodate 5,000 students. At present the new campus is located on 259 acres of land situated between I-94 and I-96. Phase I--the limited liberal arts and science wing--was completed and occupied in 1969. Phase II expanded the liberal arts and science capacity of the school and added a multi-purpose health education facility and an administrative "bridge." Phase III is expected to be finished after 1972 and will house the technologies and certain vocational facilities (LMC Catalog).

Lake Michigan College has grown from fewer than 100 students in 1954 to its present size of 3,800 full-time equivalent enrollment (North Central Report--LMC). This growth of student population has seen an addition of over 500 students per school year for the past three years, with a promise of continued steady growth for years to come.

Lake Michigan College has expanded not only in student numbers over the past years, but also in terms of courses offered to the students. With rapid expansion has come a need to offer different subject matter to students of differing abilities, interests, and personalities. Too many times the expansion of the college has outstripped its knowledge of how well it is meeting the needs of the

students it serves and how successfully the students are meeting the standards of the courses offered.

Statement of the Problem

Traditionally, the community college maintains an open-door policy, allowing all applicants to enter regardless of prior academic performance. Too many times the student is motivated by unrealistic wishful thinking when he selects courses to study. This often leads to failure and disappointment because the student has attempted a course of study too difficult for him. If information were available that would allow the student more insightful counseling about his ability levels and his chances of success, he might then select courses in keeping with his talents that could lead to greater probability of academic success.

If more precise indices of predicting academic outcome were employed, it is assumed that: (1) students would better understand their probable chance of success in a given curriculum; (2) better-placed students would be encouraged to continue their education to a more meaningful level related to their ability and expectations; (3) the college would enjoy a more favorable reputation in the community as a means of serving individual needs; (4) the college would have a better understanding of the value of the placement and entrance instruments; and

(5) with accurate knowledge of the value of present predictive instruments, plans could be made to improve future prediction by asking for more relevant information from the high school or the applicant before admission to the college.

Fricke (1956) raises an interesting question when he states that "high predictive accuracy is undesirable because it implies an inability on the part of the colleges to challenge good students or to help poor ones." If we assume the basic purpose of education is to constructively change behavior to meet the needs of the individual and society, high predictive efficiency would imply that human behavior, once it is diagnosed, was unchangeable regardless of the nature of the experiences it faced. Such an admission would be tantamount to admitting ineffectiveness in producing change in students. If, when the student enters a program, we know precisely how much he will change, or if indeed he will change at all, we have in essence removed the variability factor from the human personality. Fricke continues his discussion by stating the "predictive researchers should be continually at work to improve their techniques while guidance personnel and faculty should be constantly involved in reducing the efficiency of predictive techniques via special guidance, tutoring, and incentive programs to stimulate the student on to greater achievement."

The scientific approach implies that man must observe, understand, predict, and control. If observations are objective in nature, more precise understanding is possible. A thorough understanding of the phenomenon under study necessarily leads one to predict that certain outcomes will take place when antecedent conditions are met. When prediction is precise, controls then may be imposed more effectively to the greater advantage of all concerned.

It is the intent of this study to address itself to the problem of evaluating the efficacy of certain available indices in predicting student grade point average for students at LMC. It is felt that the available predictive indices differentially predict student grade point average, relative to the moderator variables of high school origin, sex, and academic curriculum undertaken. The predictor variables for this study will be the amount of interruption between high school and college and the five American College Testing Program scores of English, Mathematics, Social Science, Natural Science, and a Composite score. Only students with ten or more accumulated semester hours or more will be included in this study.

Moderator Variables

For purposes of this study, the term "moderator variable" is defined as a category or class to which a subject would be a member that could differentially effect

the relationship between predictors and criteria.

High school origin

It is thought by some educators that students from smaller high schools tend to be handicapped when they attend college. Reasons for this tend to be related to limited curriculum, lower teacher preparation and experience, and lower amount of money spent per student in the smaller high schools.

Larger high schools often are able to track their students into college preparatory curricula. The accelerated courses help prepare the student for better study habits in college by placing a greater premium on academic excellence.

It is hypothesized that: (1) students from large high schools will have higher mean college GPA than students from small high schools; (2) students from large high schools will have higher mean ACT Composite scores; and (3) predictions of academic success will be more accurate for students from large high schools than it will be for students from small high schools.

Sex differences

The sex of an individual often determines what treatment he will be accorded by society. Our society expects sex-appropriate behavior from its members and often moves

to insure an acceptable level of conformity. Parents expect boys to be more active, assertive, and "thing" oriented; whereas girls are expected to be more passive, cooperative, and people oriented. When a child reaches school age, sex identification patterns are generally well established. The more active assertive behavior of boys is often inappropriate for school success. Teachers tend to reward cooperative behavior more than active behavior. Indeed, elementary teachers consider discipline a greater problem with boys than it is with girls.

Generally, girls tend to have higher mean GPA than boys, and they also tend to score higher mean ACT subtests (ACT Technical Report, 1965). It may be that the general reward system for sex-appropriate behavior prepares the females in our society to score higher on standardized tests and to gain higher grade point averages in school.

It is hypothesized that: (1) females will have a higher mean GPA at LMC than males; (2) females will have higher mean Composite ACT scores than males; and (3) the relative effectiveness of the ACT scores and amount of interruption as predictors will vary as a function of sex.

Curriculum

The curriculum at LMC is divided into two sections--transfer and non-transfer. The transfer curriculum is

designed to meet the needs of those students who plan to continue their education into a third and fourth year at a senior college. Basically, the transfer curriculum is considered comparable to that of any reputable four-year institution.

The non-transfer curriculum is made up of courses considered acceptable for job entry at the end of one or two years. In the main, these courses are not considered transferable to a senior institution.

A priori logic suggests that students who enter a non-transfer curriculum might be quite different from those who enter the transfer curriculum. The non-transfer students might be expected to be less able intellectually and less academically motivated than those in the transfer curriculum, and as such they might be expected to register lower GPA and ACT scores than the transfer students.

The hypotheses to be tested are: (1) students in the transfer curriculum will tend to have higher mean college GPA than students in the non-transfer curriculum; (2) students in the transfer curriculum will tend to have higher mean composite ACT scores than the students in the non-transfer curriculum; and (3) the relative effectiveness of ACT test scores and amount of interruption, as predictors, will vary as a function of curriculum.

Predictor Variables

Interruption

Interruption is the amount of time that elapses between the termination of high school and the onset of college.

Most of the community college students come directly from high school into college with no interruption; however, there is a segment of the community college population that does have one or more years of interruption.

Interruption might offer the student more insight into his goals and ambitions and hence produce a more mature response to the demands of the college task. The Epler study (1947) of the returning veterans after World War II indicates the superior academic performance of the older student. Doty (1967) found the more mature co-ed student (median age 25) able to adjust successfully to the demands of the undergraduate academic life and compete successfully with the younger co-ed student.

It is hypothesized that: (1) interruption will significantly add to the prediction of GPA at all levels; (2) interruption is positively correlated with GPA; and (3) interruption is positively correlated with ACT scores.

American College Testing Program

The ACT is a standard entrance examination given to

incoming students. It is used primarily to assist in admitting and placing the student in appropriate courses. This test yields scores on English, Mathematics, Social Science, Natural Science, and a Composite score, which is an average of the four academic area scores.

> The English usage examination is an 80-item, 50-minute test that measures the student's understanding and use of the basic elements in correct and effective writing; punctuation, capitalization, usage, phraseology, style, and organization.
>
> The Mathematics usage test is a 40-item, 50-minute examination that measures the student's mathematical reasoning ability. This test emphasizes the solution of practical quantitative problems which are encountered in many college curricula.
>
> The Social Studies reading examination is a 52-item, 40-minute test that measures the evaluative reasoning and problem solving skills required in the social studies.
>
> The Natural Science reading examination is a 52-item, 40-minute test that measures the critical reasoning and problem solving skills required in the natural sciences (Lindquist, 1960).

The underlying concept is that the best way to predict college performance is to measure as directly as possible those academic skills needed to succeed in college. It is hypothesized that the ACT is an effective predictor of college grade point average.

CHAPTER II

REVIEW OF LITERATURE

Objective prediction finds its early roots in France, where the first intelligence test was developed. The instrument was developed by Binet and Simon. Ruch (1967) recounts the circumstances that led to its development.

In 1904, the Minister of Public Instruction in France formed a commission of medical men, educators, scientists, and public officials to study the problem of how to teach the feeble-minded children in the public schools. The important work of this commission was done by Binet, a psychologist, and Simon, a physician. These men believed that, before a program of instruction could be planned, it was necessary to work out some way of measuring the intelligence of the children they were to study.

This early beginning led finally to the proliferation of test instruments designed to describe and ultimately predict the behavior of people in virtually every mode of human endeavor.

With the development of test instruments, there was a parallel expansion of statistical sophistication and usage to aid the researcher in his understanding of his data. This led to an increased number of studies that sought to understand the relationship between test scores

and future performance.

Prediction

An early and ready target for this technique was school performance. One of the earliest studies of prediction of academic success was done by Lincoln (1917), with an early version of the College Entrance Examination Board Test (CEEB). He found a correlation of .47 and .41 between CEEB and college standing in two colleges. The correlation between high school record and college standing for the two schools was .69 and .58.

Johnson (1924), at the University of Minnesota, found intelligence tests somewhat less reliable for predicting than high school grades. High school records and freshman grades correlated .63, while intelligence tests correlated .50. A multiple coefficient of correlation of .68 for women and .65 for men was found when the predictors were combined.

Odel (1927) reported correlations of .38 between the Otis Mental Abilities Test and Freshman Grade Point Index. He also found correlations between intelligence scores and grades in specific courses ranging from .40 for arithmetic to -.19 for athletic coaching. Correlations of high school average with specific subjects ranged from -.17 for physics to .62 for horticulture.

A summary of 47 prediction studies was made by Segel

(1934), who found median correlations between general college scholarship to be .44 for general mental tests; .55 for general achievement tests; and .37 for tests of specific traits, aptitude, and achievement. He reported median correlations between general mental tests and specific college subject grades as .39 for English, .36 for Mathematics, .30 for Biology, .34 for Chemistry, and .34 for Social Studies.

Harris (1940) presents a summary of the literature from 1930 to 1938. He reported a number of investigations that found high school grades and high school rank to be the best single predictor of academic success.

Durflinger (1943), in an excellent survey of recent research findings, reported correlation coefficients of .55 for school rank and college grades. He found the majority of the studies were in the range of .50 to .60. Multiple correlations between .60 and .70 were typical when high school grade average was combined with test scores. The median correlation between intelligence tests and academic achievement was .52. Durflinger maintains that findings from one institution cannot be transferred unchanged to another college, and that high school records are the best single predictive index to use in placing high school applicants.

