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## **PROGRESS OF DEMOTED AND PROMOTED STUDENTS IN MATHEMATICS AT THE IOWA STATE COLLEGE**

FRED ROBERTSON

About 1936 the author began collecting data on the academic progress of two groups of students in mathematics at the Iowa State College. The first group was composed of students selected for their poor showing in mathematics and the second group for their excellent showing in the subject.

### **I**

#### **THE DEMOTED GROUP**

The following procedure was used to select the members of the demoted group. All entering freshmen students were given a psychological test during freshman days. Then during the third recitation period or during freshman days those students enrolled in the college algebra course were given a retention test in mathematics covering the work taken in high school. During the tenth recitation period they were given a test over the material they had covered in mathematics classes the preceding days.

The head of the mathematics department, with the advice of members of the staff, selected\* from the group whose combined scores were low in the three tests, a sufficient number to form three sections. The statistical basis for and the method used for the selection need not be explained here.

The group composed of those students selected by the head of the mathematics department (1) because they made a low combined score on the three tests previously mentioned and (2) were placed in special sections for supplementary training were called the demoted group. For the years 1941 and 1943 the procedure in forming special sections was modified as will be explained later.

This group was given two quarters to do the work in college algebra which the normal progress groups did in one quarter. The two groups used the same text. At the end of the first quarter the three sections of the slow group were combined into two sections. The first quarter work was called course "4" and the second course "101 special" to distinguish it from the usual algebra course 101. Due to convenience of administration, a student who failed to receive a passing mark in course 4 enrolled in 101 special with those who had received passing marks in course 4. The sequence of courses this group started was algebra 4, college algebra "101 special", trigonometry 102, analytic geometry 103, calculus 211, calculus 212, and calculus 213. Not all these students were enrolled in curricula which required the complete sequence. Sometimes their curricula required courses in mathematics other than those in this sequence.

\* Some phases of the Mathematics Testing Program at the Iowa State College, Mathematics Teacher, November, 1943, pages 296-301.

This study covers the academic years 1935-1944 inclusive but the years 1941 and 1943 have been considered separately. In 1941 the personnel of the demoted group was selected in the usual way and then instead of forming the new sections they were allowed to remain in the regular 101 sections. On the initiative of the student, however, he was permitted to take course 5 instead of course 101. Course 5 is the course for students who have had only one year of high school algebra it enables them to meet the entrance requirements in mathematics for certain curricula such as engineering. In 1943 this group was formed in the usual way and then they enrolled in the regular course in precollege algebra, course 5. If they were successful in the precollege algebra, they were enrolled in the regular college algebra 101 sections the next quarter.

The following table, Table I, appears in two parts: The first part is for the years 1936-1944 inclusive omitting the years 1941 and 1943. The second part is for the years 1941 and 1943 only.

In the table the courses are listed in the first column and the number of students obtaining a certain grade in a course is given in the row in which the course appears and in the column with the appropriate grade designation.

The column headed terminal means a student did not progress beyond that course in this sequence. Thus 94 students ended their mathematics study in course 4, while 17 continued through the three quarters of calculus.

TABLE I

Course	A	B	C	D	E	F	W	Repeated	Repeated more than 1 time	Terminal
Part I—Years 1936-1944 inclusive omitting 1941 and 1943										
Total Number of Demotions 366										
Algebra 4 .....	4	22	88	106	31	76	1	4	0	94
College algebra										
101 .....	0	13	72	71	10	69	3	38	6	84
Trigonometry 102	0	7	51	42	18	37	1	25	9	84
Analytics 103 .....	1	3	25	19	8	14	1	16	1	27
Calculus 211 .....	1	1	13	16	5	6	1	12	4	14
Calculus 212 .....	0	2	9	7	6	5	0	4	1	12
Calculus 213 .....	0	0	10	5	2	1	0	2	1	17
Others .....	1	4	16	8	0	4	1	1	0	
Course	A	B	C	D	E	F	W	Repeated	Repeated more than 1 time	Terminal
Part II—Years 1941 and 1943—Total Number of Demotions 47										
Algebra 5 .....	3	2	6	3	1	1	0	0	0	5
College algebra										
101 .....	0	0	3	6	2	12	1	6	1	15
Trigonometry 102	0	1	2	4	1	3	0	2	0	7
Analytics 103 .....	0	2	1	0	0	1	0	0	0	2
Calculus 211 .....	0	0	1	0	0	0	0	0	0	2
Calculus 212 .....	0	0	1	0	0	0	0	0	0	0
Calculus 213 .....	0	0	0	0	0	0	0	0	0	0
Others .....	0	0	0	0	0	0	0	0	0	

