

The Challenge of Technical Assistance

*An experiment in what may be
the most permanent and valuable aid we can give.*

by Norman H. Brooks

For five months last winter I served as a temporary professor at the Southeast Asia Treaty Organization's Graduate School of Engineering in Bangkok, Thailand, during its first year of operation.

Though SEATO is primarily a mutual defense organization, it does encompass several educational and cultural activities, such as the graduate school. Contributions for financing the school have come from all of the SEATO countries in varying amounts, with the United States supplying by far the largest share. The government of Thailand is providing the land and the buildings on the campus of Chulalongkorn University plus several staff members and some services. The United States has been providing the majority of the faculty and much of the laboratory equipment and technical books. The United Kingdom, Australia, New Zealand, and France have all been making additional contributions in equipment, staff, books, and scholarship funds. In fact, considering the varied sources of support, it is an administrative masterpiece that the school was even able to get started.

The graduate school is open to students from any of the Southeast Asian countries—including those which are not members of SEATO, such as India and Burma. In the first year there were fifteen students from Thailand, two from the Philippines and one from East Pakistan—all SEATO countries. Because of the military activities of SEATO, the school has yet to establish its reputation as a nonpartisan, nonmilitary academic institution.

So far, only civil engineering subjects are being of-

fered, because of the great need in Asia for civil engineers to work on the development of natural resources and the building of public works. As a modest beginning, in the first year only a hydraulic engineering program was offered; structural and highway engineering are being offered in the second year. Students can receive the Master's degree after two years of study including preparation of a thesis.

The American contribution comes through the International Cooperation Administration of the State Department. ICA, in turn, has a contract with Colorado State University for actually hiring professors and carrying out the program in Thailand. It was the enthusiasm of the director of this project, Dr. M. L. Albertson of CSU, which induced me to accept this challenge. The entire graduate school in Bangkok is under the capable administrative direction of Dean Thomas H. Evans (Caltech BS'29, MS'30) on leave from his post as Dean of Engineering at Colorado State.

While I was there, the faculty was comprised of five Americans, three Thai, and one New Zealander. All of the other Americans are there on two-year assignments, but because of other commitments I could stay for only one semester. Eventually, the school should develop a permanent nucleus of Asian professors to carry on the year-to-year administration and teaching. Americans and other foreigners on temporary assignments could then assist in advanced subjects and research, in support of the permanent faculty.

Since the University cannot be run with temporary

professors from the outside indefinitely, the development of a native staff is essential. Toward this end, several of the best students are being sent abroad for advanced work leading to PhD degrees in the United States, England, and France with the hope that they may become professors. It was disappointing to me not to have a Thai or Asian counterpart, (i.e. a professor in hydraulic engineering), but there was simply no one available last year with suitable qualifications to teach graduate work in this field at the school.

As with many technical assistance projects, the planning for this one was overoptimistic in its objectives. In arranging the curricula and in hiring men to teach the courses there was too much emphasis on specialties and applications. It was assumed that the students were well versed in the fundamentals of such subjects as mathematics and fluid mechanics.

Although these courses were listed on the students' undergraduate transcripts, after teaching began it was found that the students had a very poor grasp of fundamental concepts and operations. For example, they did not know how to use logarithmic graph paper; some were even using long-hand multiplication and division because they were not confident in the use of a slide rule.

Although I was engaged to teach two courses (Flow in Open Channels, and Sedimentation and Erosion Control) my instruction actually had to include a good deal of preparatory material in fluid mechanics and mathematics. But, with the small group of students all enrolled in the same four courses, we were able to keep the curriculum flexible—practically on a week-to-week basis—in order to adjust to the students' strengths and weaknesses.

Analyzing and reasoning

The main weakness of the students was in analyzing or reasoning for themselves. In Thailand, general cultural attitudes are not conducive to developing scholars. To a Thai, respect for one's elders is even more important than seeking the truth. Consequently, in the schools and universities the students are taught implicitly to learn what they are told, and are discouraged from asking questions or being inquisitive. (By contrast, Caltech students seem to be especially challenged to detect errors in their professors' lectures!)

The Thai learn mainly by memory and do not become accustomed to determining what is correct from a logical point of view. The very deep respect of Asian students for their professors is best illustrated when one asks a student whether he understands something explained to him. He will almost surely reply, "Oh, yes sir, yes sir." What this really means is that he is grateful to you for explaining it and respects your ability, and if he doesn't understand, because of his shortcomings, he does not wish to embarrass you by saying so!