In 1965, Lake Michigan College adopted the American College Testing Program as its entrance examination

instrument. The American College Testing Program was developed at the University of Iowa in 1960 as an outgrowth of the Iowa College Scholarship Placement and Testing Program from a core of the Tests of Educational Development. The ITED tests were developed at the University of Iowa in 1942 to take the place of the then existing state testing program, which was basically factual information testing and not educational development testing. To overcome this type of testing, the ITED was designed to measure growth of skills and abilities, thus making the student, rather than the subject matter, the center of teaching.

ACT Prediction

Studies have shown the ACT to be a successful instrument for predicting academic success as well as a measure of scholastic achievement.

Munday (1968) administered the American College Testing Program (ACT) as well as several other scholastic aptitude, achievement, and intelligence tests to freshmen from 51 colleges and universities. High school rank and study habit data were also obtained for the students. Results showed standard ACT predictors--the combined weighted test scores and related high school grades--to be correlated with measures of intelligence, scholastic aptitude, English and reading achievement, high school

rank, and study habits. Separate ACT test scores were found to be significantly related to measures of intelligence as well as to English and reading ability, but unrelated to study habits. High school rank was also unrelated to study habits, but highly related to ACT student-reported high school grades. This close relationship between self-reported ACT high school grades and actual high school rank was noted as highly significant since ACT grades are much easier to obtain. In general, results suggested that no significant improvement in prediction of college grade point average would result from combining other predictors with the ACT.

Lindquist (1961), in the first ACT research report, presented a summary of multiple correlations of ACT subtests and high school grades in particular subjects versus college grade averages in particular courses and overall grade point average. These correlations are based on data supplied from member schools in which at least 50 cases were reported for the separate academic areas and at least 100 cases for the overall grade point average. The multiple correlations ranged from .83 to .38 for the separate areas and from .80 to .50 for overall grade averages. The median multiple correlations were: English, .63; Mathematics, .54; Social Studies, .63; and Natural Science, .59. The median multiple correlation coefficient for overall grade average was .68. Correlations of subtest scores

separately with the criterion were not reported except in "typical" cases. For these, the English subtest was found to correlate .47 with college grades in English; the Mathematics subtest correlated .34 with college grades in Mathematics; the Social Studies subtest correlated .37 with grades in Social Studies; and the Natural Science subtest correlated .42 with grades in Science. The correlations of the subtests with overall grade average for one school reporting 1,798 cases were: English, .46; Mathematics, .37; Social Stidies, .47; and Natural Science, .40. The ACT Composite correlated .53 with the overall grade point average.

Higgins (1963), while studying community college students at Bismark Junior College, found that: (1) students coming from larger high schools tend to be better prepared for college work than students from smaller high schools; (2) girls tend to score higher on English and Social Studies on the ACT than do boys; (3) girls appear to live up to expected levels of college performance, as predicted by ACT scores and high school GPA, more often than boys; (4) on the basis of correlations, ACT Composite and English scores appear to be the best predictors of college grades outside of high school GPA; and (5) in general, all ACT scores appear to predict college grades rather well.

Hoyt (1966) reviewed a recent experiment conducted by the American College Testing Program's research service

using students enrolled in two-year occupational-terminal curriculums. A total of six groups from six two-year colleges in six different states was represented. Standard ACT data (test scores, select high school grades) were used to estimate their academic potential. These potentials were related to overall college grades and to grades in various academic courses. Comparisons were made with all research service participants (205 colleges) and with junior college research service participants (43 colleges). Within the limits of these samples, the following conclusions seem justified:

1. The academic potentials of the six groups were remarkably homogeneous. This was more true when potential was measured by high school grades than when it was measured by ACT scores.

2. These potentials were well below the average established for all colleges, but only slightly below the general junior college average. They were weaker in English and Social Studies than Mathematics and Natural Science.

3. College grades for these students averaged slightly higher than comparable grades for all college and for all junior college students. However, there were marked institutional differences suggesting that grading practices did not follow a uniform standard from college to college or from department to department.

4. ACT scores and high school grades were about equally predictive of college grades. The level of predictability was, however, reduced over that typically obtained from such data.

The American College Testing Program Technical Report

(Lindquist, 1965) indicates that median predictive validities of the individual ACT tests range from .37 to .50. The data are based on a 20 percent random sample of colleges participating in the 1962, 1963, and 1964 Research Service programs.

As Table 3 indicates, English and Social Studies correlate highest with their academic subjects, while the r for Mathematics and Natural Science, although lower, is substantial. All r's in the table are significant at the 1 percent level of confidence.

TABLE 3

Predictive Validity of Five ACT Scores

Variables	Number of Colleges	Number of Students	Median r
English test vs. College English GPA	122	54,335	.498
Mathematics test vs. College Mathematics GPA	91	27,582	.374
Social Studies test vs. College Social Studies GPA	119	42,990	.466
Natural Science test vs. College Natural Science GPA	106	38,030	.374
Composite vs. College Overall GPA	122	59,164	.497

CHAPTER III

METHODS, DESIGN, AND PROCEDURES

The sample for this study was drawn from the student population, at Lake Michigan College, which had completed its education. Student information is accumulated in an inactive file in the records center. The inactive file is the repository for personnel records of those students not taking courses in any current semester. Records for the years of 1965, 1966, and 1967 were selected for this study for two reasons: (1) 1965 was the first year the American College Testing Program was used at Lake Michigan College; and (2) it was assumed that most, if not all, of the students selected to participate in this study had completed their education at LMC and would probably not take any more courses.

The records are stored alphabetically, and it was a simple matter to systematically go through the cards and select the students who had matriculated in one of the three years, and record the information for tabulation.

The following information was gathered on all students selected for this study: student identification number; sex; high school origin; date of birth; age at high school graduation; age at entrance to LMC; number of years that intervened between high school and college;

area of study while at LMC (transfer or other curriculum); total grade point average while at LMC; number of semester hours completed; number of semesters attended; and five American College Testing Program scores--English, Mathematics, Social Science, Natural Science, and Composite Scores.

All students who had ten semester hours or more of accumulated credit at LMC and for whom the ACT scores were available were included in this study. It was assumed that the ten semester hours would be sufficient to separate the serious students from those who take one or two classes, either to satisfy their curiosity or to meet the requirements for job or school somewhere else.

Student profiles were partitioned into groups based on three moderator variables: (1) high school origin, (2) sex, and (3) curriculum.

High School Origin

The County Intermediate School District provided the data necessary to determine if a school system would be classified as large or small. The enrollment figures for 10th, 11th, and 12th grades for each school for each of the three years used in this study were gathered. The total enrollment for the three years for the three grades was accumulated and averaged, giving a mean number of students per year of 562. Any school with more than 562

students was classified as a large school, and any school with fewer than 562 students was classified as small.

Four schools were classified as large: Benton Harbor (2,118), Niles (1,358), St. Joseph (919), and South Haven (695). Thirteen high schools were classified as small: Lakeshore (532), Brandywine (514), Buchanan (481), Coloma (453), River Valley (438), Lake Michigan Catholic (354), Berrien Springs (346), Watervliet (317), New Buffalo (256), Eau Claire (228), Bridgman (212), Galien (171), and Covert (161).

A third category of LMC students in this study emerged, called "others." These are students who did not come from one of the seventeen high schools located in LMC's tax district. These students came from a high school for which no determination of size could be made.

Table 4 presents the distribution of students based on high school origin.

TABLE 4

Number and Percentage of Students Distributed by High School Origin

Source	Number	Percent
Large high schools	706	56
Small high schools	350	28
Other high schools	202	16
Total	1,258	100

Large high schools contribute twice as many students to the LMC population as do small high schools, even though reason would dictate that they would contribute equally. Sixteen percent of the study sample came from outside the tax district and could not be classified as from a large or a small high school, and were placed in the category of "other."

Sex

Sex distribution was determined by a simple count of those students whose names were masculine or feminine. Table 5 presents the distribution of students in this study based on sex.

TABLE 5

Number and Percentage of Students
Distributed by Sex

Sex	Number	Percent
Male	749	60
Female	509	40
Total	1,258	100

Table 5 indicates that 60 percent of the students in the prediction sample are male and 40 percent are female.

Curriculum

When a student registers for classes at LMC he selects

a curriculum. If he selects the transfer curriculum, he indicates that he intends to pursue a course of study that will lead him to an advanced degree. This involves study beyond the community college level, and may be in either the liberal arts or in the science areas. If a student chooses a curriculum that is considered "terminal" at the two-year college level, he might choose a course of study that would lead to a two-year associate degree or one that awards a certificate of achievement after a shorter period of study. Students who selected a transfer curriculum were classified as "transfer" and those who selected a curriculum other than transfer were classified as "other."

Table 6 presents the distribution of students based on curriculum.

TABLE 6

Number and Percentage of Students
Distributed by Curriculum

Curriculum	Number	Percent
Transfer	1,029	82
Other	229	18
Total	1,258	100

Over 80 percent of students involved in this study were registered in a "transfer" curriculum, less than 20 percent were registered in the "other" curriculum.

The three moderator variables of high school origin, sex, and curriculum were partitioned into twenty-five discrete subgroups. A total for all groups, regardless of high school origin, sex, and curriculum, produced the twenty-sixth group.

Prediction sample

The number and percentage of students for each of the twenty-six discrete groups is presented in Table 7.

TABLE 7

Number and Percentage of Subjects in Each of the Twenty-six Prediction Samples

Group	No.	%	Group	No.	%
Total	1,258	100			
LHS	706	56	SHS-M	222	18
SHS	350	28	SHS-M-Tr	176	14
OHS	202	16	SHS-M-Oth	46	4
M	749	60	SHS-F	128	10
F	509	40	SHS-F-Tr	96	7
Tr	1,029	82	SHS-F-Oth	32	3
Oth	229	18			
LHS-M	402	32	OHS-M	124	10
LHS-M-Tr	346	27	OHS-M-Tr	104	8
LHS-M-Oth	56	5	OHS-M-Oth	20	2
LHS-F	304	24	OHS-F	78	6
LHS-F-Tr	243	19	OHS-F-Tr	64	5
LHS-F-Oth	61	5	OHS-F-Oth	14	1

Abbreviations used in this table are: LHS--Large High School; SHS--Small High School; OHS--Other High School; M--Male; F--Female; Tr-Transfer Curriculum; and Oth--Other Curriculum.

Criterion measure (GPA)

The criterion measure (GPA) was partitioned into three categories representing low achievement (E and D work, or a GPA of 0 to 1.0), average achievement (C work, or a GPA of 2.0 to 2.9), and high schievement (B and A work, or a GPA of 3.0 to 4.0). All predictions were based on the probability of membership of the student profiles within one of these criterion groups.

