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Research, A Necessary Part of Science Education?

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Research, A Necessary Part Of Science Education?

One of the things we hear much about these days is the need for upgrading our science education. This necessity is accepted by all. It is, however, a complex problem for which no simple solution will be adequate, for the solution involves curriculum, teacher training, pupil preparation, laboratory facilities, freedom from official harassment, and many other factors. In the judgement of many it also involves research.

Many educators in the Philippines, by their deeds if not in words, claim that research takes the time and attention of the teacher away from his main function of teaching, and that research is to be allowed only as a luxury. This opinion is widespread and deserves careful examination. Actually, a group of educators have studied this opinion and their verdict is just the opposite; they have concluded that research actually helps a college to function better *as an educational institution.*

During the summer of 1959, a conference was held at the College of Wooster, Ohio, to obtain data on the relation between research and teaching in the small (100 to 3000 students) liberal-arts college. The findings were based in part on the results of questionnaires sent to colleges throughout the United States, and in part on the discussions of the conference participants. Data was received from 280 colleges and the thirty-two most productive colleges sent representatives to the conference.

Granting that what is good in one country is not necessarily good in another, the findings of the Wooster Conference, illuminating as they do the common need for upgrading science education and based on carefully acquired data, should be of interest to science educators in the colleges and universities of the Philippines. The Wooster Conference was also limited to the consideration of *chemistry* education, but again, there is a certain transfer-value with regard to other college science departments.

Since the purpose of the Conference was to study the relation between research and teaching effectiveness, a point of fundamental importance was the selection of a criterion of teaching effectiveness. The main criterion utilized was productivity, that is, the number of alumni who continued their studies and received the Ph.D. in Chemistry or Bio-chemistry during the period 1936-1956. The colleges accordingly were divided into the following groups: *very productive* colleges were those responsible for 30 or more Ph.D.'s during the period mentioned; *productive* colleges, from 15 through 29; *borderline* colleges, from 5 to 14, and *unproductive* colleges, 4 or less.

This criterion is very significant, but it needs some clarification. Possession of a Ph.D. degree is not necessarily an indication of scientific competence, for there are scientists of the highest caliber who do not have one. But the number of Ph.D.'s does provide an estimate of the size of the group on which we rely for leadership in research and for advanced teaching in the sciences. Furthermore, although undergraduate training for Ph.D.'s is only one function of a science department, the fact that many students do attain this goal implies stimulating teaching, good students, and the adequacy of the training.

The questionnaires were devised to provide answers to two questions: how the very productive colleges differ from the less productive, and what part research plays in that difference. The very ample questionnaires also inquired about other factors such as facilities and equipment, professional activities of the teachers, support for research and obstacles to research.

At the conference itself the answers to the various questions were discussed by small subgroups of the conference participants. Their tabulations and evaluations of the answers are published in the official Wooster Conference Report, RESEARCH AND TEACHING IN THE LIBERAL ARTS COLLEGE.[1]

The participants of the conference as well as the questionnaire respondents were almost unanimous in stating that research by the faculty member results in better teaching. This, of course, is only an opinion, since the causal effect of research on productivity is not easily susceptible to objective evaluation. There are too many other factors that enter the picture. But this much can be said: there is some connection between research and productivity, and further, the teachers in almost 300 small liberal arts colleges believe this nexus to be causal.

The questionnaires elicited the following analysis of the impact of faculty research on college education: research has its effect felt by the college, by the individual faculty member and by the student. Original research contributes to the college by keeping the faculty up to date scientifically, by bringing the college favorable publicity and by the acquisition of equipment which is beyond the normal budget possibilities of the college. The individual faculty member is affected by his research because it tends to broaden his chemical knowledge and professional contacts; and it improves his morale. Most important, it actually improves him in the area of enthusiastic teaching. The majority of the schools reported that the same people who do original research also work on various "advances in teaching" projects.

The final and most important effect of faculty research is that it stimulates the student's interest in chemistry and in the possibility of

[1] Available from Dr. John D. Reinheimer, College of Wooster, Wooster, Ohio, and from Dr. Harry F. Lewis, The Institute of Paper Chemistry, Appleton, Wisconsin.

graduate work. This student interest usually leads to student research, even on the college level. Furthermore, student research provides an opportunity for student-teacher contact that many feel to be the main good to be gained from research in colleges. This view is supported by the many letters received by the Wooster Conference from recent graduates of the participating colleges. The following is typical of the opinions of these recent graduates:

> The mere thought of reaching out into the unknown, even if it be but a small corner thereof, I found supplied a good deal of inspiration and drive to continue the investigation. Actually it gave me a renewed interest in chemistry and clinched my decision to become a chemist.

