DOCUMENT RESUME

ED 118 457 SE 020 313

AUTHOR Williams, J. D.
TITLE Continuing Education -- A Management Point of View.
PUB DATE Jun 75
NOTE 10p.; Paper presented at the Annual Meeting of the American Society for Engineering Education (Colorado State University, Ft. Collins, Colorado, June 16-19, 1975)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage
DESCRIPTORS *Adult Education; Apprenticeships; *Engineering Education; Independent Study; *Industrial Education; Industry; Management Education; *Obsolescence; Program Descriptions; Science Education; *Technical Education

ABSTRACT

The needs for continuing engineering education to avoid technical obsolescence and the programs offered by one company to fill this need are discussed. Ten educational alternative programs of the Sandia Laboratories, Albuquerque (New Mexico) are described. (CP)

Event Number 2635

AMERICAN SOCIETY FOR ENGINEERING EDUCATION

ANNUAL CONFERENCE, JUNE 16-19, 1975

COLORADO STATE UNIVERSITY

FT. COLLINS, CO 80521

TITLE OF PAPER: CONTINUING EDUCATION -- A MANAGEMENT POINT OF VIEW

NAME OF AUTHOR: J. D. WILLIAMS

TITLE & ADDRESS OF AUTHOR: INTEGRATED CIRCUIT DESIGN DEPARTMENT
SANDIA LABORATORIES
ALBUQUERQUE, NEW MEXICO 87115

CONTINUING EDUCATION -- A MANAGEMENT POINT OF VIEW

J. D. Williams, Integrated Circuits Design Department
Sandia Laboratories

Paper prepared for Event 2635, 1975 ASEE 83rd Annual Conference, Colorado State University, June 16-19.

Continuing Education. What does that expression mean to you? "Continuing Education" and "Technical Obsolescence" are probably the two most common expressions used (and often misused) in engineering education circles today. Our session today is entitled "Continuing Education - A Management Point of View." Continuing education and how to approach it means different things to different people. I'd like to review some of the concepts of continuing education and then mention a few of the opportunities which are offered by Sandia Labs to help its employees maintain their technical competency.

Let me start by discussing what Continuing Education means to me, since I am a member of the Sandia Laboratories Education Committee and a party to deciding what kind of continuing education is most appropriate for our employees. In any rapidly changing, highly technical field, nearly everyone realizes that it is impossible to learn enough during any formal degree program to allow the student to coast intellectually for the rest of his or her life. The sooner each individual accepts this fact, and develops a plan to make sure that the proper quality and quantity of growth occurs, the easier it will be for him or her to maintain technical competency. We attempt to make this point when degrees are awarded by calling the ceremony "Commencement."

I believe that the manner chosen for continual self-development is a matter of personal preference and motivation, but strong management and company support is necessary. The minute we decide for someone else what he or she needs to do to remain technically competent, we are treading on dangerous territory. We all know very competent people who haven't taken a formal course since college days, others who rarely read professional journals and still others who fail to do the many other things that are recognized as part of the conventional concept of continuing education. The converse is also true. We know many professional course takers that are not very competent people. An engineer must be dedicated to a lifetime of learning.

To an engineering educator, that may mean a lifetime of offering formal courses. Don't misinterpret what I am saying; I have been a professor of engineering, a member of a technical staff and an engineering manager. I'm very much in favor of formal courses, if they are structured properly and attended by people who are earnestly seeking to learn or re-learn the course content. For those who are there for other reasons, courses can be almost a complete waste of time. Let me emphasize that the strength or weakness with any course is dependent upon the student's desire to learn and match his needs for learning. Therefore, I place very little importance upon compulsory continuing education courses or certification programs if they merely require the completion of certain courses. I am even more against such programs if the required courses have to be given by a college or university. It is no longer true that the university is the birth place of most new research and development efforts. Often, courses taught by institutions of higher learning to offset obsolescence are taught by staff who are as obsolete as the students. Let's look at what I believe are other views of continuing education.

Top management people tend to take a larger and more enlightened view of the general concept of continuing education than do some of their subordinates. They know that in general terms, their company needs to maintain its technical competency. A continuing education program adds real vitality to a company whose managers are sincere about it. In companies whose managers are not dedicated to a genuine continuing education program for its staff, a superficial one is often instituted for cosmetic purposes. Both types of companies can also claim the programs as part of their Affirmative Action Plans. Very, very few educational programs are successful in companies which do not receive full and continual support from top management.

Middle managers may recognize the desirability of some continuing education, but they, through consulting with their first line managers, are the ones who must decide who the actual people are that will be allowed to teach or participate in the continuing education programs. They may also have to decide what work projects must be delayed or cancelled in order to accommodate the continuing education program. When such decisions are required, many middle managers cop-out and decide against releasing anyone to the continuing education programs.