Predictor variables

For each of the subjects in the prediction sample, five ACT scores (English, Mathematics, Social Studies, Natural Science, and Composite) were tabulated, as well as the amount of interruption between high school and college. These six measures constituted the predictor variables that were used to predict the membership of each subject in one of the tri-partitioned criterion groups. Twenty-six separate prediction equations were developed, one for each of the twenty-six discrete groups listed in Table 7.

Validation sample

An independent sample of 441 student profiles was collected to test the accuracy of the prediction formulae in predicting criterion group membership. The 441 student profiles in the validation group met the standards of a minimum of ten semester hours completed and five ACT scores available. These profiles were also drawn from the inactive files. The sample was collected during the spring of 1972 from those students who registered at LMC during the fall of 1968 and of 1969. Since the validation sample is considerably smaller than the prediction group, it may be assumed that an increased proportion of those students who entered in 1968 and 1969 were still in the process of taking classes and would not be found in the inactive file.

The ratio of students from LHS, SHS, and OHS remains essentially the same from the prediction group to the validation group, as to sex and curricula. In fact, all categories remain nearly unchanged except by a few percentage point differences.

Statistical Treatment

Homogeneity of prediction sample

An analysis of variance test was conducted on the GPA for students in the 1965, 1966, and 1967 predictor

TABLE 8

Number and Percentage of Subjects in Each of the Twenty-six Validation Samples

Group	No.	%	Group	No.	%
Total	441	100			
LHS	237	54	SHS-M	77	17
SHS	143	32	SHS-M-Tr	65	15
OHS	61	14	SHS-M-Oth	12	3
M	233	52	SHS-F	66	15
F/	208	48	SHS-F-Tr	52	12
Tr	352	80	SHS-F-Oth	14	3
Oth	86	20			
LHS-M	124	28	OHS-M	32	7
LHS-M-Tr	109	25	OHS-M-Tr	28	6
LHS-M-Oth	15	3	OHS-M-Oth	4	1
LHS-F	113	26	OHS-F	29	7
LHS-F-Tr	84	19	OHS-F-Tr	14	3
LHS-F-Oth	29	7	OHS-F-Oth	15	3

sample to determine if the samples over these three years were homogeneous. If homogeneity is established; i.e., the analysis of variance produces an F that is not significant, it may then be assumed that what differences do exist in means and standard deviations are not sufficiently large to jeopardize the homogeneity.

Testing hypothesis of group differences

A t-test was run to determine the significance of differences between the GPA and ACT means when the group

was divided on the basis of the moderator variables of sex, curriculum, and high school origin.

Product moment correlation coefficients were developed for all predictor variables and the criterion measure. Intercorrelations of predictor and criterion measures are found in Appendix A for prediction group and validation group.

Discriminant analysis

Discriminant analysis program BMDØ5M (Rao, 1952) was used to develop the prediction equations. Separate sets of alpha and beta weights were developed for all twenty-six discrete groups and for each of the three categories of the criterion measure. The BMDØ5M program systematically weighed each student profile and each component which was used to predict criterion group membership, and selected the category of "most likely membership" and assigned him to that category. The program also determined if this was an accurate or inaccurate categorization, and tabulated the number of accurate classifications for each of the three criterion levels.

Prediction equations which were developed upon the prediction group were then applied to the validation group in order to determine the stability and accuracy of the predictions. The general form for the prediction equation used for this program is:

$$Y = \alpha + B_1X_1 + B_2X_2 + \ldots\ldots\ldots B_6X_6$$

Where α is the constant for the likelihood of criterion group membership, B_1 is the beta weight for interruption, B_2 is the beta weight for ACT-English, etc. All student profiles were treated by the alpha and beta weight unique to their prediction group membership--i.e., all LHS-M-Tr analyzed by the statistical treatment unique to that group, and so for all twenty-six groups. The alpha and beta weights for each of the twenty-six discrete groups are found in Appendix C.

Index of forecasting efficiency

The index of forecasting efficiency (Guilford, 1950) is defined as the percentage reduction in errors of prediction by reasons of correlation between two variables. The formula is:

$$E = 100\ (1 - \sqrt{1-r^2})$$

All product moment correlation coefficients between predictor variables and criterion measure were treated with the index of forecasting efficiency. Appendix A displays the correlation coefficients between the predictor variables and GPA as well as the index of forecasting efficiency (E).

Practical application of prediction

A master card will be prepared for each of the twenty-

five predictor categories that indicate the alpha and beta weights for each grade membership group (high, medium, and low). When the ACT results are returned to the college, a counselor will ascertain which of the twenty-five discrete prediction categories the counselee best fits. In the event precise predictive information is not avaliable for his category, the counselor may take the option of using the nearest possible category to the student's characteristics, realizing that the accuracy of prediction will be reduced and the results will have to be interpreted with more caution.

The student's ACT scores will be punched into the computer along with the prediction information. The computer will then process the information and print out the probability of the student's membership in either a low, medium, or high academic achievement group. Within moments, the counselor and student will know the probable academic success of the student. With this knowledge, more enlightened decisions could be made.

CHAPTER IV

RESULTS

The results of this study will be presented in the following order: (1) analysis of variance of the criterion measure for the prediction group for the years 1965, 1966, and 1967 to determine homogeneity with respect to level of academic achievement; (2) results pertaining to testing the hypotheses for the moderator variables; and (3) results pertaining to testing the hypotheses for the predictor variables.

Homogeneity of Criterion Measure for Prediction Group

Table 9 presents data on the cumulative grade point

TABLE 9

Summary Data and Analysis of Variance Data for GPA for the Years 1965, 1966, and 1967

	1965	1966	1967
n:	474	386	397
M:	2.231	2.328	2.324
SD:	.765	.676	.717

Source	ss	DF	MS	F
Between groups	2.689	2	1.344	2.564
Within groups	660.716	1255	.524	. .
Total	663.405	1257		

average for those students comprising the prediction group differentiated on the basis of year of entry--1965, 1966, and 1967. In addition to the results of an analysis of variance, the means and standard deviation for GPA for each group is given. An F of 2.564 with 2 and 1255 degrees of freedom is not significant at the .05 level of confidence.

Moderator Variables

High school origin

Table 10 presents the grade point averages and asso-

TABLE 10

Mean GPA Data and t Values for High School Origin for Prediction Sample

	LHS	SHS	t	DF	p
n:	706	350			
M:	2.295	2.288	0.154	1054	not significant
SD:	.702	.680			
	LHS	OHS	t	DF	p
n:	706	202			
M:	2.295	2.231	1.137	906	not significant
SD:	.0702	.714			
	SHS	OHS	t	DF	p
n:	350	202			
M:	2.288	2.231	1.137	906	not significant
SD:	.679	.714			

ciated _t_ tests for students classified according to high school origin. Table 10 indicates that the highest _t_ value of 1.137 with 906 degrees of freedom is not significant. None of the comparisons were significant.

Table 11 presents mean ACT composite scores relative to high school origin. This table indicates that the difference in ACT-Composite score between LHS and SHS, as indicated by a _t_ value of .441, is not significant. It also indicates that there is a significant difference in the ability of students from large high schools and small high schools to score higher ACT-Composite scores than

TABLE 11

Mean ACT-Composite Scores and _t_ Values
Relative to High School Origin
for Prediction Sample

	LHS	SHS	_t_	DF	p
n:	706	350			
M:	19.160	19.350	.441	1054	not significant
SD:	6.810	6.090			
	LHS	**OHS**	**_t_**	**DF**	**p**
n:	706	202			
M:	19.160	17.870	2.517	906	<.02
SD:	6.810	4.790			
	SHS	**OHS**	**_t_**	**DF**	**p**
n:	350	202			
M:	19.350	17.870	2.959	550	<.01
SD:	6.090	4.790			

students from other high schools. Two t values are significant, LHS-OHS at the .02 level and SHS-OHS at the .01 level of confidence.

Sex

Table 12 shows the mean GPA and t value for male and female groups. The mean GPA of 2.162 for males is significantly lower than the mean of 2.461 for the female students. The t value is significant at greater than the .01 level of confidence.

TABLE 12

Mean GPA and t Value for Male and Female Students for Prediction Sample

	Males	Females	t	DF	p
n:	749	509			
M:	2.162	2.461	7.627	1256	< .01
SD:	.675	.691			

Table 13 presents the mean ACT-Composite scores for

TABLE 13

Mean ACT-Composite Scores and t Value for Male and Female Students for Prediction Sample

	Males	Females	t	DF	p
n:	749	509			
M:	19.400	18.440	2.095	1256	< .01
SD:	5.960	5.420			

males and females. The *t* value of 2.095 for 1256 degrees of freedom is significant at greater than .01 level of confidence.

Curriculum

Table 14 presents the mean GPA for transfer and other curriculum. The *t* value of 2.766 with 1256 degrees of freedom is significant at greater than the .01 level of confidence.

TABLE 14

Mean GPA and *t* Value for Curriculum for Prediction Sample

	Transfer	Other	*t*	DF	p
n:	1029	229			
M:	2.316	2.175	2.766	1256	$<.01$
SD:	.686	.737			

Table 15 presents mean ACT-Composite scores for transfer and other curriculum. The *t* value of 3.939 with

TABLE 15

Mean ACT-Composite Scores and *t* Value for Curriculum for Prediction Sample

	Transfer	Other	*t*	DF	p
n:	1029	229			
M:	19.320	17.670	3.939	1256	$<.01$
SD:	5.670	5.980			

1256 degrees of freedom is significant at less than the .01 level of confidence.

Predictor Variables

Table 16 provides a summary of the product-moment correlation coefficients found in Appendix A. Only those correlations significant at the .01 level of confidence are presented in this table. Viewing the intercorrelations between predictors and criterion for the major moderator variables will indicate that the correlations are positively related to GPA. This generalization holds true for the prediction sample as well as the validation sample. This table indicates that the correlations tend to increase from the prediction sample to the validation sample, for most predictors. The exception to this generalization is interruption, where a reduction in the magnitude of the correlation is noted from the prediction sample to the validation sample.

Differences in the correlations will be noted between the different levels of the moderator variables for each of the six predictors.

Interruption

Table 16 indicates that the highest correlation between amount of interruption and GPA for the moderator variable high school origin, is OHS, with an r of .33.