Besides the opinions of students and teachers, there are certain objective correlations that suggest the effect research has on productivity. Thus, of the total funds available for research in the schools studied, 57 per cent was distributed among only 10 per cent of the schools, and this 10 per cent (thirty schools) were the highest in productivity. Another correlation indicates that there is a stimulation from working on or seeing others work on original research projects, for the number of senior research projects arising from faculty research projects is greatest in the most productive colleges.

It is interesting to note that in the very productive colleges the teachers felt, for the most part, that research did not take up time needed for class preparation, but only in the less productive colleges (where little or no research was in progress) did they feel that research interfered with class work.

The questionnaires brought out other interesting benefits of research such as the greater respect accorded the teacher engaged in research, the increased class interest because of illustrations and comments derived from personal research and the additional income available to the professors as a result of summer research projects and consulting positions.

As has been mentioned, productivity is probably based on a number of factors besides faculty research. The questionnaires brought out many of them. The more important are: better prepared and larger chemistry faculties, lower contact hours per teacher, more major students, larger and more adequate chemistry libraries located in the chemistry (science) building, more departmental services such as a secretary and full time stock-room clerk, a definite and sufficient budget. In addition, the more productive schools are usually free from a proliferation of special courses of applied science. Such courses apparently make little or no contribution to the preparation of the student either for graduate work or for industry. This latter point is directly contrary to the practice in Philippine schools and to the government requirements.

While granting the importance of these other factors, the conference participants and the respondents to the questionnaires agreed that research and productivity are closely related for, if research is part of the college science activity, productivity is usually high. It follows that one way to stimulate the unproductive colleges to produce the results of the upper third of our colleges is to help these schools initiate a program of research by the staff and students.

Research can be costly. This is probably one of the main factors that make college administrators hesitate to undertake research in their departments. This is especially true of the many Philippine schools which are stock corporations or which are used to support other activities.

There is a two-fold solution here. First, the schools must realize that research should be part of their *educational* endeavor, a necessary part of what they must provide if they are to impart a satisfactory education in the modern world. Secondly, the National Science Development Board, on August 29th of last year, announced a policy of awarding grants for basic research to educational institutions on a share-the-cost basis. Thus, official recognition is given to the fact, well recognized elsewhere in the world, that basic research, as distinguished from applied research, is a proper activity for academic institutions.

During the conference the participants gave particular attention to the problem of improving, through a faculty research program, the productivity of the "borderline" and "unproductive" colleges. As a result of their discussions a number of recommendations were made for both the faculty and the college administrators.

For the faculty members who have not kept up with recent developments in their field, it was suggested that they participate in seminars and special projects to make up their deficiencies. Such seminars are seldom held in the Philippines, but it is something that might well be started. The study of current issues of science publications, especially those which are rigorous rather than merely descriptive, are strongly recommended. Examples of these are SCIENTIFIC AMERICAN and the JOURNAL OF CHEMICAL EDUCATION. These are available in the Philippines and should be received by all colleges with science programs.

For college administrators many suggestions were made at the Wooster Conference, but they are all aimed at encouraging *in a practical way* research by the faculty. This involves, among other things, encouraging the teachers to apply for grants from outside organizations, seeing that they have a reasonable teaching load (not more than 15 to 17 contact hours a week), and providing stockroom and secretarial help. All of these help establish a climate in which research is possible.

Research in Philippine colleges is an investment that can return double dividends. The results of research contribute to fundamental knowledge while the projects themselves strengthen the teaching programs and promise more and better qualified scientific manpower for the future. The importance of science for the Philippines is clear. Research in our colleges seems a necessary means to that end.

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Brainwarping

When we reached Hongkong, expelled from Red China after four years in its prisons, my companion, Father John Houle, and I, went directly from the ship to a press conference that had been arranged in a clubroom near the pier. One of the first questions which the reporters put to Father Houle was: "Were you brainwashed?" Father thought a moment, frowned, and then asked: "What do you mean?"

The process was not new to us, but this term for it was. And it did not seem to be a good name for what it described. When we wash something, we clean and purify it. Now there is nothing cleansing about this process as used in Red China,—neither in its methods, nor in its end product. It is dirty work, employed systematically to deprave and poison the minds of those subjected to it. By the time I had my second press conference on the subject, when I arrived in San Francisco, I had my own name for it: brainwarping—a deliberate distorting of honest information and thinking.

Edward Hunter seems to have been the first to give the term "brainwashing" wide currency, using it in 1951 in the title of his book, BRAINWASHING IN RED CHINA. Employed first to describe Communist measures aimed at moving non-believers to accept their commands and doctrines, the term is nowadays applied loosely to any technique designed to manipulate human thought or action against the desire, will, or knowledge of the individual.

The Chinese Communists call it "thought-reform" (*Ssu-hsiang Kai-tsao*), or "remoulding the mind,"—as if the mind of man were something merely material, and pliable like clay. They would claim that all non-Communists have incorrect "bourgeois" attitudes and beliefs, and must therefore be re-educated by them before they would be fit to take a safe and useful place in their new society.