

## STATISTICS IN EDUCATION<sup>1</sup>

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1. **Introduction.** On this occasion, natural and social scientists are drawn together by a common concern — to discuss the place of statistics in their various disciplines. Consequently, we acquaint ourselves with the functions and activities, techniques and methods of different disciplines as well as the limitations and difficulties faced in contributing to knowledge made possible through statistics. Concrete and reliable evidences of truth obtained by each discipline in this manner enrich our fund of generalizations about man and his world.

For the social scientists, the focus of study is on man's social behavior — his practices and malpractices, his problems, his innovations, his institutions, the inevitable changes in human values and the continuous reassessment of his plans and goals. It is the intention of this paper to show that statistical studies in education could be utilized by social scientists in describing man's behavior and possibly point to more effective social interactions especially in the school setting.

Needless to say, education covers a very broad range of areas for study than can be treated statistically. Depth studies of the learner and the learning process, understanding the intricacies of the human mind and of personality dimensions

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might best be approached by other ways than the quantitative. Likewise, relevant experiences in and out of school, various social situations — student-teacher relations, teacher-administrator relations, even relationship between students and their parents or with their peers may need to be qualitatively described rather than statistically treated. In the larger context of formal education, numerous antecedents determine the patterns of social behavior — philosophical, sociological, political, or historical. Thus the organizational structure of an educational institution, the prevailing types of schools, the educational system itself, — if these are studied at all — may require many other research designs such as documentary analysis or case studies and the like. Where then will statistics come in?

**2. Educational Studies and Statistics.** Surveys of characteristics of school settings and their constituencies are essentially statistical studies. School statistics such as enrolments—distributed by sex, by grade level, by courses, by institutions; the number and follow-up of graduates; correlational and evaluative studies; validation studies; content analysis of tests and course materials; comparative and experimental studies in education all provide statistical data that can be perused by interested researchers. In the College of Education, U.P., out of a total of 371 studies done from 1918 to 1967 by education graduate students, 237 or 64% made use of statistics. One hundred twelve or 30% were surveys; 106 or 28% were evaluative; 15 or 4% were correlational and 4 or 1% were experimental studies. The earlier investigations, being mostly baseline data, were necessarily surveys. Much encouragement has yet to be made for more experimentation in education.

How have our social scientists availed themselves of these researches? Oftentimes, we hear critics deplore certain conditions in our society, including the plight of education and yet they do not, in their comments, reflect one true mark of the educated man; that is, express some skepticism over such situations. Do they truly exist? Serious indictments spoken with assurance require some supporting evidence. Certainly, there

are available statistics that could have been cited. The NSDB has collected 4355 graduate theses from 1913 to 1960, in 44 fields of specializations done at our local universities. Of these, 1,728 are in education. Many of these are statistical in nature and await annotation and dissemination. To date, it seems that only graduate students read these researches either as related studies, as models for their own research or as bases in choosing their own research topics. After the submission of research papers as partial requirements for graduation towards a degree, these studies are usually stacked in libraries and remain unpublished. The extent of present use of these studies is not commensurate to all the years, time, effort, expense, sleepless nights, care and thought put into them by both students and research advisers. If these findings could reach the proper school authorities, government and civic agencies, curriculum experts, and social scientists not just for their implementation but also for the advancement of knowledge, then one step in the amelioration of social life may have been taken. A number of studies will be cited here to illustrate what other social scientists may look into. Only pertinent aspects, however, will be mentioned for lack of time.

3. **Dropouts and cultural practices.** What for instance, would be of interest to an anthropologist? The study of R. Medina in 1961 revealed, after a survey of the causes of dropouts of Mohammedan children in Zamboanga City, that religion, customs and traditions were not determining factors. Among the main causes mentioned for dropouts were poverty, ill health, change of residence, and helping of parents<sup>[1]</sup>. On the other hand, a survey of cultural practices in the Mountain Province among the high school students in Bontoc studied by A. Sumedca in 1964 showed effects of such practices on student misbehavior<sup>[2]</sup>. The tolerance of drinking among the youth resulted in their attendance of classes in a state of intoxication, irregular attendance and commission of irresponsible acts within the school confines. The social practice of frequenting the "olog" contributed to promiscuity, early marriages, dropouts and distraction in their studies. The nursing of belligerent attitudes to non-residents, including teachers, led to open defiance

of authority and difficulty in enforcing discipline. What will experts on cultural minorities say about these observations that will enlighten the people concerned and possibly help improve their condition?