TABLE 16

Summary Table of Appendix A. Intercorrelations Between Predictors and Criterion for Prediction (P) and Validation (V) Samples. Correlations Significant at Least the .01 Level of Confidence are Given

	No. of Students		Inter.		Eng.		Math.		Soc. St.		Nat. Sci.		Compos.	
	P	V	P	V	P	V	P	V	P	V	P	V	P	V
Total	1258	441	.16	.14	.36	. .	.22	.24	.32	.39	.26	.26	.35	.39
LHS	706	237	.12	. .	.38	. .	.24	.29	.37	.39	.29	.34	.39	.43
SHS	350	143	. .	. .	.33	.39	.22	. .	.29	.44	.27	.29	.29	.44
OHS	202	61	.33	. .	.34	. .	.18	. .	.22	. .	. .	. .	.28	. .
M	749	233	.14	. .	.29	. .	.33	.25	.23	.32	.28	. .	.35	.29
F	509	208	.15	. .	.39	.49	.20	.32	.38	.51	.32	.46	.42	.57
Tr	1029	352	.16	.16	.34	.40	.22	.26	.32	.42	.28	.28	.36	.43
Oth	229	89	. .	. .	.41	.31	.21	. .	.29	.24	.18	. .	.30	. .
LHS-M	402	124	. .	. .	.31	.32	.37	.27	.34	.30	.31	. .	.39	.34
LHS-M-Tr	346	109	. .	. .	.27	.38	.34	.28	.32	.31	.29	.27	.37	.37
LHS-M-Oth	56	15	.36	. .	.48	. .	.51	. .	.37	. .	.36	. .	.55	. .
LHS-F	304	113	. .	. .	. .	.55	.19	.44	.43	.56	.32	.58	.45	.62
LHS-F-Tr	243	84	. .	. .	.39	.57	. .	.46	.43	.61	.40	.62	.44	.66
LHS-F-Oth	61	29	. .	. .	.44	.50	.32	. .	.36	. .	. .	. .	.42	. .
SHS-M	222	77	.23	. .	.28	.37	.29	.34	.29	.41	.30	.37	.32	.45
SHS-M-Tr	176	65	.26	. .	.27	.40	.29	.45	.30	.45	.29	.42	.36	.53

TABLE 16--Continued

	No. of Students		Inter.		Eng.		Math.		Soc. St.		Nat. Sci.		Compos.	
	P	V	P	V	P	V	P	V	P	V	P	V	P	V
SHS-M-Oth	46	12	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
SHS-F	128	66	. .	. .	.36	.35	. .	. .	.33	.48	.32	.32	.36	.49
SHS-F-Tr	96	52	. .	. .	.31	.28	. .	. .	.29	.48	.30	. .	.33	.49
SHS-F-Oth	32	14	. .	. .	.53	.79	. .	. .	.46	.68	. .	. .	.47	.65
OHS-M	124	32	.29	. .	.28	. .	.28	. .	. .	. .	. .	. .	.28	. .
OHS-M-Tr	104	28	.34	. .	. .	. .	.30	. .	. .	. .	. .	. .	.31	. .
OHS-M-Oth	20	4	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
OHS-F	78	29	.38	. .	.39	.56	. .	.48	.30	. .	.29	. .	.38	.55
OHS-F-Tr	64	14	.41	. .	.46	. .	.26	. .	.38	. .	.38	. .	.47	.64
OHS-F-Oth	14	15	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

Appendix A, Table 19, indicates that such a correlation reduces errors of prediction by 5.5 percent. This relationship gives the greatest reduction of error when amount of interruption is used to predict GPA for both the prediction and validation samples across all major moderator variable categories.

Inspection of Appendix A confirms that most correlations for all combinations of moderator variables are positive, but low. This holds true for all correlations except three, which are negative. These are: SHS-F-Oth in the prediction sample, with an r of -.052; LHS-F-Tr in the validation sample, with an r of -.258; and OHS-M-Oth, with an r of -.585. The r for LHS-F-Tr, -.258, is significant at the .05 level of confidence.

Inspection of Appendix B indicates that interruption is positively correlated with GPA and negatively correlated with most ACT-Composite scores. This relationship tends to hold true for the prediction sample as well as the validation sample. The exceptions to this generalization are found mostly for the ACT-English and ACT-Social Studies subtests. Positive correlations occur in the prediction sample for English in LHS, M, Tr, and in the validation sample for SHS, OHS, F, Tr, and Oth. Positive correlations occur for Social Studies in the prediction sample for SHS, M, and Tr, and in the validation sample for OHS. A positive correlation occurs for Composite in

the validation sample for Tr.

Nine of the thirteen positive correlations occur for English, four for Social Studies, and one for Composite. Sixty-seven of the seventy correlations between interruption and ACT scores are negative, and thirteen are positive.

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Table 16 and Appendix A (Tables 19, 20, 21, 22, and 23) reflect the correlations of each of the ACT scores with GPA. For the prediction sample, the correlation between ACT-Composite and GPA is higher for LHS than it is for SHS, and higher for SHS than it is for OHS. Females have a higher correlation than males, and transfer curriculum is higher than the other curriculum.

These generalizations apply to the validation sample with the exception of SHS which has a correlation higher than LHS, and LHS which has a correlation higher than OHS.

Table 17 presents the rank ordering of magnitudes of the correlations between ACT predictors and GPA criterion for major moderator variables.

As Table 17 indicates, the ACT-Composite scores for the predictor sample are ranked first and second more times than any other predictor, indicating that Composite score correlates higher with GPA than all subtests most

TABLE 17

Rank Order of Magnitude of Correlations for ACT Predictors for Major Moderator Variables
1 = Highest Rank

	Eng.	Math	Soc. St.	Nat. Sci.	Comp.
Prediction Sample					
Total	1	5	3	4	2
LHS	2	5	3	4	1
SHS	1	5	3	4	2
OHS	1	4	3	5	2
M	3	2	5	4	1
F	2	5	3	4	1
Tr	2	5	3	4	1
Oth	1	4	3	5	2
Number of Times Ranked as:					
1	3	0	0	0	4
2	3	1	0	0	3
3	1	0	6	0	0
4	0	2	0	5	0
5	0	4	1	2	0
Validation Sample					
Total	3	5	2	4	1
LHS	1	5	3	4	2
SHS	3	5	2	4	1
OHS	2	4	1	5	3
M	3	4	1	5	2
F	3	5	2	4	1
Tr	3	5	2	4	1
Oth	1	5	3	4	2
Number of Times Ranked as:					
1	2	0	2	0	3
2	1	0	3	0	3
3	4	0	2	0	1
4	0	2	0	5	0
5	0	5	0	2	0

frequently. English scores correlate second most frequently, Social Studies third, and Natural Science and Mathematics are tied for lowest correlation.

For the validation sample, ACT Composite score is ranked first and second more times than any other predictor, indicating that Composite scores correlate more highly with GPA than all subtests most frequently. English and Social Studies are tied for second, Natural Science ranks third, and Mathematics ranks last as predictors of GPA, although all are statistically significant.

For both the prediction and validation sample, Composite was first and Mathematics was last. English was second for the prediction sample and tied with Social Studies for second in the validation sample. Social Studies scores ranked third in the prediction sample, and Natural Science ranked third in the validation sample.

Accuracy of prediction

Table 18 presents the precentage of students correctly assigned to low, medium, and high GPA group membership by the BMDØ5M discriminant analysis program. This program also indicated those student profiles incorrectly classified. The incorrect classifications are not presented in this table.

In both the prediction and validation samples, it will be noted that classification into GPA groupings is

TABLE 18

Percentage of Students Correctly Assigned to Low, Medium, and High GPA Group Membership Based on Prediction Formula for All Groups

	Prediction Sample								Validation Sample								Total Dif. (P-V)
	Low		Medium		High		Total		Low		Medium		High		Total		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Total	62	387	39	677	69	194	51	1258	65	134	33	227	56	80	47	411	- 4
LHS	63	213	35	378	72	116	50	706	68	80	30	119	68	38	49	237	- 1
SHS	61	108	44	195	64	47	52	350	71	38	39	82	29	23	48	143	- 4
OHS	64	67	47	103	69	32	56	202	50	16	35	26	47	9	43	61	-13
M	63	275	34	387	71	87	49	749	69	87	30	118	46	13	46	233	- 3
F	65	112	43	289	71	108	54	509	66	47	30	109	63	52	47	208	- 7
Tr	62	304	41	561	67	164	51	1029	63	107	37	174	49	71	47	352	- 4
Oth	66	83	35	114	68	32	51	229	70	27	25	53	78	9	44	89	- 7
LHS-M	63	142	30	214	72	46	46	402	63	52	25	59	46	13	44	124	- 2
LHS-M-Tr	58	115	30	187	70	44	45	346	60	45	27	51	54	13	44	109	+ 1
LHS-M-Oth	78	27	81	27	50	2	78	56	57	7	50	8	0	0	53	15	-25
LHS-F	64	70	40	164	70	70	52	304	75	28	32	60	80	25	53	113	+ 1
LHS-F-Tr	63	51	43	133	66	59	53	243	68	19	43	44	76	21	57	84	+ 4
LHS-F-Oth	47	19	52	31	73	11	54	61	67	9	19	16	75	4	41	29	-13
SHS-M	63	83	47	115	58	24	54	222	83	24	41	46	57	7	56	77	+ 2
SHS-M-Tr	56	66	55	92	50	18	55	176	85	20	43	40	40	5	55	65	0

TABLE 18--Continued

	Prediction Sample								Validation Sample								Total Dif. (P-V)
	Low		Medium		High		Total		Low		Medium		High		Total		
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
SHS-M-Oth	71	17	52	23	83	6	63	46	50	4	0	6	0	2	17	12	-46
SHS-F	75	25	45	79	57	23	52	128	57	14	25	36	63	16	41	66	-11
SHS-F-Tr	71	17	44	18	44	18	52	96	50	12	29	24	44	16	38	52	-14
SHS-F-Oth	63	8	53	19	80	5	59	32	100	2	17	12	0	0	29	14	-30
OHS-M	62	50	47	57	59	17	55	124	64	11	46	13	25	8	47	32	- 8
OHS-M-Tr	60	40	56	50	71	14	60	104	60	10	55	11	29	7	50	28	-10
OHS-M-Oth	70	10	71	7	100	3	75	20	0	1	0	2	100	1	25	4	-50
OHS-F	65	17	63	46	73	15	65	78	61	5	23	13	74	11	48	29	-17
OHS-F-Tr	73	15	63	38	73	11	67	64	100	1	25	4	67	9	57	14	-10
OHS-F-Oth	50	2	63	8	75	4	64	14	25	14	22	9	100	2	33	15	-31
Median Percent	63		45		70		53		64		30		54		47		- 6

considerably more accurate for the low GPA group (0 to 1.9) and high GPA group (3.0 to 4.0) than it is for the medium GPA group (2.0 to 2.9). The validation sample shows prediction is more accurate for the low GPA group than for the high GPA group and more accurate for the high GPA group than for the medium GPA group. The only exception to this generalization for the major moderator variables of the validation sample is found in other curriculum, where prediction is more accurate for high GPA than for low.

In the prediction sample, there is greater accuracy when predicting high GPA than low, and more accuracy for predicting low GPA than for medium GPA.