Of these 366 demotions for the years 1936-1944, omitting 1941 and 1943, 129 passed all mathematics courses in which they enrolled, although each course may not have been passed on the first trial. But 50 of these 129 enrolled in course 4 only. Therefore 79 or 22 percent passed all mathematics courses of college grade in which they enrolled. Of these 79, 70 passed all mathematics courses in which they enrolled on the first trial.

Of these 47 demotions for the years 1941 and 1943, 8 passed all mathematics courses in which they enrolled, but of these 8, 2 attempted mathematics course 5 (precollege algebra) only. Therefore 6 or 13 percent passed all mathematics courses of college grade in which they enrolled and passed them on the first trial.

From 1940 to 1944 inclusive no one of the group reached a level beyond the first quarter of calculus 211.

The following table, Table II, shows the progress made by groups according to score made in course 4. Thus the progress of the group which made A in mathematics 4 is found on the first line. It shows the group had a final grade point average of 1.57 in all the mathematics courses of college level which they completed. At this institution the grades A, B, C, D carry 4, 3, 2, 1 grade points respectively for each quarter hour of credit earned.

At the Iowa State College a 2.0 grade point average is required before a student may pass from the junior to the senior college. To meet this rule some students elect to repeat a course to raise their average grade. Thus the group which made an A grade in course 4 raised their grade point average in all college level mathematics courses from 1.43 to 1.57 by repeating some mathematics courses.

TABLE II

	No. getting grade in 4	Compl'd 101 first trial	Compl'd 101 more than one trial	Enrolled in 4 only	Grade point av. 101	Final grade point av. 101	Grade pt. av. all college level math. courses	Final gr. pt. av. all college level math. courses
<b>Part I—Years 1936-1944 inclusive omitting 1941 and 1943</b>								
<b>Total Number of Demotions 366</b>								
A	4	3	0	1	2.00	2.00	1.43	1.57
B	22	14	3	4	1.75	1.87	1.56	1.73
C	88	68	11	14	1.71	1.75	1.45	1.64
D	106	69	17	25	1.10	1.42	1.00	1.28
E	31	12	1	11	0.52	0.91	0.62	1.06
F	76	57	10	29	0.74	0.95	0.37	0.56
W	1	4	0	0				
	No. getting grade in 4	Compl'd 101 first trial	Compl'd 101 more than one trial	Enrolled in 4 only	Grade point av. 101	Final grade point av. 101	Grade pt. av. all college level math. courses	Final gr. pt. av. all college level math. courses
<b>Part II—Years 1941 and 1943—Total Number of Demotions 47</b>								
<b>Course 5 or 101</b>								
A		0	0	1				
B		0	0	0				
C		2	4	1	2.00	2.00	1.81	1.81
D		7	9	0	1.00	1.00	1.06	1.18
E				1	0.00	0.00	0.00	0.00
F				2	0.00	0.55	0.21	0.42

The table, Table III, shows in the first column the percent of those enrolled in college algebra who took course 4; the second column, the number passing all mathematics courses in which they enrolled; the fifth column, the number of times the students attempted course 4; and the 6th column gives the number passing course 4. The last column gives the number of students who terminated their mathematical training at the course indicated. Thus 17 continued through the sequence and their terminal course was the third quarter of calculus.

