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THE PASS-FAIL SYSTEM AND THE CHANGE IN THE ACCOUNTING OF GRADES ON COMPREHENSIVE EXAMINATIONS AT KNOX COLLEGE.

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DATA ON ENROLLMENT AND PERFORMANCE IN COURSES TAKEN ON A PASS-FAIL BASIS WERE ANALYZED TO ASSESS THE EFFORT OF CHANGES IN GRADE ACCOUNTING ON COMPREHENSIVE EXAMINATIONS. FINDINGS INDICATED THAT (1) ENROLLMENT IN PASS-FAIL COURSES FOR 1966-67 INCREASED 55.5 PERCENT OVER 1965-66, (2) A STUDENT'S GRADE INDEX WAS LIKELY TO INCREASE DIRECTLY WITH THE NUMBER OF PASS-FAIL COURSES TAKEN, (3) PASS-FAIL ENROLLMENT DID NOT ENCOURAGE STUDENTS TO ENROLL IN RIGOROUS COURSES, (4) THE PASS-FAIL SYSTEM LOWERED MEAN ACADEMIC PERFORMANCE, AND (5) STUDENTS TENDED TO ENROLL IN GENERAL EDUCATION COURSES FOR PASS-FAIL CREDIT. ELIMINATION OF GRADES FOR SENIOR COMPREHENSIVE EXAMINATIONS SKEWED THE DISTRIBUTION OF 1967 COMPREHENSIVE GRADES POSITIVELY AND CONTRIBUTED DIRECTLY TO BOTH MEAN REDUCTION IN GRADE INDICES AND VARIATION IN COMPREHENSIVE SCORES AMONG THE GRADUATING CLASS. THE AUTHOR RECOMMENDS THAT PASS-FAIL COURSES BE LIMITED TO FOUR PER STUDENT AND THAT PASS-FAIL GRADES SHOULD NOT BE USED FOR GENERAL EDUCATION COURSES. (JN)

THE PASS-FAIL SYSTEM AND THE CHANGE IN THE ACCOUNTING OF GRADES ON COMPREHENSIVE EXAMINATIONS AT KNOX COLLEGE

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At first glance one might be tempted to dismiss the pass-fail grading system as one of those "exciting" innovations in academic procedures which educators must explore from time to time to satisfy their sense of "involvement in learning processes which are alive and viable". Seldom does one find educationese in such flower. Rarely has an educational experiment been greeted more enthusiastically. Thus of the Princeton pass-fail program,[1] Dean John Monro of Harvard: "Bravo...It comes as a nice, pleasant springtime surprise...original...beautiful."[2] (Harvard will wait and see if it works.)

In fairness to this spirit of optimism, however, it should be recognized that unless such experimentation is undertaken with flair it may succumb to the inflexibilities of convention before it can get off the ground. Furthermore, one can see in the enthusiasm for pass-fail experimentation a reflection of the frustration which "positive motivation in learning" theorists have felt these many years in their battles with conventional teaching and grading procedures.[3]

The Knox College system of pass-fail grading, which antedated the Princeton program by one year, was intended to provide encouragement to juniors

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[1] The Princeton program is intended to encourage students "to take courses they might otherwise by-pass because of pressures for high grades". Students may take one course per term on a pass-fail basis for a maximum of four terms. New York Times, May 5, 1965, p 49.

[2] New York Times, May 23, 1965, E-9.

[3] The positive theorists abhor the threat of low grades as a (negative) stimulus to learning, arguing that this makes the teacher's evaluation of a student preeminent; that what tends to be learned, or not learned under these circumstances is how to do well on the tests of individual teachers.

and seniors to take courses outside their major fields.[4] The system was established on a two year trial basis, the Academic Status Committee being charged with reporting its evaluation of the experiment to the general faculty at the end of the trial period. Following the faculty's decision to eliminate grades on the Senior Comprehensive Examinations in computing students' cumulative indices, the committee was invited to include an evaluation of performance on the Comprehensive in its report. To support this committee's deliberations, the present paper (1) examines some basic data concerning enrollment and performance in courses taken pass-fail at Knox College, (2) analyzes the performance on Comprehensives following the change in academic accounting, and (3) makes policy recommendations concerning the restructuring of the pass-fail system.