If student profiles were assigned to GPA groups in a random fashion, it would be expected that each student would have an equal chance of being assigned to one of the three groups. This would mean that chance prediction of GPA group membership would not exceed 33 percent accuracy.

Viewing the major moderator variables in the validation sample--or low, high, and total--indicates that all but one (SHS-High GPA) exceeds 33 percent. Three of the medium GPA group meet or exceed 33 percent and four are below chance expectation.

The accuracy of prediction varies considerably, in some cases, as a function of the moderator variable levels

for each of the validation sample criterion categories. For example: prediction accuracy for high school origin for the high GPA group ranged from 68 percent accuracy for LHS to 29 percent accuracy for SHS; for sex, the accuracy of prediction for males was 56 percent as compared to 63 percent accuracy for females; and for curriculum, the accuracy was 49 percent for transfer and 78 percent for other curriculum. Similar comparisons can be made for low and medium GPA group.

Comparing the accuracy of prediction for totals between the prediction and validation sample (Difference P-V) shows a loss of accuracy of 4 percent. A loss of 1 percent is noted for LHS, 4 percent for SHS, and 13 percent for OHS. A 3 percent loss of prediction accuracy is noted for males and 7 percent for females. The transfer curriculum showed a loss of predictive accuracy of 4 percent, while the other curriculum shows a loss of 7 percent. The median loss across all moderator variable combinations was 6 percent.

This loss of predictive accuracy is typical of the application of prediction equations to a group independent of the one on which it was initially developed.

CHAPTER V

CONCLUSIONS, DISCUSSION, AND SUMMARY

Conclusions

Homogeneity of GPA for prediction sample

The results of Table 9 indicate that the F value of 2.564, with 2 and 1255 degrees of freedom, is not significant at the .05 level of confidence. It is therefore assumed that the grade point averages for student samples from 1965, 1966, and 1967 are sufficiently similar to treat them as belonging to the same population, thus permitting a pooling of subjects.

High school origin

The data in Table 10 indicated no significant differences exist in college GPA relative to high school origin. This leads to rejection of the hypothesis that students from large high schools will have significantly higher college GPA than students from small high schools. It should be noted, however, that students from large high schools do have the highest college GPA, while students from small high schools have the second highest college GPA, and students from other high schools have the lowest college GPA. Although differences are not statistically significant, they do fall in the expected direction.

The data in Table 11 indicate that no significant difference exists for ACT-Composite score between large high schools and small high schools. This leads to the rejection of the hypothesis that students from large high schools will have higher mean ACT-Composite scores than students from small high schools.

Significant differences were noted between large high schools (LHS) and other high schools (OHS). A *t* value of 2.517, with 906 degrees of freedom, is significant at greater than the .02 level of confidence. Significant differences were noted between small high schools and other high schools. A *t* value of 2.959, with 550 degrees of freedom, is significant at greater than the .01 level of confidence.

The rejection of the hypotheses related to high school origin may have to do with the socio-economic composition of students from the largest high school in the study. This high school is composed primarily of students from lower middle class or upper lower class. This school district has the largest number of ADC families of any school in the county. Very few of these students come from homes that would be considered middle-class or higher.

The smaller high schools in this study are composed of a mixture of students from bedroom suburban school districts and consolidated rural school districts. It

may well be that the students from the suburban schools (mostly middle class) will have higher GPA and ACT scores than those students from the consolidated rural schools, or for that matter, the lower class students from the larger high schools. These differences might be due to some form of early training or conditioning related to the language patterns of the parents, the expectation levels for education, or subtle patterns of reinforcement that might lead to lower levels of academic performance. No data from this study were developed to test this concept.

Sex

The t value in Table 12 indicates that a highly significant difference exists between male and female mean GPA for the prediction group. This datum supports the hypothesis that females will have higher mean GPA's than males.

The data from Table 13 indicate that the hypothesis that women will have a higher mean ACT-Composite score than men must be rejected. The t value of 2.095 is significant at greater than the $<.01$ level of confidence, indicating generally higher scores for males.

Curriculum

Tables 14 and 15 support the hypothesis that students

in the transfer curriculum will have a higher mean GPA and higher mean ACT-Composite scores than students in curricula other than transfer. These _t_ values, both significant at better than the .01 level of confidence, leave little doubt about the superior achievement of the students planning to transfer over the non-transfer student.

These differences may be due to intellectual inability on the part of the students in the non-transfer curriculum, or they might have to do with the grading practices of instructors who teach these non-transfer courses. It may be that these teachers are more conservative in their grading practices and tend to give lower grades than those given by teachers in the transfer curriculum.

This explanation does not hold for the performance of students in the other curriculum on the ACT tests. Lower performance here might be attributed to motivation, reading, or test-taking skills. ACT test content must also be inspected in light of the past courses taken by the students, as well as their interest patterns. It may be that English and Social Studies are not the favorite subjects of non-transfer students, and hence they tend to score lower on these tests.

Interruption

Appendix A and Table 16 indicate that interruption for the prediction sample is positively correlated with

college GPA for all of the major moderator variables. With the exception of SHS and other curriculum (both at the .05 level of confidence), they are significant at the .01 level of confidence. Inspection of the E values for each of these moderator variables indicates that these correlations add at most no more than 5.5 percent reduction in error of prediction, and in most cases the reduction of error of prediction is only a little over 1 percent. The hypothesis that interruption contributes substantially to the prediction of GPA is rejected. The hypothesis that the correlation between interruption and GPA will be positive is accepted, however.

The data in Appendix B indicate that negative correlations exist between most ACT subtests and interruption. Those that are not negative are low, but positive. This relationship occurs in both the prediction and validation samples. For the entire sample, irrespective of moderator variables, all ACT scores are negatively correlated with interruption. The hypothesis that interruption is positively correlated with ACT scores is rejected.

The data in this study relative to interruption support the following conclusions: (1) as interruption increases, college GPA increases; (2) as interruption increases, ACT scores tend to decrease; and (3) as a predictor, interruption does not appreciably reduce the errors of prediction.

American College Testing Program

As Table 17 indicates, ACT Composite is the most valuable predictor for the major moderator variable categories for the prediction sample, followed by ACT subtests in English, Social Studies, Natural Science, and Mathematics.

For the validation sample, the generalization tends to hold true that ACT-Composite and English are the most valuable predictors and Mathematics is the least valuable. The relative positions of Social Studies and Natural Science are reversed in the validation sample, with Social Studies following English in predictive value.

Most correlations between ACT-Composite scores and GPA for the major moderator variables are positive and significant at the .01 level of confidence or better. The exceptions to this are found for the OHS and other curriculum moderator variable categories. An inspection of the E values indicates that the ACT-Composite for the entire validation sample contributes 8 percent to improvement in prediction due to the correlation. The range of the E values is from 3 percent to 8 percent for all ACT predictors.

The hypothesis that ACT will significantly contribute to the prediction of college GPA is upheld by the data.

Prediction accuracy

The shrinkage in predictive accuracy, when going from prediction to validation across high, medium, and low GPA categories for the major moderator variables, ranges from a loss of 1 percent (LHS) to a loss of 13 percent (OHS). The median reduction of prediction accuracy is 6 percent.

As the loss of predictive accuracy for the combinations of moderator variables is studied, caution must be taken to consider the sample size limitations of some of these groups.

If students were assigned, randomly, to a high, medium, or low group, chance probabilities would imply no more than one-third accuracy of prediction. The prediction accuracy for low GPA total is nearly twice chance, with 65 percent for the validation sample. Prediction for medium GPA for the validation sample is at chance expectation with 33 percent prediction accuracy, while prediction for the high GPA group is more than one and one-half times chance expectation (56 percent).

Predictive accuracy for the samples, considering all GPA categories combined, is slightly more for LHS (49 percent) than it is for SHS (48 percent), which is more accurate than it is for OHS (43 percent). Predictive accuracy is slightly greater for females (47 percent) than it is

for males (46 percent), and predictive accuracy is greater for transfer curriculum (47 percent) than it is for other curriculum (44 percent).

In comparing the predictive accuracy of the moderator variables with the predictive accuracy of the entire sample without regard to moderator variables, total prediction is improved by 5 percent or more for the following GPA categories: low GPA--SHS and other curriculum; medium GPA--other curriculum; and high GPA--SHS, OHS, males, and transfer curriculum.

Predictive precision is improved in three out of nine GPA categories for high school origin, and a comparable number of declines are noted. Male and female samples show one gain and one loss; the same is true for transfer and other curriculum.

The use of moderator variables increases the precision of prediction in enough categories to warrant their use as predictor categories.

Discussion

Limitations

Several limitations of this study should be noted. Of primary concern is sample size. In the main, the sample sizes for the major moderator variables are more than adequate to make generalizations regarding the predictive

accuracy of the predictor variables. Several of the sub-samples for moderator variable combinations, however, were of such limited size as to render their predictive value highly questionable, particularly for the validation group. An arbitrary minimum of fifty student profiles should be included in each group in order to give confidence in that group's predictability. The predictive accuracy data for the following groups should be viewed with extreme caution due to their limited sample size. Prediction samples OHS-F-Oth (N=14), OHS-M-Oth (N=20), SHS-F-Oth (N=32), and SHS-M-Oth (N=46) fall into this category. From the validation sample, all six sub-categories of moderator variables are less than the prescribed fifty. Four others must be considered limited in sample size from the validation sample: SHS-F-Oth (N=14), SHS-M-Oth (N=12), LHS-F-Oth (N=29), and LHS-M-Oth (N=15).

Two practical problems arise when thought is given to the implementation of these results. Of concern to the administrator would be the complexity of the application of the twenty-five prediction equations to any given student population. A determination will have to be made on each student as to what high school origin group and curriculum he belongs. This approach is somewhat different from the usual cut-off score for making determinations, whereby the counselor compares the students' potentials to one predictive standard.

Since no predictive strategy has been used in the past at LMC, and there is no basis for comparing the accuracy of this technique with others, this study may present an overly favorable estimate of the value of this predictive technique.

Another point worthy of consideration might be the cost in human and computer resources to process all incoming students and to project their chances of success in a given curriculum. A further drain on the institutional resources would be needed to maintain a student data bank and to periodically assess the effectiveness of the prediction equations. It may be that LMC might prefer to pursue a less costly and demanding process, less accurate in predicting GPA, but easier to understand and apply.

Unexpected results

Most studies indicate that, on academic aptitude tests, females tend to excel males. Such was not the case for the prediction sample. The male mean ACT-Composite score, Table 13, exceeded the female mean ACT-Composite score by an amount significant at the .01 level of confidence. Such a finding was not expected in view of the significantly higher mean GPA for females. This difference did not affect the predictive accuracy of interruption and ACT scores, which were used in predicting

GPA 46 percent accurately for males and 47 percent accurately for females. When separate prediction formulae were developed for males and females, the ultimate predictive accuracy was about the same.

