THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

C. B. JORDAN—CHAIRMAN OF EXECUTIVE COMMITTEE, A. A. C. P., EDITOR OF THIS DEPARTMENT.

The paper by Professor Dunn adds valuable data to promote progress in teaching Botany and Pharmacognosy. Such information should be presented to Pharmacy students for their guidance, and guidance of students is important, especially with beginning students.—C. J. ZUFALL.

A STATISTICAL STUDY OF THE RECORDS OF THE SAME CLASS IN BOTANY AND PHARMACOGNOSY.

BY MARIN S. DUNN.*

We have always believed that a close relationship exists between the quality of student work in botany and that in pharmacognosy. However, we have lacked definite quantitative studies to support our view, and it was for the purpose of obtaining these that the following analysis was made, using the records of one class of one hundred and twelve students taking botany and pharmacognosy in successive years (1930–1931) (1931–1932). The final grade in botany represents the average of three or four examinations and two note-book inspections while that in pharmacognosy the averages of quiz grades, note-book and five examination grades.

From the crude scores of the same class in botany and pharmacognosy arranged in simple series, the cases have been regrouped for each examination, quiz and note-book into group series with an interval of five. Then from these, the central tendency as represented by the median, mean and mode, the first and third quartile points, the range of the first quarter, middle fifty per cent and fourth quarter, the quartile deviation and the standard deviation have been computed. Lastly, the correlation from simple series between the final grades in botany and those in pharmacognosy has been worked out using the Pearson formula.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 . \Sigma y^2}}$$

$$\text{P. E.} = \frac{.6745 \times (1 - r^2)}{\sqrt{N}}$$

The results are given in Tables I and II. (Turn to page 993.)

DISCUSSION.

Casual observation of Examinations I and II in botany would lead one to believe that the class contained many good and many poor pupils with a few average ones. As a matter of fact, as proved by their later records, the reverse is the case, there were a few extremely good pupils, a few extremely poor, and the rest average. Many students who were just above the passing grade of 70 in their examinations in theoretical botany and pharmacognosy were able to pull their final average to the

* Professor of Biology at the Philadelphia College of Pharmacy and Science.

eighty mark. The means in botany hugged the eighty mark except in Examination IV which was taken principally by those whose grades were low enough to make this examination compulsory. Often, students who barely passed botany found themselves continually in hot water in pharmacognosy. However, other students who were doubtful in botany but passing, and beginning their study of pharmacognosy found new interest and pulled themselves out of the danger zone.

The majority of the class, however, did about the same grade of work in pharmacognosy that they did in botany—some a little better and some a little worse.

In pharmacognosy, the first examination was poorly answered by many of the students; Examination II was a little better; Examinations III, IV and V showed continuous improvement with the peak reached in Examination V where 25 students made between 96 and 100, 30 between 91 and 95, 25 between 86 and 90. (Table I.) From a wide distribution of marks, the field became more and more limited, except in the range of the first quarter where the low grades of a few absolute failures lent themselves to a wide distribution. (Table II.) The mean of the final grades in pharmacognosy was 79.8; the measure of the spread or variability 9.8.

In the normal probability curve, 34% of the cases lie between the mean and $+1\sigma$, between $+1\sigma$ and $+2\sigma$ lie 14% of the cases, between $+2\sigma$ and $+3\sigma$, 2% of the cases. In other words if σ is the standard deviation and is measured from the mean, between -1σ and $+1\sigma$ lie about 68% of the cases, between -2σ and $+2\sigma$ lie about 95% of the cases, whereas only about .27 of 1% of the cases lie outside of $\pm 3\sigma$.

In our distribution curve in botany if we lay off on the base line distances of $\pm 1\sigma$, 2σ and 3σ from the mean, we find that 71% of the cases lie between -1σ and $+1\sigma$, and 98% between -2σ and $+2\sigma$. Only one case lies beyond -3σ. Doing the same for pharmacognosy, we find 79% of the cases lie between -1σ and $+1\sigma$ and about 97% between -2σ and $+2\sigma$. Two cases lie beyond -3σ. From the above, we are able to see that although our curves for botany and pharmacognosy do not coincide with the normal curve, yet they approach it rather closely.

By the use of the Pearson formula, the correlation index of relationship from simple series between the final grades in botany and pharmacognosy calculated was found to be $+0.58 \pm 0.04$. This is about the same as the correlation of an average of elementary school marks with an average of first-year high school marks. It denotes a substantial or marked relationship between the two sets of grades.

There is a fair chance that a student doing average or better-than-average work in botany will, under the same conditions probably do about the same kind of work in pharmacognosy, while a poor student in botany has the chances against him. Of course, other factors play a very big rôle in student success. Other things being equal, our data indicates the better the training in botany, the better the chances in pharmacognosy.