I

Pass-Fail Enrollment

The pass-fail system has been popular among students at Knox College. Over forty per cent of the 1966-67 seniors who were eligible took at least two courses on a pass-fail basis in their junior and senior years. Over sixty per cent of the 1966-67 juniors who were eligible took at least one course on a pass-fail basis. Table I indicates a total pass-fail enrollment in 1965-66 of 243, a figure which increased to 378 in 1966-67. This

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[4] Juniors and seniors must have an upperclass index of 2.00 or better to be eligible to enroll on a pass-fail basis. They can not take a course pass-fail in their major field, nor will they be allowed to take a course pass-fail which is to be used to satisfy a proficiency in mathematics or language. Such courses may be used to satisfy General Education distribution requirements, however. In this sytem "pass" indicates that the student has performed in what would normally be regarded as the A - D range.

55.5 per cent increase is to be partially explained by the fact that the change to the three-three system increased the eligible student's opportunity to take a course pass-fail by fifty per cent. It should also be noted that the 1966-67 junior class was twenty-five per cent larger than the junior class of the preceding year. Such things considered, however, pass-fail has obviously "caught on" among the students.

Table II shows that of the 1966-67 student body, the mean grade index for those students who had taken a pass-fail course at every opportunity (five for seniors, three for juniors) was 3.01. This figure compares with a mean index of 2.67 for those eligible students who took no pass-fail courses. As a general statement it may be said that a student's grade index varies directly with the accepted opportunity to take pass-fail courses. This is explained by (A) the tendency for the superior students to take pass-fail courses more frequently than the average student, and (B) the tendency of students to relax in the pass-fail course while concentrating their energies on the courses which count in their grade averages. We shall present evidence on these points below.[5]

Table III indicates that about forty per cent of the pass-fail enrollment was associated with the satisfaction of distribution requirements. This average is not particularly meaningful when one considers the tremendous variation in the use of pass-fail to satisfy distribution requirements

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[5] Meanwhile, it should be emphasized that the evidence to be presented does not imply that a smaller amount of academic work was done at the college in the presence of the pass-fail system than would have been the case in its absence.

that exists between the three basic areas. Roughly, three-quarters of the courses taken pass-fail in the science-math area were used to fulfill distribution requirements. The corresponding figures for humanities and social studies were one-third and one-fourth respectively. These data reflect a long standing fact at Knox College that science-math majors show more willingness to take humanities and social studies courses than majors in these latter areas show willingness to take science-math courses.[6]

The idea of permitting students to take distribution requirements on a pass-fail basis rests on the presumption that in this way students will be encouraged to take a more rigorous set of courses than they would normally take. In the sciences the number of students who actually are influenced towards a more rigorous program is relatively small. The following figures indicate the fall term enrollment on a pass-fail basis in the elementary mathematics and science courses:

Pass-Fail Enrollment	Course Taken
5	Biology 121
2	Chemistry 101
2	Math 151
1	Geology 101
0	Physics 101 - 111

[6] By current standards the students who graduated the year before the present distribution requirements went into effect completed ninety-eight per cent of the humanities requirement, ninety per cent of the social studies requirement, and seventy-one per cent of the science-math requirement. The non-science majors completed only fifty-seven per cent of the science-math requirement. Office of Institutional Research, The Distribution of Courses Taken by 1963 Graduates of Knox College, Oct. 1963.

By contrast, of the ninety-four students enrolling in Biology 320 (Human Ecology) in the spring term, fifty-two enrolled on a pass-fail basis. What useful purpose is served by permitting students to enroll pass-fail in a course designed to fit into the General Education program is not clear. It is to be doubted that the existence of the pass-fail system increased the enrollment of this course to any considerable degree.

Pass-fail enrollment in the humanities and social studies areas has been diversified rather than concentrated in especially prepared General Education courses. In many cases in these areas enrollments doubtlessly support the hoped for achievement of pass-fail--the enrichment of students' academic programs. It must be remembered, however, that the average student's program in humanities and social studies was quite decent before pass-fail and much of the enrollment under consideration would have occurred had the pass-fail system not existed.

The Academic Performance in Courses Taken Pass-Fail

From the standpoint of academic performance, the pass-fail system was a failure in its first year of operation. In 1965-66 the faculty reported that seventeen and one-half per cent of the students taking courses on a pass-fail basis performed comparably to the D and F level. Usually only seven per cent of the juniors and seniors earn D's and F's, and a large share of these low grades are earned by students not eligible for pass-fail. The percentage of A's and B's earned by juniors and seniors in 1965-66 was 63.4, as compared with 65.5 the preceding year. We might have expected a higher percentage of A's and B's if the pass-fail students had given special attention to the courses which counted in their grade average.