The negative relationship between most ACT subtests and interruption does not coincide with expectations for this relationship. The positive relationship that exists between interruption and GPA does coincide with what was expected. The conclusion that can be drawn from these results is that as the amount of interruption increases, GPA tends to increase; as interruption increases, ACT tends to decrease. This indicates that students with more interruption generally do better in college, and those with less interruption do not achieve as well on ACT subtests, nor do they have as high a GPA on average.

Although nothing in this study investigates the phenomenon, it may be that academic achievement for students with greater interruption is more a function of behavior not measured here. Such characteristics as motivation, organization, and need to achieve may be related to the success of the student with greater interruption.

Suggested studies

If a future study of this type were to be undertaken, the following suggestions might be considered.

Addition of high school GPA.--The ACT program calls

for the incoming college student to report the last high school grade earned in English, Mathematics, Social Studies, and Natural Science. ACT research indicates that self-report grades have a useful level of reliability, and when added to the ACT subtest, enhance prediction considerably.

A point of interest would be the comparison of these data and these results, with the addition of high school grades, to the prediction equations to determine the change in predictive accuracy in low, medium, and high grade point levels.

Socio-economic factors.--Consideration in this study was given only to the high school size. None was given to the socio-economic factors that might influence academic ability. Future researchers might find information about the following considerations: (1) amount of money spent on education in a given school district relative to college GPA; (2) nature of curriculum offered in high school relative to college performance; and (3) educational and occupational level of parents related to college GPA.

Summary

A study was conducted to determine the predictive accuracy of six predictor variables: interruption (the amount of elapsed time between high school graduation and entrance into Lake Michigan College) and five ACT scores

(English, Mathematics, Social Studies, Natural Science, and Composite score). Student profiles were collected from the college's inactive file for students who had completed ten or more semester hours of work, who had taken the ACT battery, and who had enrolled during 1965, 1966, or 1967. This group of 1,258 profiles made up the prediction sample.

Three moderator variables were considered: sex (male and female), curriculum (transfer and other), and high school origin (large, small, and other). A moderator is defined as any class or category that could differentially affect the relationship between predictors and criteria.

Twenty-six separate prediction equations were developed by means of Discriminant Analysis program BMDØ5M which predicted group membership on the basis of GPA for low (0.0 to 1.9), medium (2.0 to 2.9), and high (3.0 to 4.0) groups.

To determine if significant differences exist between the GPA and ACT means for each of the major moderator variables, student's _t_ test was used. Product moment correlation coefficients were developed for all predictor variables and the criterion measure, as well as intercorrelation matrix between all predictors and criterion, for major moderator variable groups.

The percentage of reduction in error of prediction

(E) by reason of correlation between two variables was computed for all correlations between predictors and criterion measure for all major moderator and combined moderator variable categories.

A validation sample of 441 student profiles was drawn from the same student population as the prediction sample, except for registration during 1968 and 1969. This sample was used to test the predictive accuracy of the prediction equations and to determine the difference in accuracy, if any, when the formulae are applied to a sample other than that from which they were developed.

No significant differences were found between the three levels of high school origin for GPA in the prediction sample. Differences were not found to be significant between mean ACT-Composite scores for students from LHS and SHS. Significant differences were found between mean ACT-Composite scores for students from LHS and OHS and students from SHS and OHS. Students from OHS had the lowest mean score for ACT-Composite, followed by students from LHS. Male and female differences between mean GPA and ACT-Composite scores were found to be significant. Females earned higher mean GPA, and males had higher mean ACT-Composite scores.

Curriculum differences between mean GPA and ACT-Composite scores were found to be significant. Students in the transfer curriculum earned the highest mean GPA

and ACT-Composite scores.

A larger number of correlations between interruption and GPA proved to be significant for the larger sample in the major moderator variable groups than were found in the smaller samples in the combined moderator variable groups in both the prediction and validation samples. Interruption had low positive correlation with GPA and reduced errors of prediction by no more than 1 percent for total in the prediction sample and nearly 1 percent for the validation sample. It must be concluded that interruption does not necessarily insure high GPA and ACT-Composite scores.

Interruption was found to be negatively correlated with most of the ACT subtests. This negative correlation indicates that as interruption increases, ACT scores decrease; or as interruption decreases, ACT scores increase. This reduction in performance related to increased interruption could be attributed to an erosion of test-taking skills that those fresh from high school still have intact, or a reduction in the absolute knowledge (academic content) that some of the tests require.

The ACT-Composite score proved to be the most valuable for predicting GPA in both the prediction and the validation samples. English and Social Studies vied for second and third places. The least predictive of the ACT tests was Mathematics.

Although none of the predictors in isolation provided conclusive insight into academic performance, when combined they predicted low GPA at nearly twice chance expectation, and high GPA at nearly one and one-half times chance expectation for the validation sample. The greatest error was in the prediction of the medium GPA group in which predictive accuracy was at chance or near chance level for the major moderator variables. For totals, predictive accuracy was from 8 percent to 19 percent more accurate than it was for medium GPA.

The reduction in predictive accuracy from the prediction sample to the validation sample for totals was a loss of 4 percent in accuracy of prediction. Such a loss is not unexpected when the predictive equations are developed on one sample and then applied to another sample from the same population.

In summary, it may be said that the moderator variable categories add to the predictive precision of student GPA at LMC, and tend to improve prediction over the total sample in as many categories as it reduces accuracy of prediction. This variation in the accuracy is sufficient to warrant considering the moderator variable categories as they are presented.

Interruption, as a predictor variable, provided little improvement in predictive accuracy. The most accurate predictors were ACT-Composite, English, and Social Studies.

In combination, the predictor variables did prove effective in predicting low and high GPA groups for students with ten semester hours at LMC, and were a modest success in predicting total GPA for any given moderator variable sample. The medium GPA group was the most difficult for these variables to predict for any of the moderator variable categories or any combination of the moderator variable categories.

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APPENDIX A

INTERRUPTION

TABLE 19

Product-moment Correlation Coefficient Between Interruption and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.155**	1.209	441	.138**	0.955
LHS	706	.117**	0.738	237	.028	0.039
SHS	350	.145**	1.057	143	.105	0.553
OHS	202	.329**	5.567	61	.213	2.295
M	749	.142**	1.013	233	.109	0.596
F	509	.150**	1.131	208	.133	0.888
Tr	1029	.161**	1.305	352	.159**	1.272
Oth	229	.163*	1.337	89	.186	1.745
LHS-M	402	.095	0.452	124	.086	0.370
LHS-M-Tr	346	.066	0.218	109	.099	0.491
LHS-M-Oth	56	.356**	6.551	15	.186	1.745
LHS-F	304	.122*	0.747	113	.002	0.000
LHS-F-Tr	243	.129	0.836	84	-.258*	3.386
LHS-F-Oth	61	.139	0.971	29	.161	1.305
SHS-M	222	.229**	2.657	77	.103	0.532
SHS-M-Tr	176	.259**	3.412	65	.054	0.146
SHS-M-Oth	46	.069	0.238	12	.354	6.475
SHS-F	128	.090	0.406	66	.087	0.379
SHS-F-Tr	96	.220*	2.450	52	.219	2.428
SHS-F-Oth	32	-.052	0.135	14	.245	3.048
OHS-M	124	.288**	4.237	32	.130	0.849
OHS-M-Tr	104	.340**	5.957	28	.347	6.213
OHS-M-Oth	20	.203	2.082	4	-.585	18.897
OHS-F	78	.377**	7.379	29	.196	1.940
OHS-F-Tr	64	.408**	8.702	14	.241	2.947
OHS-F-Oth	14	.356	6.551	15	.302	5.057

*Significant at the .05 level of confidence.

**Significant at the .01 level of confidence.

ACT-ENGLISH

TABLE 20

Product-moment Correlation Coefficient Between ACT-English Scores and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.356**	6.551	441	.384**	7.669
LHS	706	.377**	7.345	237	.447**	10.547
SHS	350	.325**	5.429	143	.396**	8.175
OHS	202	.337**	5.850	61	.250*	3.175
M	749	.294**	4.419	233	.241**	2.947
F	509	.398**	8.261	208	.495**	13.111
Tr	1029	.339**	5.921	352	.401**	8.392
Oth	229	.412**	8.881	89	.310**	4.926
LHS-M	402	.306**	4.797	124	.317**	5.157
LHS-M-Tr	346	.270**	3.714	109	.376**	7.338
LHS-M-Oth	56	.480**	12.273	15	.179	1.615
LHS-F	304	.413	8.927	113	.553**	16.682
LHS-F-Tr	243	.388**	7.834	84	.568**	17.697
LHS-F-Oth	61	.443**	10.348	29	.502**	13.513
SHS-M	222	.281**	4.029	77	.372**	7.177
SHS-M-Tr	176	.269**	3.686	65	.403**	8.480
SHS-M-Oth	46	.342*	6.030	12	.229	2.651
SHS-F	128	.361**	6.743	66	.349**	6.288
SHS-F-Tr	96	.309**	4.894	52	.278*	3.942
SHS-F-Oth	32	.529**	15.138	14	.795**	39.339
OHS-M	124	.280**	4.000	32	.077	0.295
OHS-M-Tr	104	.245*	3.048	28	.072	0.260
OHS-M-Oth	20	.479*	12.219	4	.116	0.675
OHS-F	78	.398**	8.261	29	.561**	17.218
OHS-F-Tr	64	.462**	11.312	14	.551*	16.549
OHS-F-Oth	14	.228	2.634	15	.391	7.961

*Significant at the .05 level of confidence.

**Significant at the .01 level of confidence.

ACT-MATHEMATICS

TABLE 21

Product-moment Correlation Coefficient Between ACT-Mathematics Scores and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.224**	2.541	441	.238**	2.873
LHS	706	.236**	2.825	237	.295**	4.450
SHS	350	.217**	2.383	143	.187*	1.764
OHS	202	.181**	1.652	61	.182	1.670
M	749	.332**	5.672	233	.250**	3.175
F	509	.201**	2.041	208	.324**	5.394
Tr	1029	.221**	2.472	352	.260**	3.439
Oth	229	.206**	2.145	89	.108	0.585
LHS-M	402	.366**	6.939	124	.274**	3.827
LHS-M-Tr	346	.338**	5.885	109	.277**	3.913
LHS-M-Oth	56	.507**	13.805	15	.171	1.473
LHS-F	304	.199**	2.000	113	.437**	10.054
LHS-F-Tr	243	.157*	1.240	84	.456**	11.002
LHS-F-Oth	61	.322**	5.326	29	.304	4.733
SHS-M	222	.287**	4.207	77	.342**	6.030
SHS-M-Tr	176	.293**	4.389	65	.448**	10.597
SHS-M-Oth	46	.265	3.575	12	-.227	2.611
SHS-F	128	.199*	2.000	66	.148	1.101
SHS-F-Tr	96	.213*	2.295	52	.125	0.782
SHS-F-Oth	32	.170	1.456	14	.287	4.207
OHS-M	124	.283**	4.088	32	.208	0.072
OHS-M-Tr	104	.303**	4.701	28	.028	0.039
OHS-M-Oth	20	.230	2.681	4	.221	2.473
OHS-F	78	.198	1.980	29	.477**	12.110
OHS-F-Tr	64	.262**	3.493	14	.526*	14.952
OHS-F-Oth	14	-.025	0.031	15	.245	3.048

*Significant at the .05 level of confidence.