Surveys were not confined only to the non-Christian groups. Social workers and health practitioners will find the study of P. Bautista in 1962 pertinent to their specializations. He surveyed home conditions and practices in Macabebe as these affect personal hygiene and community health<sup>[3]</sup>. He found in his survey that the houses had no facilities for washing hands or feet, nor for bathing. Drinking was done from common glasses, wiping with the same towel, and combing with the same comb. Houses were disorderly and dirty; toilets were unclean. Add to this the prevalence of superstitious beliefs as reported by D. Abara in her study of pupils in Northern Luzon<sup>[4]</sup>. There the people close the windows of rooms with sick persons to drive out evil spirits. While the studies were done primarily for their curricular implications for health instruction, they indicate that the adults in these communities have much to learn of practices that would lead to a healthier and more scientific outlook. Can social workers do anything about these situations?

4. **Parental influence.** Sociologists may, by their study of the family and the interactions of its members, expect to find evidence of parental influence on their children's choices of professions. Fernandez reported high correlation between courses chosen by senior students in high school and those of their parents' choices for them in the direction of the more highly prestigious<sup>[5]</sup>. This observation raises the question: Is it best for the parents to choose the careers of their children?

Students would make their own preferences if given the freedom to do so. Eduave analyzed subject preferences of 1514 sixth grade students in Manila<sup>[6]</sup>. He found out that boys preferred mathematics, health and sciences, and social studies, while girls preferred language, music, arts, physical education,

Philippine and work education. Fifty per cent of the respondents considered mathematics as difficult.

5. **Proficiency in mathematics.** It is interesting to note that the differences in performance in mathematics was reported by L. Basilla to be correlated to personality differences<sup>[7]</sup>. She took personality measures using scales and teacher-judgments of high and low achievers in mathematics among third year students at the Calocan High School, a total of 678 students. She found out that high achievers were relatively free from anxiety and selfdoubt, had the ability to act independently, and to get along with others, as well as the ability to manipulate symbols. The low achievers scored high in flexibility and femininity. They were more concerned with personal pleasure and diversion, were slow in thought and action, apathetic, shy, easygoing, and impulsive. These are findings that psychologists may wish to confirm or explain. There are many researches on factors affecting academic performance including self-concepts and study habits. Ramirez studied non-intellective factors related to academic performance of high ability students in secondary schools<sup>[8]</sup>.

C. Gonsalvez in 1961, constructed a test to measure the proficiency level of college freshmen in U.P. for College Mathematics<sup>[9]</sup>. She used a total of 613 college freshmen randomly chosen — 382 boys and 230 girls coming from 91 public high schools and 160 private high schools. Test results showed that boys and girls coming from public high school were more proficient in mathematics; that is, they had better understanding of mathematical concepts than those of the private schools. In both public and private schools, boys excelled the girls in mathematics proficiency. Students taking engineering courses were more proficient in mathematics than those taking other courses. The weakest spot of the students in the test was problem-solving. This information is significant for curriculum experts in mathematics in their task of curriculum improvement and even for revision of instructional procedures. This finding will also be of concern to those critics who tend to

compare the products of public and private schools in the country.

6. **Communication media.** It is in teaching techniques where experimentations have been made. Researchers hesitate to try this approach because of controls required on many variables. One of the studies of this type was done by P. Arabit. She compared the whole-part method to the part whole method in the teaching of beginning reading with the use of Pilipino as medium of instruction<sup>[10]</sup>. She equated the two groups in age, mental ability and economic status. The whole-part method begins with the introduction of the sentence, then the phrase, the words and finally, the analysis of words and the syllables composing the words. The part-whole method starts with the learning of the vowels and syllables, then combining them to form words, phrases and finally sentences.

Of the two tests given to subjects in this experiment, the recognition test had no significant difference between the two methods, but the comprehension test showed significant results in favor of the part-whole method. Should such findings not be conveyed to elementary school teachers of reading to encourage similar trials in their schools?

When it comes to dissemination, communication experts will agree that some media are more effective than others for certain purposes and situations. Agencies concerned with community development, for example, may wish to know which type of informational material in agriculture would be best for farmers. E. Gomez in 1964 studied the relative effectiveness of four types of informational materials which she tried on 142 graduates and participants of leadership and CD-WAY institutes<sup>[11]</sup>. Through analysis of variance, multiple range test and chi-square, she arrived at some useful findings. The younger adults understood better the popular semi-illustrated type than the semi-technical type of information material. It was just the reverse for the older adults. There seemed to be a

change in reading pattern with age — from comic books to more important information. The respondents on the college level scored higher for the semi-technical type of information. Participants with previous understanding or knowledge of the new farming practices also scored higher in the popular-semi-illustrated materials. There were no significant differences in the results of the scores according to sex, religion and occupation. However, single adults understood better the semi-technical materials while married adults scored higher in the popular semi-illustrated type.