Since there is apparently a definite positive correlation between work in botany and pharmacognosy, every effort must be made to give the student as fine a botanical foundation as possible. Our study also shows there is a need for particularly careful teaching in the early months of study in both subjects—teaching which involves closer coöperation between student and instructor, especially in borderline cases.

TABLE I.—COMPARISON OF DISTRIBUTION FREQUENCIES OF THE SCORES MADE IN BOTANY AND PHARMACOGNOSY.

	Botany.							Pharmacognosy.								
	Exam. I.	Exam. II.	Exam. III.	Exam. IV.	Note-book I.	Note-book II.	Final Grade.	Exam. I.	Exam. II.	Exam. III.	Exam. IV.	Exam. V.	Note-book.	Quiz I.	Quiz II.	Final Grade.
96–100	6	15	0	0	2	3	0	4	1	5	18	25	0	0	2	1
91–95	18	8	9	2	5	18	10	6	10	14	25	30	3	9	26	9
86–90	20	19	14	3	26	32	22	9	19	21	27	25	24	12	25	17
81–85	16	7	28	6	26	23	30	12	16	11	15	10	39	28	32	31
76–80	11	16	21	3	26	27	26	8	16	11	6	4	30	17	11	28
71–75	8	14	11	3	9	5	13	18	17	23	5	3	8	19	7	16
66–70	25	28	16	6	15	4	10	12	13	6	5	4	1	9	1	3
61–65	3	3	8	2	2	0	0	11	5	4	2	2	0	11	1	3
56–60	2	0	5	2	1	0	1	10	5	1	0	1	0	3	1	2
51–55	0	0	0	1	0	0	0	8	5	6	1	0	0	3	1	0
46–50	3	0	0	1	0	0	0	4	2	2	0	0	0	0	0	0
41–45	0	1	0	0	0	0	0	5	0	2	0	0	0	1	0	0
36–40	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1
31–35	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0
26–30	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
21–25	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
16–20	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
11–15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6–10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0– 5	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0

TABLE II.—COMPILED STATISTICAL DATA OBTAINED FROM STUDENT RECORDS IN BOTANY AND PHARMACOGNOSY.

	Botany.							Pharmacognosy.								
	Exam. I.	Exam. II.	Exam. III.	Exam. IV.	Note-book I.	Note-book II.	Final Grade.	Exam. I.	Exam. II.	Exam. III.	Exam. IV.	Exam. V.	Note-book.	Quiz. I.	Quiz II.	Final Grade.
Mean	79.9	79.5	77.8	74.2	80.3	84.3	81.0	69.6	75.7	77.8	85.6	88.2	81.3	76.9	84.9	79.8
Mode	68.0	68.0	83.0	83.0 68.0	83.0	88.0	83.0	73.0	88.0	73.0	88.0	93.0	83.0	83.0	83.0	83.0
Median	82.3	78.8	79.8	75.2	81.6	85.3	82.0	71.4	78.0	79.9	89.1	91.3	82.7	78.9	84.4	81.3
Q_1	70.0	70.1	70.7	67.0	76.2	79.5	76.8	59.4	69.4	72.0	82.8	86.1	78.8	71.3	81.7	76.4
Q_3	90.0	89.7	85.1	84.1	87.0	89.9	86.9	82.0	86.6	89.2	94.3	95.8	86.1	84.8	91.2	85.8
Range 1st Quarter	23.0	30.1	14.4	17.0	16.2	9.5	20.8	38.4	69.4	52.0	82.8	86.1	8.8	30.3	26.7	49.4
Range Middle 50%	20.0	19.6	14.4	17.1	10.8	10.4	10.1	22.3	17.2	17.2	11.5	9.7	7.4	13.5	9.5	9.4
Range 4th Quarter	9.0	10.3	8.9	10.9	11.0	8.1	8.1	17.0	13.4	7.8	5.7	4.3	8.9	9.3	7.8	10.2
Quartile Deviation	10.0	9.8	7.2	8.6	5.4	5.2	5.1	11.3	8.6	8.6	5.8	4.8	3.7	6.7	4.8	3.7
Standard Deviation	11.7	12.0	9.4	11.5	7.7	6.8	7.3	16.0	14.2	14.0	14.5	12.0	9.0	10.3	7.7	9.8

Coeff. of Correlation $+0.58 \pm 0.04$.

REFERENCE.

Symonds, Percival M., "Measurement in Secondary Education," The Macmillan Company, New York, 1930.

AN ESPERANTO PHARMACOPŒIA?

The Pharmaceutical Journal of October 26th, states "that a difficulty which would arise immediately in producing an international pharmacopœia—such as was suggested at the Brussels Conference—is the choice of language." Latin is obviously unsuitable for description and modern phraseology. Colin A. Barnes suggests "that the international auxiliary language, Esperanto, be used, as this was adopted by the League of Nations some twelve years or more ago as the only practical language in existence for international use. Many scientific papers have already been published through this helpful medium, and there also exists a dictionary of international medical terms published in the language by one of the European countries."