**Significant at the .ol level of confidence.

ACT-SOCIAL STUDIES

TABLE 22

Product-moment Correlation Coefficient Between ACT-Social Studies Scores and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.319**	5.225	441	.387**	7.792
LHS	706	.367**	6.978	237	.392**	8.003
SHS	350	.297**	4.512	143	.440**	10.176
OHS	202	.218**	2.405	61	.321*	5.292
M	749	.230**	2.681	233	.315**	5.091
F	509	.376**	7.338	208	.513**	14.161
Tr	1029	.318**	5.191	352	.422**	9.340
Oth	229	.297**	4.512	89	.235*	2.800
LHS-M	402	.339**	5.921	124	.304**	4.732
LHS-M-Tr	346	.321**	5.292	109	.314**	5.058
LHS-M-Oth	56	.365**	6.899	15	.101	0.511
LHS-F	304	.425**	9.481	113	.561**	17.218
LHS-F-Tr	243	.425**	9.481	84	.610**	20.760
LHS-F-Oth	61	.361**	6.743	29	.362*	6.782
SHS-M	222	.297**	4.512	77	.409**	8.747
SHS-M-Tr	176	.301**	4.638	65	.450**	10.697
SHS-M-Oth	46	.280	4.000	12	.238	2.873
SHS-F	128	.326**	5.463	66	.481**	12.328
SHS-F-Tr	96	.299**	4.575	52	.478**	12.164
SHS-F-Oth	32	.459**	11.156	14	.684**	27.052
OHS-M	124	.192*	1.861	32	.269	3.686
OHS-M-Tr	104	.216*	2.361	28	.238	2.873
OHS-M-Oth	20	.107	0.574	4	.883*	53.063
OHS-F	78	.302**	4.670	29	.391*	7.961
OHS-F-Tr	64	.377**	7.379	14	.594*	19.553
OHS-F-Oth	14	.072	0.259	15	.130	0.849

*Significant at the .05 level of confidence.

**Significant at the .01 level of confidence.

ACT-NATURAL SCIENCE

TABLE 23

Product-moment Correlation Coefficient Between ACT-Natural Science Scores and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.264**	3.548	441	.259**	3.412
LHS	706	.285**	4.147	237	.343**	6.066
SHS	350	.267**	3.630	143	.297**	4.512
OHS	202	.174*	1.525	61	-.004	0.000
M	749	.281**	4.029	233	.185	1.726
F	509	.320**	5.258	208	.455**	10.951
Tr	1029	.283**	4.088	352	.284**	4.118
Oth	229	.179**	1.615	89	.135	0.915
LHS-M	402	.309**	4.894	124	.224*	2.540
LHS-M-Tr	346	.298**	4.543	109	.273**	3.799
LHS-M-Oth	56	.363**	6.821	15	-.208	2.187
LHS-F	304	.323**	5.360	113	.584**	18.825
LHS-F-Tr	243	.404**	8.524	84	.616**	21.225
LHS-F-Oth	61	.135	0.915	29	.428*	9.622
SHS-M	222	.302**	4.669	77	.368**	7.017
SHS-M-Tr	176	.292**	4.358	65	.423**	9.387
SHS-M-Oth	46	.356*	6.551	12	.150	1.131
SHS-F	128	.322**	5.326	66	.324**	5.394
SHS-F-Tr	96	.304**	4.733	52	.324*	5.394
SHS-F-Oth	32	.401*	8.392	14	.349	6.288
OHS-M	124	.144	1.042	32	-.106	0.563
OHS-M-Tr	104	.185*	1.726	28	-.137	0.943
OHS-M-Oth	20	.039	0.076	4	.217	2.383
OHS-F	78	.287**	4.207	29	.229	2.657
OHS-F-Tr	64	.376**	7.338	14	.329	5.567
OHS-F-Oth	14	-.033	0.054	15	.079	0.313

*Significant at the .05 level of confidence.

**Significant at the .01 level of confidence.

ACT-COMPOSITE

TABLE 24

Product-moment Correlation Coefficient Between ACT-Composite Scores and College GPA for Prediction and Validation Sample. The Index of Forecasting Efficiency is Given as E

Group	Prediction Group			Validation Group		
	N	r	E	N	r	E
Total	1258	.352**	6.400	441	.393**	8.046
LHS	706	.399**	8.305	237	.434**	9.909
SHS	350	.299**	4.575	143	.441**	10.249
OHS	202	.280**	4.000	61	.236	2.825
M	749	.354**	6.475	233	.299**	4.575
F	509	.421**	9.294	208	.566**	17.560
Tr	1029	.359**	6.666	352	.428**	9.622
Oth	229	.301**	4.638	89	.242*	2.972
LHS-M	402	.398**	8.261	124	.339**	5.921
LHS-M-Tr	346	.370**	7.097	109	.367**	6.978
LHS-M-Oth	56	.551**	16.549	15	-.026	0.034
LHS-F	304	.448**	10.597	113	.615**	21.147
LHS-F-Tr	243	.436**	10.005	84	.660**	24.873
LHS-F-Oth	61	.423**	9.387	29	.445*	10.447
SHS-M	222	.324**	5.394	77	.449**	10.646
SHS-M-Tr	176	.357**	6.589	65	.531**	15.263
SHS-M-Oth	46	.260	3.439	12	.110	0.607
SHS-F	128	.359**	6.666	66	.488**	12.716
SHS-F-Tr	96	.329**	5.567	52	.485**	12.549
SHS-F-Oth	32	.471**	11.787	14	.654**	24.351
OHS-M	124	.280**	4.000	32	.038	0.072
OHS-M-Tr	104	.310**	4.926	28	.019	0.018
OHS-M-Oth	20	.186	1.745	4	.379	7.460
OHS-F	78	.379**	7.460	29	.548**	16.352
OHS-F-Tr	64	.465**	11.469	14	.641**	23.246
OHS-F-Oth	14	.073	0.267	15	.229	2.657

*Significant at the .05 level of confidence.

**Significant at the .01 level of confidence.

APPENDIX B

Product-moment Correlation Coefficient Matrix for Predictor Variables and Criterion for Prediction Sample and Validation Sample

1=Grade Point Average; 2=Interruption; 3=ACT English score; 4=ACT-Mathematics score; 5=ACT-Social Studies score; 6=ACT-Natural Science score; 7=ACT-Composite score

Total Prediction Sample N=1258

	1	2	3	4	5	6	7
1	. .	.15477	.35625	.22427	.31891	.26420	.35229
2	.13798	. .	-.01795	-.10559	-.01309	-.43090	-.06207
3	.38447	.00125	. .	.28720	.43414	.37417	.50011
4	.23863	-.12551	.37641	. .	.34976	.43844	.52490
5	.38746	-.03627	.64593	.37949	. .	.50855	.60211
6	.25914	-.12253	.55739	.49778	.71688	. .	.66633
7	.39302	-.09475	.77503	.68890	.86031	.86730	. .

Total Validation Sample N=441

LHS Prediction Sample N=706

	1	2	3	4	5	6	7
1	. .	.11729	.37685	.23574	.36698	.28535	.39950
2	.02842	. .	.01642	-.07963	-.00160	-.01488	-.02485
3	.44673	-.14980	. .	.26922	.47724	.35850	.52643
4	.29499	-.11130	.46236	. .	.35503	.44647	.52408
5	.39170	-.12938	.64951	.50606	. .	.51951	.65676
6	.34270	-.12738	.58213	.59982	.77220	. .	.61010
7	.43358	-.15439	.77307	.78062	.88051	.89279	. .

LHS Validation Sample N=237

SHS Prediction Sample N=350

	1	2	3	4	5	6	7
1	. .	.14478	.32461	.21714	.29671	.26745	.29863
2	.10527	. .	-.10788	-.11275	.01990	-.03922	-.08763
3	.39603	.02796	. .	.26832	.34573	.34481	.37319
4	.18684	-.11762	.27351	. .	.32547	.37020	.43591
5	.43956	-.06856	.65746	.21303	. .	.45060	.46671
6	.29653	-.12958	.48061	.35637	.67467	. .	.72818
7	.44137	-.10281	.75842	.55833	.84940	.82644	. .

SHS Validation Sample N=143

OHS Prediction Sample N=202

	1	2	3	4	5	6	7
1	. .	.32940	.33720	.18149	.21752	.17351	.27951
2	.21328	. .	-.03000	-.19173	-.08891	-.15630	-.16307
3	.25015	.13929	. .	.37597	.48387	.47944	.63417
4	.18175	-.24567	.32278	. .	.40337	.52138	.72822
5	.32131	.05826	.63018	.24660	. .	.62955	.75144
6	-.00388	-.11568	.60356	.40763	.60442	. .	.78988
7	.23594	-.04313	.83181	.60947	.81368	.83063	. .

OHS Validation Sample N=61

Males Prediction Sample N=749

	1	2	3	4	5	6	7
1	. .	.14263	.29384	.33266	.29990	.28140	.35370
2	.10923	. .	.01349	-.03005	.05233	-.01902	-.00830
3	.24132	-.15687	. .	.35568	.41805	.40810	.47686
4	.25075	-.11802	.45154	. .	.37364	.44398	.52735
5	.31491	-.04758	.65569	.40077	. .	.48972	.55645
6	.18501	-.11084	.64866	.50432	.74539	. .	.67389
7	.29896	-.12850	.81789	.72450	.85523	.87885	. .

Males Validation Sample N=233

Females Prediction Sample N=509

	1	2	3	4	5	6	7
1	. .	.15039	.38765	.20109	.37637	.31956	.42128
2	.13278	. .	-.06907	-.13209	-.06182	-.04754	-.10101
3	.49529	.02514	. .	.28637	.48407	.38719	.59333
4	.32446	-.10971	.42527	. .	.34437	.41588	.53140
5	.51362	-.02196	.71339	.34382	. .	.54757	.68498
6	.45457	-.10824	.61075	.44660	.68868	. .	.65190
7	.56607	-.07376	.83125	.64020	.86570	.85681	. .