A student, given a general problem to do, without any explicit instructions, may feel lost; it is a new experience for him to try to understand and analyze by himself. Since my students felt it extremely important to submit all their homework problems (and thus please the professor) they were prone to excessive collaboration. One or two of the bright students often prescribed the procedure for the slower students, so there were students who submitted nearly perfect homework papers time after time, and yet failed miserably on the quizzes.

Sometimes when I would ask a small explicit question in a quiz, which required an answer of just a few lines, the students would open the valves wide on that subject and give me a facsimile of several lectures from their notes, to be sure to cover the point which I had asked! As a student said to one of my colleagues after a frustrating experience with an American-type quiz, "I really know all this material, but I got mixed up on the quiz because I don't understand it."

English was also a problem for many of them. They had studied it in secondary school and college, but usually with Thai teachers who had not acquired facility in listening, speaking, and using the English idiom. The lectures were all given in English, although I did study the native Thai language for conversational purposes and sometimes used a few Thai phrases in class to emphasize a point (or at least provide comic relief). At first the students were very reluctant to ask questions in class, but later overcame their shyness when they were assured that I wanted questions.

It also became clear that the students were not accustomed to using books or the library. On several occasions when I gave assignments that required looking things up in the library, two or three of the students would make the necessary library exploration and then report back to the other students what they needed to know to finish their work.

Always please the professor

In spite of one's best efforts, the pleasing of the professor still seems to be a stronger habit than the seeking of truth. Once while I was conducting a seminar with five of the best students in the class, the brightest student gave a completely illogical explanation of a certain problem. After he had finished his blackboard derivation, I asked the other students if they all understood the solution, without implying that I myself would reject it. There was a vigorous nodding of heads and looks of satisfaction all around the table, as they eagerly thought they were agreeing with me. I hope they will not soon forget the shock of discovering that they were all wrong.

In spite of their difficulties, however, the students were consistently diligent and cheerful, and many made remarkably good progress during the semester. I have never known such an enthusiastic, congenial, or respectful class. For instance, a few days before I

left, at a tea party in my honor, they presented me with a beautiful engraved silver plaque showing the coat-of-arms of the school, my name, and an inscription.

Because of the eagerness of the U.S. and the Colorado State University to develop an outstanding graduate school of engineering, a great deal of money has been spent on laboratory equipment, principally in the field of hydraulics and fluid mechanics. As often happens, much of the equipment was designed and planned before the school was even started, and before a good determination of the needs of the school could be made.

The establishment of a new university laboratory is usually a slow process, with pieces of equipment being added from time to time as the staff decides what is wanted. However, for a technical assistance project there always seems to be a much greater rush to get started because the appropriation money comes only a year or two at a time.

Furthermore, in this case there has been an over-emphasis on expensive laboratory equipment. Perhaps to visiting politicians equipment with the red, white, and blue American ICA seal looks more tangible than professors — upon whom it is not so easy to stick the seal. As a result, the hydraulics laboratory now being built with equipment specially designed and built in the U.K. and U.S. will be equipped far beyond the present capabilities of the students to make good use of it.

Ultimately the school may be a center of hydraulic research for Southeast Asia, but again the bottleneck will be in the training of the men and not in the availability of the equipment. Since only a few of the American staff know how to use the vast quantities of hydraulic laboratory equipment, it will take time to train the students, research workers, future Asian faculty members, and even the mechanics and technicians. As a matter of fact, the hydraulic laboratory at the SEATO Graduate School of Engineering will be far better equipped for student instruction than the

hydraulic laboratory at Caltech.

There is one hazard in giving the Asian students too much elaborate laboratory equipment. Although it is important for them to have laboratory instruction, still nothing should take precedence over the learning of fundamentals. Furthermore, the students may not learn how to improvise, and later in their careers may not be able to get a job done without fancy instruments or black boxes. After all, it might be a good experience for Asian students to have to make something in the laboratory with baling wire instead of using American-made gadgets.