With the change to the three-three system the academic performance of students taking courses pass-fail greatly improved. For the fall term the faculty reported that nine per cent of the pass-fail students were lagging at the D and F level. By the end of the second year the number of very poor showings by pass-fail students was moderate, and scattered observations were made by faculty that B+ work was not uncommon for pass-fail students. It is also worthy of note that the percentage of A's and B's earned by the 1966-67 Senior Class was 72.9, an all time high. A and B performance in the junior class, however, remained stable at 60.4 per cent.

Academic Performance in Biology 320: Human Ecology

Table IV shows that of the ninety-four students enrolled for Biology 320 in the spring term, fifty-two took the course on a pass-fail basis. Table V indicates that these students had a mean cumulative index of 2.62 at the end of the winter term. Their mean performance rating in Biology 320 was 2.42. The remaining forty-two students who took the course on a normal basis had a mean index of 2.42, but a performance rating of 3.02 for the course. The difference in the performance of the two groups is significant to .01 level, and it should be emphasized that both groups of students consisted largely of majors in humanities and social studies. The data indicate that while most students taking Biology 320 on a pass-fail basis did substantially more work than was necessary to "get by" the course, these students did not work up to their potential. Apparently the grades of the other students in the course appreciated through a comparison of performance with pass-fail students.

Table VI shows that the fifty-two students taking Biology 320 on a pass-fail basis had a mean index of 2.92 in those courses they took for credit. If we average this performance with the performance rating in Comprehensives and in Biology 320, we get an index of 2.73 for the term, a figure we might have expected with or without the pass-fail system. There is no reason to believe that these students would have achieved a grade average significantly different from 2.73 if the pass-fail system had not existed. The data do suggest, however, that when study requirements for courses conflict and one of the courses is taken on a pass-fail basis, the pass-fail course will generally be sloughed.

II

The Performance on Comprehensive Examinations

Another step in the direction of deemphasis on grades at Knox College came in the faculty decision not to include Comprehensive grades in the determination of cumulative indices beginning with the class of 1967. Table VII compares the performance of graduating seniors taking the Comprehensive in 1967 with the performance of their counterparts of 1966. The data indicate that the 1967 seniors took the Comprehensive Examinations much less seriously than 1966 seniors. The percentage of A's on these tests fell from 21.0 to 6.7.

One might be tempted to dismiss the above conclusion on the basis that the percentage of A's in 1967 was biased downward by the fact that Honors candidates did not take the Comprehensive. However, only eight students missed taking the Comprehensive for this reason, and it is by no means a foregone conclusion that all of these students would have made A's.

Nor can the poorer showing on the 1967 Comprehensive be discounted as a reflection of the general fall in cumulative indices. As Table VII indicates, the fall in the Comprehensive index was almost exactly matched by a fall in the average of cumulative indices. On the basis of the 1966 data,[7] we would have anticipated a fall in the Comprehensive index of only one-third its actual fall. Given the knowledge that the 1967 average of cumulative indices would fall to 2.60, we might have expected the 1967 Comprehensive index to fall to 2.71. The fact that the latter index also fell to 2.60 reflects the instability in the relationship between cumulative indices and Comprehensive grades which occurred between 1966 and 1967.

The faculty in its wisdom has succeeded in making a bad situation worse. In recent years we have had a number of students who did not achieve as high a grade on the Comprehensive as we had expected, and this situation has now been magnified. The drastic fall in the percentage of A grades on the Comprehensive is reflected in the smaller mean and variance of Comprehensive grades in 1967. The same fact accounts for the reduced amount of variation in Comprehensive grades that can be associated with variation in grade indices. Table VII shows that in 1966 this association was thirty-six per cent; in 1967 the figure was twenty-five per cent. Considering the currently low coefficient of determination (r^2) and the equally low coefficient of regression we may conclude that, if the object is to raise the general performance on the Comprehensive, we will not succeed merely by getting better students.

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[7] Coefficient of Regression = .35. This value fell to .25 in 1967.

