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## A Study of Student Achievement and Mortality in College Mathematics

By FRED ROBERTSON

This study was undertaken to obtain a clearer insight into the achievements and the mortality of entering freshmen in college mathematics.

In the fall of 1952, one thousand and four (1004) students (nearly all freshmen) enrolled in the college algebra course at The Iowa State College. This study records their successes and failures as of the end of the winter quarter of 1954. Then they had had three quarters in their freshman year, (a summer quarter in 1953) and two quarters in the 1953-54 school year.

For instructional purposes each of the 1004 entering freshmen were assigned to one of three groups, namely an accelerated group, a normal group, and a group getting remedial attention. The first group was selected for their excellent work and their promise of future success. They were 128 in number and they elected to take algebra and trigonometry in one quarter. The group given remedial attention was selected for their lack of achievement in previous scholastic work and their willingness to accept the remedial work.

A student making *Normal progress* is defined as one obtaining a grade of A, B, or C either on the first time taking the course or on a subsequent trial. In The Iowa State College an average grade point of 2.0 or better is required for promotion from the Junior College. A letter grade A carries 4 grade points, a B grade 3 grade points, and a C grade 2 grade points, and a D grade 1 grade point. Also, a student may repeat a course and replace an earlier grade. Since a grade point average of 2.0 is required in all subjects for promotion, it seemed reasonable to define a normal progress grade in a subject as 2.0 grade points or better on some trial.

Table I below lists the mathematics courses, for this group, along the top and numbers and percentages along the left hand side. The numbers apply to the entire group of 1004. As an example of reading the table in the college algebra column and number row the number 898 is found. This means that at some time during these five regular quarters 898 of the 1004 entering freshmen were

	Non-collegiate algebra	College algebra trigonometry	College algebra	Trigonometry	Analytics	Calculus I	Calculus II	Calculus III	Other courses Fresh. & Soph. level	Other courses Junior level
Number	Type	898	649	555		365	259	69	67	4
No. normal progressive		677	530	404		287	213	68	57	4
normal prog. cumulative mortality per cent		75.4	81.6	72.8		78.6	82.2		85.1	
		106	355	449		639	745			
		10.5	35.3	44.7						
Table II Remedial Group										
No.		56	36	13	12				2	
No. normal progressive		23	11	5	6				1	
normal prog. cumulative mortality per cent		41.1	30.6	38.4	50.0					
			20	43	44					
			35.7	76.8	78.6					
Table III Accelerated Group										
No.		128		116		105	87	62	2	1
No. normal progress		128		107		104	83	61	2	1
normal prog. cumulative mortality per cent		100		92.2		99.0	95.4	98.3		
				12		23	41	66		
				9.4		18.0	32.0	51.6		

classified in college algebra at the termination of the course. The number under it, 677, means that 677 or 75.4 per cent of these 898 students obtained a normal progress grade in the subject at some time during the period of this study. The next entry 106 in the same column means that 106 or 10.5 per cent of the original 1004 were not in attendance at the end of the course.

Table II is similar to table I except that it relates only the subgroup taking remedial work.

Table III is similar to the other tables except that it relates to the accelerated group only.

It should be noted that the time element is such that the record for college algebra, trigonometry and analytics is practically complete. The record for Calculus I will have a few additions, for Calculus II, more additions, and the record for Calculus III is being largely written this spring quarter of 1954 when the majority of the students in this group are classified in this course. This statement concerning the Calculus III does not apply to the accelerated group.

In the courses where the number of students listed is small, no valid conclusions may be expected.

In the column headed "other courses" it should be noticed the percentage obtaining a normal progress grade is noticeably higher than in the courses in the ordinary sequence. This may be due in part to the fact that most of these courses were specially designed to meet the needs of the students. These courses were primarily one in mathematics for agriculture and a two course terminal sequence in freshmen mathematics.

To this investigator it seems the mortality in mathematics, though not unusually high, is yet too high for the best interests of the people of the state.

It is a fact that we as educators have not yet developed adequate means to teach mathematics outside the class room. Thus, if are to reach the greatest number with the most information it is imperative that more enter our class rooms and remain there longer. To obtain the maximum from their experiences in the class room we as instructors must teach those topics of interest and most usefulness to the student in an interesting manner.

What specifically can be done to improve mathematics teaching? If one believes in mathematical training for the select few then probably little should be done. However if the philosophy is the most mathematics for the most people then certainly changes should be made.

First, the idea that the high schools are to blame for what is often termed low standards should be eliminated. The high school teacher is a specialist in teaching before a certificate to teach is granted. Second, the high school teacher is concerned rightly with training the large group who terminate their formal training with the high school diploma or before. They are not going to spend a disproportionate time with the college preparatory group even if they could know in advance the students who are going to attend college. Third, it might be very beneficial if the colleges insisted on some practice teaching for their professors.

The instructor should teach to give students an appreciation of mathematics and avoid in so far as possible those little occurrences which alienate the student from mathematics. One technique is to encourage a student by giving him a sense of accomplishment or a feeling of belonging to the group.

Maybe the instructor should evaluate the importance of his subject at frequent intervals. It is natural for the mathematics instructor to think his subject is the very best but so do the teachers of the other subjects. Mathematics has no monopoly on developing thinking on the part of the student. In fact some other studies may even surpass mathematics since those subjects are more interesting to the student. Is mathematics in a favored role in competition for students? Is it as useful as we like to think?

Attendance in the mathematics classes was declining until the war. Thus mathematics may be thought of as a war subject. Thus the mathematics instructors are somewhat like the old lady who was very proud of her son Jim. After watching him march in a parade she fondly reported, "They were all out of step but Jim."

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