It is an excellent idea to have a center of advanced study in Thailand, because it keeps local problems clearly before the student during the course of his study and research. Traditionally, most Thai students have taken graduate study abroad, but somehow many of these young men fail to relate their advanced technical education to the basic practical problems at home. Illustrating this point, Ronald McLaughlin (Caltech MS '52, PhD '58) sanitary engineer in Bangkok for a two-year hitch for the World Health Organization, observes that several Thai men with Master's degrees in public health from the U.S. subconsciously do not really accept the germ theory of disease.

In Thailand, a country of 198,000 square miles (25 percent larger than California), 80 percent of the 22,000,000 people derive their livelihood directly from agriculture. Because there is less population pressure than in other Asian countries (about 110 persons per square mile compared with about 300 and 600 per square mile in India and Japan respectively), Thailand is able to export about 20 percent of her rice crop. Rice alone accounts for 50 percent of the value of all exports, with other agriculture products amounting to another 30 percent. Thus, the balance of trade and the ability of Thailand to import needed manufactured goods depends heavily on the agricultural output, which, in turn, depends on the availability of water.

Between the annual monsoon periods (May-October) there is a six-month dry season during which no

*The Thai government
built this fine
classroom and office
building to house the
SEATO Graduate School
of Engineering on the
campus of Chulalongkorn
University.*



crops can grow without irrigation water. A typical rice paddy grows one crop during the wet season, with natural or controlled flooding from the rain-swollen rivers. But to deliver significant amounts of irrigation water through the canals in the dry season will require the building of large storage dams to hold back some of the flood waters.

One large project on the Ping River, the Yanhee Dam, currently under construction, not only will provide 8,000,000 acre-feet of water storage for irrigation in the fertile central plain (the "rice bowl") but will also generate 550,000 kilowatts of electricity for power-hungry Thailand which, at present, has only 200,000 kw of installed generating capacity in the whole country.

Development of water resources

It is clear that the benefits to be derived from comprehensive development of the huge rivers in South-east Asia will be enormous for this region, and some of the technical problems involved will challenge the world's most competent hydraulic engineers. (Indeed, it is gratifying for a hydraulic engineer to work in a country where the prime minister is more concerned with how successful the rice crop will be this year than with hitting the moon!)

During my stay in Thailand I visited several hydraulic projects. A typical irrigation project consists of a low diversion dam (without appreciable storage) for diverting water into a system of earth canals when the natural river flow is adequate. In some projects I noticed gross errors in design, such as spillways discharging into alluvial channels without stilling basins. Because of the urgency of resource developments and the low national income, we should do all we can to help the Thai government avoid making such mistakes. But in one newly-completed project it was an American technical assistance expert who had



Students at the Graduate School of Engineering on a field trip in Thailand.

laid out the faulty spillway, which is in real danger of failing under flood conditions unless rather drastic revisions are now undertaken. Not only can the Thai people not afford to make mistakes; the United States can afford even less to send over any but our very best engineers.

In addition to my field trips, I arranged some informal consultations with the Royal Irrigation Department, asking many questions for background information for my teaching and they, in turn, asked me questions. (For example, "How can we stabilize the royal bathing beach in front of the King's summer palace?") In the process I learned something of how an engineering organization works in Thailand. The engineers are all very status-conscious. In fact, the civil servants have definite ranks and often wear uniforms which clearly indicate their rank to one another.

If a committee meeting is called to decide something, it is silently ascertained who has the highest rank, and he is the one who decides. The Director-General of the Irrigation Department may solicit suggestions from his senior engineering staff, but somehow they always like his suggestions best. In such organizations, where the initiative and directives come from above, there is little opportunity for the young engineer to use his imagination and initiative; conversely, he takes little responsibility for his work because all decisions, big and small, are made at higher levels.

The practical approach

The engineers in Bangkok also seem to be reluctant to get out into the field. Because of social custom they shun dirty work even though it may be the way to get on with the job. For example, I inquired about the nature of the bed sediment of the large Chao Phya River which runs south through the heart of Thailand. The engineers in the Irrigation Department said they themselves were very interested to know, but that they did not have the proper type of sampling equipment to get a bed sample, and besides their survey parties were all busy in other places. So, the next time out on a field trip I wore my bathing suit, jumped overboard and scooped up a sample off the bottom in a jar. Not the very best sampling procedure, to be sure, but nonetheless there was a sample.

Thai engineers do not seem to have the ability to shortcut a lot of red tape, apply a little common sense and get the job done in a hurry. In fact, when American technical experts work with the Thai people they are often tempted to take over too much of the initiative because they don't have the patience to wait through innumerable delays and cross-checking. They forget that their role is only to assist, and not to take charge.