What about research on teachers and school administrators? Bureau officials and division superintendents will be glad to know that the scholars they send for graduate studies choose for their research, topics very relevant to their work in the field — not just to inquire about existing conditions but to seek their improvement. Some of these studies are in descriptive form while others are evaluative and a few are experimental. B. Lao studied certain characteristics of teachers that influenced their participation in faculty meetings<sup>[12]</sup>. Among her findings were the comparatively greater participation in faculty meetings by teachers who were longer in the service, had higher educational attainment, had earned some distinctions (awards or scholarship), were older and were married. Differences in major fields of specialization did not seem to be significant in their participation. Valisno's study of area supervisors of the Bureau of Private Schools was directed to the problems affecting their performance and duties<sup>[13]</sup>. It revealed that only 34% of those assigned met the academic requirement required for the position. Thus, the need for more in-service training, conferences and professional libraries was expressed. This is a healthy sign since awareness of needs is the first step in the improvement of a situation. The next step involving implementation will be possible if such researches reach the proper authorities.

**7. Correlation and other evaluative devices.** One of our big problems in schools is the selection of students and their placement in the courses best fitted for them. Content analysis

of tests used by our local schools had been made to determine their effectiveness as admission tools. Jesena in 1962 item analyzed 318 test papers on the L. Padilla mental ability test as an admission tool at the U.P. Iloilo College<sup>[14]</sup>. She found out that the prediction of health education and literature was slightly significant at  $r$ 's of .35 and .38 respectively. Relationship between predicted grades and actual grades in General Science, Philippine Government, Arithmetic and Composition, and Filipino showed substantial relationship. Predicted and actual grades in Philippine History were most closely related, with an  $r$  of .63.

Not all tests in these researches could, however, come from local sources. So much has yet to be done in the area of test construction especially of standardized tests in education. Thus, P. Lorenzo in correlating reading performance to academic achievement of college students had to use all American tests in reading<sup>[15]</sup>. Very low predicted values were obtained. Rabago encountered a similar problem when she correlated the scores in the Differential Aptitude tests with grades in science subjects of the U.P. Preparatory School students<sup>16</sup>. She used multiple regression and multiple correlation coefficient. The norms of the imported test were non-applicable. She had to prepare her own. Her findings indicated that grades in biology predicted for scores on tests with high language factor; grades in chemistry predicted for scores with high verbal reasoning and mechanical reasoning while grades in physics predicted for scores in numerical ability and abstract reasoning.

Validation studies would be of value to test-constructors. These point out the best way to revise tests such as entrance examinations, achievement tests and other evaluative devices. However, these suggestions go to waste unless duly implemented.

**8. Concluding Remarks.** The examples of studies mentioned in this paper are a few of the statistically treated researches in education for social scientists to consider in their



interpretation of man's social behavior. These studies could suggest other areas of investigations and more refined designs for statistical analysis. Since the trend nowadays is towards production of more research, the intelligent use of research tools should be the next concern of research experts. Genuine appreciation, understanding and competence in statistics ought to be aimed at especially among graduate students. Students tend to approach statistics courses with timidity and awe. Such attitude blocks the comprehension even of promising would-be researchers. The number of studies that calls for statistical skills could have been much more.

To improve this situation, statisticians could help researchers in many ways other than as consultants and resource persons. First of all, they could guide our students to a more positive approach towards statistics as a valuable tool for research. Secondly, they could include education students in their in-service training programs. Thirdly, they could institute or encourage our unit to institute more statistical courses suited to our needs. Fourthly, they could help us design research resulting in national impact. Since the government spends so much for education, we ought to do more studies that will resolve vital issues in education. Why not more projection studies, experimentations and cross-cultural studies on significant matters in different countries and regions? Teacher education programs may be compared, tests may be constructed and standardized, more curriculum materials could be evaluated.

We in education invite our colleagues in the other disciplines to think and work with us in these research endeavors. Let no one be guilty of absolute disinterest and deliberate isolation, for the task of the social scientist is great in keeping pace with the natural and physical sciences. They have harnessed so much of nature. We hardly understand man. We need dialogues initiated in gatherings such as this to liberate ideas

that could lead the earnest student, faculty member, research teams, agencies and even enterprising private individuals to discover scientists and enlarge our generalizations about man. The Jesuit philosopher Pierre Teilhard de Chardin aptly said, "Because the world is round, men cannot escape from each other, but must always move closer. As they rub their minds together, they become keener, brighter, more curious, more human." May such thoughts guide us in our deliberations in this conference.

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