Performance on the 1967 Economics Comprehensive

It may be felt, of course, that the above analysis of Comprehensive grades correlates the wrong variables. A correlation between an index of grades required in the major and Comprehensive grades might provide a more meaningful coefficient. A comparison of performance in 300 level courses required in the major with Comprehensive grades might also be valuable. Unfortunately, such major field indices are not at hand and cannot be readily obtained for the entire population.[8] For illustrative purposes, however, the relevant data have been assimilated for the Economics majors who took the Comprehensive Examination in 1967.[9]

Table VIII indicates that the twenty-three students who took the 1967 Comprehensive in Economics had a mean cumulative index of 2.63 and a variance of .19. These averages do not differ significantly from the

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[8] The existence of such data would provide us with more specific information as to the relationship between performance in the major with performance on the Comprehensive. The conclusions of the immediately preceding analysis, however, would only be strengthened by their availability. The central fact of the matter relates to the changing variance of Comprehensive grades reflecting the smaller percentage of A grades. Since we know that grades in the major do not vary as much as total grades and that grades in required courses vary even less, we would expect less correlation between these indices and Comprehensive grades than we have obtained between cumulative indices and Comprehensive grades. Compare Table IX.

[9] The Department of Economics was selected for a number of reasons. The members of the department have made an effort to impress upon the students the seriousness of the Comprehensive and if any substantial correlations are to be found between performance on the Comprehensive and other indices they should be found here. The department also assigns the grade in the Comprehensive before it knows to whom the grade is being assigned. A final consideration is that the department declares specifically which courses are considered requisite to the major, and a student's index of grades for these courses is relatively easy to obtain.

corresponding figures for the population of graduating seniors. The average performance on the Economics Comprehensive of 2.43 falls about one standard error below the population mean of 2.60. (The Economics mean is low but not exceptionally low). As might be expected the grades of students taking the Economics Comprehensive were also low relative to their grades in the required courses for the major (index = 2.73) and to their grades in required 300 level courses (index = 2.71).

As low as the grades were on the Economics Comprehensive, they were raised appreciably by the students' performance on the Graduate Record Exam (mean = 632 or 90th percentile) which was given a weight of one-third in the determination of the Comprehensive grade. One student would have failed the Comprehensive but for a substantial score on the GRE.

Table IX indicates that forty-two per cent of the variation in the Comprehensive grades of Economics majors was associated with variation in cumulative indices. This figure is considerably larger than the corresponding twenty-five per cent covariation for the college as a whole. As expected, however, the correlations between the Economics Comprehensives grades and indices of required Economics courses was lower ($r^2 = .34$) and the correlation between Economics Comprehensive grades and indices of required 300 level courses even lower ($r^2 = .32$). If the data on Economics students can be used as a guide, we might guess that the percentage of variation in Comprehensive grades for the college as a whole which could be associated with variation in required courses in the major field, or with required

300 level courses in the major, was something less than twenty per cent in 1967.

Table IX shows that forty-one per cent of the variation in GRE scores was associated with variation in the indices of required 300 level courses. The corresponding covariation between required course indices and GRE scores was only twenty-nine per cent. The difference between these two r^2 values might possibly be explained by the two courses in accounting which are required at the 200 level. Probably of considerably more importance, however, was the late intellectual maturing of some of the Economics majors (e.g. Aigner, Wheeler, Fiddes, Winkler, Bastian). Many Economics majors do well in advanced courses and score high on the GRE who have mediocre records in their first course in the department.[10]

III

Conclusions and Recommendations

The pass-fail system at Knox College has neither worked as well as its proponents had hoped nor as badly as its opponents had feared. Some students use the system to gain credit in a course (or courses) with a minimum of effort, but there is much less of this under the three-three system than was the case under the semester system. Most students do considerably more work than is necessary to pass. As a means of encouraging students to undertake a broader and more rigorous program, the pass-

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[10] Hopefully, this maturing occurs throughout the college. It is one of the reasons why Economics majors as a group make such a fine showing on the GRE.

fail system has been only moderately successful. Its popularity with students seems to rest principally on (A) the relaxations of tensions when course requirements conflict, and (B) its use in the satisfaction of General Education requirements.

If we can justify the enthusiasm for experimentation in pass-fail as a positive force in the initiation of the system, we might have hoped for greater success of the program. Its foundations in student popularity are not particularly commendable. If pass-fail provides for relaxation of tensions when course requirements conflict, it also provides for relaxation when class attendance and sleeping conflict. While an atmosphere of reduced conflict may not be noticed most of the time, it becomes uncomfortably apparent at times; i.e., in the absenteeism at the 1967 Senior Convocation. As concerns the system's student popularity relative to the satisfaction of distribution requirements, the practice of allowing students to take courses specifically designed for General Education on a pass-fail basis is self-defeating. It undermines the basic purposes of pass-fail. The system is supposed to encourage students to take courses they might not otherwise take; i.e., to take basic physics rather than astronomy. To permit students to take astronomy pass-fail to satisfy a distribution requirement is not consistent with the original justifications of the experimentation.