Since we can never hope to provide technical assistance on all kinds of projects indefinitely, education is perhaps the most permanent or valuable type of tech-

nical aid. Assistance in particular projects is certainly helpful in getting quick results but, in the long run, only by improving the education of the young men of today can there be better leadership and planning in building future engineering works.

In general, I believe it is extremely worthwhile for the United States to share its wealth and know-how with underdeveloped nations. It can promote lasting friendships, and increase the prosperity of the world as a whole, and lead to a more peaceful environment for everyone.

In 1958 about \$20,000,000 worth of technical assistance per year was being granted to Thailand in a variety of projects in the areas of public health, education, agriculture, transportation, communications, water development, industry, mining, fisheries, power, and public administration. I do not like to think of technical assistance as simply an activity to contain communism, with the implication that were it not for the communist threat we would not bother to give technical assistance to the Asian countries. Nevertheless, this attitude was clearly stated by the ICA director in Thailand in a briefing session for the ICA staff, and is probably the official attitude of the State Department and Congress.

It is certainly not conducive to establishing permanent friendship, inasmuch as the receiving country is apt to feel that our aid is a tool of diplomacy given for some political advantage, and not through a sincere desire to assist the people of that country for their own sake. In fact, if a country wants to get the most aid dollars from the United States, it should probably manage to act slightly friendly to the U.S. but still behave as though it might espouse Communism next year or the year after!

I felt this attitude particularly when I visited South Viet Nam briefly on my return trip. The State Department, in its eagerness to pour technical assistance money into that country, has not taken sufficient care to see that the projects undertaken are worthwhile or well conceived. This is apt to result in second-rate accomplishments.

Aid from the World Bank

Because of the political implications of unilateral assistance, more effort should be made to channel technical assistance through agencies of the United Nations, including the World Bank. These agencies can ask probing technical questions and make numerous suggestions but, when no longer wanted, they can be asked to leave without political repercussions. Like any other lending institution, the World Bank insists on reasonable investigations, planning, and methods of financing. If a government asks for a loan to build a dam (as in the case of Yanhee Dam) the World Bank will not grant the loan until it is convinced that a full engineering study has been made of the feasibility and desirability of the undertaking. In

this way the local governments are forced to do their planning, but with outside assistance to indicate what planning is needed.

A good example of the excellent unbiased work of the World Bank is the recent comprehensive economic and social report of a mission it organized at the request of the government of Thailand — "A Public Development Program for Thailand," published by the Johns Hopkins Press in Baltimore, Md., 1959.

Although technical assistance is certainly worthwhile, I believe there are very definite limits to the amount which a small foreign country can absorb. The limitation exists in the administrative setup of the receiving country. Without the threat of undue foreign influence the United States can put in only as much assistance as the foreign government can plan for and accommodate with its available manpower and budget. In 1958, the ICA budget for Thailand was already about 5 percent of the total spending of the Thai government. Some technical assistance projects have been only partially successful because of adverse administrative arrangements.

At the Chulalongkorn University, for example, the efforts of the University of Texas in upgrading the engineering program were lost in default because the Dean of Engineering was not receptive to change. New, young, well-qualified faculty members who could have been inspired to serve the university simply were *not* inspired and did not stay. Much of the elaborate equipment sent to the university is not used because of the poor quality of the faculty in general. Clearly what is needed is a new Dean of Engineering, but this is something which cannot be accomplished through the American technical assistance program.

Technical assistance depends on people

Except for emergency measures like wheat to India, or public health measures in times of epidemic, I believe the emphasis in technical assistance should be on people. We do not necessarily need *more* personnel in foreign countries, but in some instances *better* personnel should be sent.

In my opinion some engineers employed by the State Department in responsible jobs could not hold equally responsible engineering jobs in this country because of inadequate qualifications. Technical assistance experts need not always be older men with years of experience, but can just as well be young men with imagination and adaptability, for many engineering problems cannot be solved by the same techniques used in the U.S. anyway.

In filling technical assistance posts, the State Department should not imply that the jobs are political chores to be done in disagreeable places; instead it should present such jobs as a challenge to our best qualified people to be of service to underdeveloped nations. I believe many outstanding engineers and scientists would accept such a challenge.