TABLE III

Part I—Years 1936-1944 inclusive omitting 1941 and 1943

Percent of college algebra students demoted .....	9.2
Number passed all math. courses in which enrolled.....	129
Number enrolled in and passed 4 or 5 only .....	49

Course	4	101sp	102	103	211	212	213	Others
Number trials .....	379	294	197	89	58	37	22	35
Number taking .....	366	241	155	71	44	29	17	34
Number passing .....	225	184	123	59	38	22	17	30

Part II—Years 1941 and 1943

Percent of college algebra students demoted .....	5.0
Number passed all math. courses in which enrolled.....	8
Number enrolled in and passed 5 only .....	2

Course	5	101sp	102	103	211	212	213	Others
Number trials .....	18	52	13	4	2	0	0	2
Number passing .....	18	41	11	4	2	0	0	2
Number taking .....	14	14	9	3	2	0	0	2

Several instructors of the demoted sections were asked, "Do you think it wise to form demoted sections?" The majority replied quickly and emphatically, "No". The remainder had no decided opinions.

Conclusion: Since this is a progress report, the data is factual and need not determine the desirability of continuing the demoted sections. However, the instructors of these sections agree the main problem here is vocational in character. That is, when a demoted section is formed each counsellor should be notified of the personnel of the section and requested to investigate the desirability of a change in curricula for each member of these sections.

II

THE PROMOTED GROUP

The basic requirement for admission to the Iowa State College is graduation from an approved high school. Each student who plans to enter the college for the first time must fill out a formal applica-

tion for admission. The registrar will then notify the applicant of his admission status.

Admission will be granted upon formal application and certification of graduation from an approved Iowa\* high school provided the record shows the completion of one unit each of algebra and plane geometry.

To meet the requirements for the Divisions of Engineering and Science and for the Curricula in Dairy Industry, Forestry, Industrial Education, and Landscape Architecture of the Division of Agriculture, an additional half unit of algebra is required.

For those students who present one unit of algebra for entrance the sequence of mathematics courses is non-collegiate algebra 5, college algebra 101, trigonometry 102, analytics 103, calculus 211, calculus 212, calculus 213, etc.

A student enrolled in course 5, who desires promotion, may be given at his request or on the request of his instructor the same comprehensive retention test in mathematics which the college algebra group has taken. If his scores on this test and on the psychological test given during freshman days are very high (approximately the average of the college algebra group), then the Head of the Mathematics Department after a consultation with the student may recommend that he be advanced to college algebra 101 and be given credit in course 5. Usually the grade given for course 5 has been the grade granted on the mathematics test as A, B, C, or D. However for the years 1943 and 1944 the student was given the grade in course 5 which he obtained from classroom work in college algebra 101.

This group consisting of those students who enrolled in course 5 and then were promoted to college algebra 101 by examination is the one covered in the second part of this study.

The following table, Table I, shows the distribution of marks in each of the mathematics courses for this group.

TABLE I

	A	B	C	D	E	F	W	Repeated once	Repeated more than once	Ter- minal
Years 1936-1942 inclusive—Total No. of Promotions 77										
Non-collegiate algebra .....	5	9	11	25	26					
(by examination)										
College algebra 101	10	19	24	12	3	7	1	13	0	5
Trigonometry 102	8	14	25	12	2	3	0	5	0	15
Analytics 103 .....	6	13	22	3	3	2	0	3	1	7
Calculus 211 .....	7	8	14	8	1	3	0	5	0	2
Calculus 212 .....	9	7	12	7	1	1	0	2	0	9
Calculus 213 .....	5	7	10	3	1	0	0	1	0	26
Others .....	3	7	8	2	0	0	0	0	0	

\* For entrance requirements for others and for non-residents of Iowa see the Iowa State College bulletin.