The combination of the pass-fail system and the current accounting of Comprehensive grades permits seniors to take one course or less on a normally graded basis in the spring term. Considering the deterioration of

performance on the Comprehensive and the mediocre success of the pass-fail system, the continuation of the situation seems pointless, not to say dangerous. It would be supposititious to predict that these conditions will lead to excursions to the Mardi Gras, to generally sunnier climes, etc. by groups of students. Sufficient to say that only losers play the kind of game where there is little to gain and much to lose. We may enjoy the play, of course, but sooner or later we will lose.

The policy recommendations which follow from the above considerations of pass-fail is that the system should be modified rather than abandoned. On the one hand the program should be extended in two directions: (1) The requirement of an upperclass C average for participation should be removed. Pass-fail courses do not improve a student's grade average and are of no help to a student in meeting the upperclass C average graduation requirement.[11] (2) The privilege of pass-fail should be extended to all students. Students actually concerned with upgrading their portfolio of courses might well do so as freshmen, sometimes with better results. A few Economics majors, for example, have been encouraged to take calculus because of pass-fail. The results have been less than spectacular, but these same students might well have done better in the course in their early years at college. They were closer to their high school mathematics as freshmen than they were as seniors.

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[11] The 1968 Senior Class has the option of the old quality point system and some few of these students might improve their chance of graduation via pass-fail. There are not enough of these students to warrant a postponement of policy change, however.

On the other hand, the pass-fail system should be restricted in two directions: (1) The number of courses taken pass-fail should be limited to four. This would return the program to its original dimensions. If the pass-fail system is effective the large majority of students should take one or two courses pass-fail which they would not otherwise have taken. A substantial but relatively small percentage of students might take three or four such courses pursuant to the degree. To pretend that we are generally altering the course structure of a student's academic program by as many as five or six courses through the magic of pass-fail is to ignore the greater probability that many of these courses would have been taken in the absence of pass-fail. (2) Only those courses specifically declared to be requisite to a major should be taken pass-fail. This would permit a student to take courses such as Art 103, Biology 121, Economics 201, History 104, Math 151, Physics 101, etc. on a pass-fail basis whether the course was used to satisfy a distribution requirement or not. Courses such as Art 104, Biology 320, (at least as the course was structured last year), Economics 211, Physics 251, etc. should not be included in the pass-fail program whether they are used to satisfy a distribution requirement or not.

Seniors should not be permitted to take a course pass-fail in the term of their Comprehensive for the reasons discussed above. Eleven terms should be adequate to alter a student's academic program via pass-fail.

If the 1967 performance on the Comprehensive Examinations is a harbinger of what is to occur in future springs, we should return to a thirty-six

course graduation requirement. We have reduced the graduation requirement to thirty-five courses on the assumption that students do something in preparing for the Comprehensive which compares with what is done for one course credit. If it becomes generally true that students do little or nothing in preparing for the Comprehensive we will have debased the graduation requirement by requiring only thirty-five courses.

It may well be, of course, that the 1967 performance on the Comprehensive was merely a first year reaction to a change in regulations which will not be repeated. It might help to go through a generation of students with a stable Comprehensive program; it might also help if some departments would rid themselves of the preconception that no student will fail.

TABLE I

STUDENTS TAKING COURSES ON PASS-FAIL BASIS, CLASSIFIED BY AREA, 1965-66, 1966-67

Area	Enrollment 1965-66	Enrollment 1966-67	Per Cent Increase
Humanities	128	173	35.1
Science and Mathematics	50	141	182.0
Social Studies	65	64	-1.5
Total	243	378	55.5

Source: Office of Institutional Research
Knox College, July, 1967

TABLE II

FREQUENCY DISTRIBUTION AND MEAN GRADE INDEX OF STUDENTS TAKING PASS-FAIL COURSES, CLASSIFIED BY NUMBER OF PASS-FAIL COURSES TAKEN, 224 SENIORS AND 313 JUNIORS, KNOX COLLEGE, 1966-1967

Number of Pass-Fail Courses Taken	Seniors		Juniors	
	Number of Students	Mean# Index	Number of Students	Mean# Index
0	8	Below 2.00*	38	Below 2.00*
0	60	2.67	117	2.67
.5-1	64	2.65	94	2.67
1.5-2	49	2.88	52	2.77
2.5-3	26	2.90	12	3.12
3.5-4	12	3.00	--	--
4.5-5	5	3.01	--	--
	224		313	

Source: Office of Institutional Research
Knox College, July, 1967

* Not eligible to take courses pass-fail.