Females Validation Sample N=208

Transfer Curriculum Prediction Sample N=1029

	1	2	3	4	5	6	7
1	. .	.16134	.33833	.22169	.31838	.28274	.35939
2	.15966	. .	.01630	-.06269	.02178	-.00606	-.02313
3	.40110	.04675	. .	.27990	.43088	.38550	.51143
4	.26022	-.03986	.35063	. .	.33816	.45444	.52836
5	.42164	.06420	.65005	.33442	. .	.51960	.59039
6	.28356	-.04363	.55266	.47911	.70082	. .	.71924
7	.42838	.00084	.77263	.66840	.84942	.86265	. .

Transfer Curriculum Validation Sample N=352

Other Curriculum Prediction Sample N=229

	1	2	3	4	5	6	7
1	. .	.16349	.41160	.20612	.29695	.17899	.30075
2	.18580	. .	-.09275	-.22927	-.0881	-.12427	-.15192
3	.31012	.05496	. .	.28897	.41815	.31143	.43041
4	.10805	-.23657	.41570	. .	.35590	.36791	.48255
5	.23507	-.06852	.57270	.49476	. .	.45367	.62303
6	.13526	-.15263	.50516	.51629	.72379	. .	.46987
7	.24155	-.12548	.74803	.74823	.87215	.85836	. .

Other Curriculum Prediction Sample N=89

APPENDIX C

Alpha and Beta Weights for Prediction Equations for Discriminant Analysis for Several Groups (BMDØ5M) by Groups

B1=Interruption; B2=ACT-English; B3=ACT-Mathematics; B4=ACT-Social Studies; B5=ACT-Natural Science; B6=ACT-Composite score. 1=low achievement (0 to 1.9 GPA); 2=medium achievement (2.0 to 2.9 GPA); 3=high achievement (3.0 to 4.0 GPA)

	Alpha	B1	B2	B3	B4	B5	B6
			Total Scores N=1258				
1	-07.44206	0.13259	0.31808	0.15104	0.11087	0.18453	0.13748
2	-10.13152	0.16451	0.38630	0.14485	0.14904	0.20739	0.16461
3	-13.82213	0.27149	0.44872	0.17910	0.18041	0.18296	0.23328
			Large High Schools N=706				
1	-06.99370	0.06761	0.26737	0.12901	0.15722	0.16201	0.13639
2	-09.86961	0.08585	0.33050	0.12104	0.20508	0.19003	0.16527
3	-13.12469	0.13638	0.38666	0.14688	0.24622	0.15894	0.22712
			Small High Schools N=350				
1	-09.33992	0.29017	0.50509	0.20683	0.04872	0.22951	0.12086
2	-12.21531	0.33565	0.58943	0.21372	0.07207	0.24207	0.15371
3	-17.21326	0.53478	0.66541	0.23938	0.10925	0.27192	0.20902
			Other High Schools N=202				
1	-07.72721	0.30588	0.21309	0.15630	0.13083	0.18422	0.26176
2	-09.90525	0.37872	0.27673	0.13730	0.19503	0.20535	0.25498
3	-15.22654	0.67940	0.35142	0.25484	0.16612	0.12505	0.40622

	Alpha	B1	B2	B3	B4	B5	B6
			Males N=749				
1	-08.14063	0.12563	0.26080	0.26930	0.11165	0.22623	0.08867
2	-10.91536	0.17668	0.30734	0.28025	0.15027	0.24362	0.12675
3	-15.13149	0.33278	0.34055	0.37668	0.16433	0.24922	0.16665
			Females N=509				
1	-06.86935	0.12896	0.36073	0.06660	0.09852	0.13446	0.20722
2	-09.82991	0.14882	0.43701	0.05746	0.13588	0.18499	0.21954
3	-13.65524	0.22855	0.48774	0.06415	0.18074	0.14438	0.33750
			Transfer Curriculum N=1029				
1	-07.86752	0.09987	0.34079	0.14647	0.12199	0.21484	0.11671
2	-10.61931	0.12119	0.40457	0.13771	0.15816	0.25534	0.13608
3	-14.52927	0.24524	0.45807	0.17140	0.19080	0.22516	0.22579
			Other Curriculum N=229				
1	-06.50924	0.17120	0.24908	0.19755	0.09462	0.12351	0.16657
2	-09.00961	0.22275	0.33278	0.20097	0.13830	0.11367	0.19523
3	-11.60653	0.28868	0.42474	0.22823	0.16933	0.08680	0.20041

	Alpha	B1	B2	B3	B4	B5	B6
	Large High Schools-Males N=402						
1	-07.71019	0.11192	0.21350	0.22847	0.11849	0.25452	0.09378
2	-10.91553	0.16356	0.24782	0.24578	0.16637	0.27979	0.14141
3	-14.52388	0.22679	0.28622	0.34221	0.19656	0.28029	0.14083
	Large High Schools-Males-Transfer Curriculum N=346						
1	-07.68988	0.11558	0.20560	0.21579	0.11928	0.27012	0.08158
2	-10.64138	0.16558	0.23579	0.20896	0.16751	0.31336	0.12269
3	-13.82488	0.19740	0.26642	0.31812	0.18952	0.29896	0.12194
	Large High Schools-Males-Other Curriculum N=56						
1	-09.25213	0.33372	0.15332	0.15410	-0.12967	0.15308	0.83623
2	-15.11233	0.41902	0.10952	0.33388	-0.22268	0.15799	1.10312
3	-41.22444	3.00698	0.74375	-0.35689	-0.24928	0.19689	1.75946
	Large High Schools-Females N=304						
1	-06.64733	0.04836	0.28767	0.08568	0.23675	0.06760	0.15201
2	-09.42053	0.04736	0.36624	0.06764	0.28468	0.11304	0.15293
3	-13.06792	0.08552	0.39392	0.07973	0.34729	0.06540	0.27148
	Large High Schools-Females-Transfer Curriculum N=243						
1	-07.98358	0.08024	0.29783	0.08284	0.34131	0.10490	0.13283
2	-10.92137	0.05136	0.38503	0.05618	0.37073	0.17940	0.13262
3	-15.50582	0.12366	0.41267	0.06128	0.45554	0.15990	0.24511
	Large High Schools-Females-Other Curriculum N=61						
1	-05.60258	0.00792	0.17047	0.05496	-0.28707	-0.-6-55	0.89355
2	-07.33773	0.04526	0.22874	0.04981	-0.18775	-0.01818	0.79215
3	-09.70896	0.00670	0.60480	0.42438	0.08390	-0.08685	-0.01582

	Alpha	B1	B2	B3	B4	B5	B6
	Small High Schools-Males N=222						
1	-09.56766	0.10648	0.38254	0.30102	0.10183	0.21372	0.11019
2	-12.07743	0.23522	0.44001	0.29699	0.12369	0.24473	0.13804
3	-18.45059	0.60079	0.48900	0.38316	0.13642	0.29734	0.20993
	Small High Schools-Males-Transfer Curriculum N=176						
1	-09.89293	0.07990	0.66592	0.23962	0.06659	0.22382	-0.02181
2	-12.44827	0.21764	0.69876	0.27728	0.08004	0.32320	-0.07493
3	-18.31720	0.62076	0.70752	0.26756	0.10865	0.15902	0.29792
	Small High Schools-Males-Other Curriculum N=46						
1	-11.83626	-0.18582	0.22323	0.48842	0.06617	0.34449	0.15833
2	-13.10771	0.44023	0.30846	0.37020	0.12591	0.34210	0.19984
3	-22.10363	-0.50897	0.33088	0.62734	0.10458	0.48484	0.20990
	Small High Schools-Females N=128						
1	-10.67703	0.36105	0.93020	0.10112	-0.09539	0.29877	0.08440
2	-14.86425	0.38825	1.10331	0.16731	-0.07870	0.34577	0.02380
3	-19.15109	0.52517	1.25722	0.17406	-0.01902	0.41740	-0.07493
	Small High Schools-Females-Transfer Curriculum N=96						
1	-09.46045	0.19916	0.91776	0.14324	-0.07469	0.41219	-0.23102
2	-13.07121	0.23959	1.04517	0.22970	-0.05448	0.47228	-0.31598
3	-17.07690	0.44833	1.23366	0.28438	-0.00295	0.52031	-0.47846
	Small High Schools-Females-Other Curriculum N=32						
1	-18.91465	0.72434	1.05757	0.05488	-0.19113	-0.18828	1.59680
2	-26.38527	0.80713	1.52093	0.08164	-0.16006	-0.31611	1.62840
3	-31.99344	0.92131	1.71607	0.06196	0.04405	-0.22045	1.40369

	Alpha	B1	B2	B3	B4	B5	B6
	Other High Schools-Males N=124						
1	-08.09402	0.19124	0.14290	0.28052	0.12162	0.07677	0.33722
2	-10.01546	0.15231	0.22985	0.34855	0.24554	0.08164	0.16909
3	-14.81762	0.84982	0.24430	0.46497	0.09135	-0.01660	0.46544
	Other High Schools-Males-Transfer Curriculum N=104						
1	-09.76422	0.17846	0.18545	0.22366	0.10156	-0.01638	0.63707
2	-11.91800	0.16882	0.25873	0.26553	0.19659	0.00191	0.53002
3	-17.80459	0.94905	0.24638	0.37598	0.07301	-0.11117	0.87182
	Other High Schools-Males-Other Curriculum N=20						
1	-06.06479	1.50417	0.27639	0.37686	0.24675	0.39261	-0.54722
2	-06.71320	1.39439	1.06143	1.41508	1.19477	0.86411	-3.71882
3	-11.08529	1.61714	1.95617	1.93802	1.46905	1.37646	-5.64035
	Other High Schools-Females N=78						
1	-07.78397	0.33453	0.34272	-0.01978	0.13994	0.33278	0.24839
2	-12.38321	0.47592	0.37557	-0.09429	0.19888	0.47513	0.34939
3	-19.48636	0.71166	0.49825	-0.03909	0.23569	0.44653	0.48487
	Other High Schools-Females-Transfer Curriculum N=64						
1	-07.47829	0.17847	0.37628	-0.03279	0.13403	0.32917	0.24011
2	-13.37049	0.30794	0.42280	-0.11759	0.19329	0.51815	0.37269
3	-20.20183	0.54914	0.52368	-0.06137	0.21130	0.51412	0.51017
	Other High Schools-Females-Other Curriculum N=14						
1	-39.67909	1.53805	-0.72574	1.50354	1.61178	0.57143	1.16980
2	-26.28071	1.27464	0.28686	1.44247	2.06610	1.19427	-1.68016
3	-42.67929	1.66745	0.42476	1.84027	2.55442	1.33796	-1.96394