Years 1943-1944—Total No. of Promotions 15

Non-collegiate algebra	5	1	5	4	5	0	0	0	0	0	
College algebra 101	1	5	4	4	5	2	0	0	1	0	3
Trigonometry 102	4	3	4	4	1	0	0	0	0	0	8
Analytics 103	2	1	1	0	0	0	0	0	0	0	3
Calculus 211	0	1	0	0	0	0	0	0	0	0	0
Calculus 212	0	1	0	0	0	0	0	0	0	0	0
Calculus 213	0	1	0	0	0	0	0	0	0	0	1
Others	0	0	1	0	0	0	0	0	0	0	

Of these 77 students in the years 1936-1942 inclusive, 42 passed on the first trial all mathematics courses of college grade in which they enrolled.

Of these 15 students in the years 1943 and 1944, 13 passed on the first trial all mathematics courses in which they enrolled.

The following table, Table II, shows what each starting letter group did in the collegiate mathematics courses. For instance during the years 1936-1942 inclusive of the 19 students who made an A grade on the examination 8 completed course 101 on the first trial, and 1 took no mathematics course. Their grade point average in college algebra 101 was 3.12; in all their mathematics courses it was 3.00 which was finally brought to a 3.13 average. At the Iowa State College a student must make a 2.00 point average to progress from the junior to the senior college. It has been the practice to permit students who do not meet the 2.00 point average in the junior college to repeat a course to raise the grade point average. That is, if a student had a D score in a course he could repeat the course in class. If he obtained a B score, then the B score would be counted instead of the D score in computing the grade point average.

TABLE II

	No. students obtaining grade by exam	No. completing 101 1st trial	No. completing 101 2nd trial	Took no math. course	No. failing some o pass 101	No. failing some math. course	Grade point av. math. 101	Final grade pt. av. in math. 101	Gr. pt. av. all math. courses	Final gr. pt. av. all math. courses
<i>Years 1936-1947 inclusive</i>										
A	9	8	0	1	0	1	3.12	3.12	3.00	3.13
B	11	9	1	1	0	1	3.30	3.30	2.82	2.98
C	25	21	0	3	1	6	1.91	1.96	2.03	2.17
D	26	15	7	4	0	11	1.46	2.41	1.96	2.25
Total							2.13	2.49	2.33	2.53

## Years 1943-1944\*

A	1	1	0	0	0	0	4.00	4.00	4.00	4.00
B	5	4	0	2	0	0	3.20	3.70	3.63	3.63
C	4	4	0	1	0	0	2.00	2.00	2.00	2.00
D	5	4	1	0	0	1	0.80	1.00	1.74	1.84
Total							2.06	2.13	2.70	2.74

\* The grade given in course 5 is the grade obtained by taking college algebra 101 in class.

The following table, Table III, shows the progress of the group as the students progress in their sequence of mathematics courses. The table for years 1936-1944 inclusive is self-explanatory.

TABLE III

Percent of students in 5 promoted .....	5.8
Number promoted .....	92
Number passed all math. courses attempted .....	80
Number passed college algebra only .....	7
Number took exam. for entrance credit .....	7
(No course work)	

Course								Others	
	101	102	103	211	212	213	Others non-Collegiate	Others Collegiate	
Number trials .....	94	77	53	43	38	28	20	3	
Number taking .....	80	71	48	38	36	27	20	2	
Number passing .....	78	69	47	37	32	27	20	2	

Table II part II shows that those students who obtained an A or B score for course 5 by examination obtained almost a B average or better in their following mathematics courses. There seemed to be little difference in the successful completion of their mathematics sequence of those who obtained either a C or a D grade on the examination.

Conclusion: Clearly the best of these students, those who obtained an A or B score on the examination, did very well in their following work and their promotion was justified. For the other group, those who obtained a C or D score on the examination, the justification for their promotion is not so evident, although it seemed desirable for part or most of the group.

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