As of June, 1967.

TABLE III

STUDENTS TAKING COURSES ON PASS-FAIL BASIS TO SATISFY DISTRIBUTION REQUIREMENTS, CLASSIFIED BY AREA, 1965-66 AND 1966-67

Area	Enrollment 1965-66	Per Cent of Total Pass-Fail	Enrollment 1966-67	Per Cent of Total Pass-Fail
Humanities	41	32.0	58	33.5
Science and Mathematics	39	78.0	103	73.0
Social Studies	12	18.4	14	21.8
Total	92	40.3	175	38.9

Source: Office of Institutional Research
Knox College, July, 1967

TABLE IV

COMPARISON OF ACADEMIC PERFORMANCE OF STUDENTS TAKING BIOLOGY 320 ON PASS-FAIL BASIS WITH THE ACADEMIC PERFORMANCE OF STUDENTS BEING GRADED IN THE USUAL MANNER, SPRING, 1967

Performance Rating	Normal Enrollment	Pass-Fail Enrollment	Totals
A	13	3	16
B	16	18	34
C	12	29	41
D	0	2	2
F	0	0	0
I	1	0	1
	42	52	94

Source: Office of Institutional Research
Knox College, July, 1967

TABLE V

MEAN INDEX AND ACADEMIC PERFORMANCE RATING OF STUDENTS TAKING BIOLOGY 320, CLASSIFIED BY PASS-FAIL STUDENTS AND OTHER STUDENTS SPRING, 1967

	Number of Students	Mean* Cumulative Index	Mean Performance Rating
Pass-Fail	52	2.62	2.42
Others	42	2.42	3.02

Source: George Ward, Grade Report of Biol 320

*Grade Report, March, 1967

Significance of Difference Between Mean Academic Rating

$$t = \frac{3.02 - 2.42}{.138} = 4.36$$

Conclusion: Difference in performance of the groups cannot be attributed to random variation of students involved.

TABLE VI

PERFORMANCE IN OTHER COURSES OF 52 STUDENTS TAKING BIOLOGY 320 PASS-FAIL, SPRING 1967

	Number of Units	Comprehensive Examination	Biology 320 (rating)	Total
A	25	2	3	30
B	37.5	10	18	65.5
C	25	9	29	63
D	2		2	4
F	1			1
Total	90.5	21	52	163.5
Index	2.92		2.42	2.73

Source: Office of Institutional Research
Knox College, July, 1967

TABLE VII

CORRELATIONS OF CUMULATIVE GRADE INDICES AND PERFORMANCE ON COMPREHENSIVE GRADUATING CLASS, 1966 AND 1967

	1966	1967
Mean Cumulative Index	2.77	2.60
Mean Index of Comprehensive Grades	2.78	2.60
Variance of Comprehensive Grades	.70	.57
r^2 *	.36	.25
Percentage of A's in Comprehensives	21.0	6.7

Source: Office of Institutional Research
Knox College, July, 1967

* Proportion of variation in comprehensive grades associated with variation in cumulative grade indices.

TABLE VIII

ARITHMETIC MEAN AND VARIANCE OF ACADEMIC PERFORMANCE: INDEX FOR REQUIRED COURSES IN MAJOR, INDEX FOR 300 LEVEL REQUIRED COURSES, INDEX FOR COMPREHENSIVE, GRADUATE RECORD EXAM SCORES; 23 ECONOMIC SENIORS, SPRING, 1967

Index	Mean	Variance
Cumulative	2.63	.19
Required Courses in Major	2.73	.24
Required 300 Level Courses in Major	2.71	.48
Comprehensive Exam	2.43	.66
Graduate Record Exam	632	4200

Source: Office of Institutional Research
Knox College, July, 1967

TABLE IX

CORRELATIONS OF ACADEMIC PERFORMANCE BY 23 ECONOMIC SENIORS, SPRING, 1967

Variables	r^2 *
x = Cumulative Indices y = Comprehensive Grades	.42
x = Required Course Indices y = Comprehensive Grades	.34
x = Required Course Indices y = GRE Scores	.29
x = Required 300 Level Courses y = Comprehensive Grades	.32
x = Required 300 Level Courses y = GRE Scores	.41

Source: Office of Institutional Research
Knox College, July, 1967

* Proportion of variation in y associated with variation in x.