First line managers have even tougher decisions to make. They participate in the personnel and job selection process with the middle managers, as mentioned previously, and they are also faced with the reality that their chances of promotion are much more strongly influenced by how well they and their group can perform and complete the immediate task, than in how well they develop their staff for the future benefit of their group or company.

The staff may support or not support the programs in direct proportion to the attitudes of management. Properly motivated staff will develop their own continuing education plans. These properly motivated people can be aided substantially by whatever help they can get. I have already indicated that the continuing education process is very dependent upon the individual being educated; therefore, many different kinds of educational experiences and aides are required. I will now briefly review the many different educational opportunities available at Sandia.

Educational Aids Program

The Educational Aids Program (EAP) provides tuition assistance and limited time off the job to on-roll employees to encourage them to pursue a formal plan of development through study at a local university.

Under EAP, an employee may pursue an applicable undergraduate or graduate degree, or may take courses which relate to his or her job or a job at Sandia to which the employee aspires.

The plan provides 100% tuition for approved courses taken on the employee's own time, or 50% tuition for courses requiring time off the job. Employees who have attained junior status or who have a technical institute degree are permitted up to a maximum of 7-1/2 hours per week time off work for course attendance and travel.

In the 17-year history of the program, almost 3000 employees have participated in EAP; attendance each semester ranges from 175 to 200 employees. Degrees awarded during these years, either partially or fully under EAP support total 174 bachelor's and 166 master's. In addition, 36 PhD degrees awarded to Sandia staff included a significant amount of course work done under EAP. Sandia also has a graduate education program which includes a

Doctoral Study Program (DSP), a University Part Time Program (UPT), and a One Year on Campus Program (OYOC). These programs are not continuing education per se, but they provide a means for completing one's formal education.

Out-of-Hours Courses

For over twenty years Sandia Laboratories has made available to all employees a wide range of courses which are taught during the lunch period and after work hours. Main objective of these courses is to assist employees in the maintenance and development of skills which relate to current or future job assignments at Sandia.

Over 100 different out-of-hours courses are offered each semester. The scope of course offerings ranges from the technologies of science, engineering, and math to the development of skills in the areas of management, secretarial work, machine operation, and language. Academic levels extend from the trades and vocations to post-graduate work. Participation in the out-of-hours courses is open to all employees without expense. Textbooks and other handout materials are retained by students who successfully complete the courses. Approximately 4000 employees have participated in the out-of-hours programs since its inception.

Technical Institute Equivalency Program

The Technical Institute Equivalency Program is directed specifically to on-roll Staff Assistants who are not technical institute graduates, as well as to other employees who aspire to attain this background.

In-Hours Technical Courses

In the past three years a number of courses in various areas of science, engineering, and mathematics have been developed and conducted in-hours on Laboratories premises for Sandia staff, and new courses are in process of development. The main objective of each of these courses is to assist in the professional development of Sandia staff by providing knowledge and skills which are immediately and directly applicable to their technical assignments. Considerable effort has been expended to determine the subject areas which need in-hours treatment, to tailor course content to specific job applications, and to determine by post-course evaluation whether or not course objectives are being satisfied.

The in-hours courses generally are taught by members of the technical staff, although some outside contracts have been made with outstanding professional specialists to handle special training needs. Nominations to each course are made by line organization directors, and in most cases pre-course orientation meetings and interviews involving the prospective students, the course supervisor, and the instructor are utilized to determine need priorities and to assure a match between students' job needs and course content.

Attendance at in-hours courses is considered a regular job assignment, and requires at least the same effort and attention which are applied to any other job assignments. Most courses run a full semester (16 weeks) with classes conducted twice or three times per week. All classes are videotaped to allow makeup for absences. Many of the courses are videotaped and student materials prepared in such a way as to be used on an individualized self-pacing basis. The engineers can take modules of learning when they want the knowledge, need the knowledge, and can apply the knowledge. This results in highly individualized learning usually over a much shorter time base than 16 weeks. The following is a listing of technical in-hours courses which have been conducted recently or are currently in development:

Weapon Physics
Stress Wave Phenomena
Materials Technology
Statistical Design and Analysis
MOS Circuits
Integrated Circuits
Engineering Math Refresher
Physical Design of Electronic Systems (3 parts)
Applied Memory Technology
Technology of Explosives
Explosives Safety
Pressure Safety
Microprocessor
Engineering Geology
Heat Transfer
Digital Design

In addition to the above, when an educational need is fairly extensive and immediate, for example in the area of digital systems engineering, laser physics, or detonation physics, expert training teams or individual lecturers are contracted for accelerated one- or two-week in-house training sessions.

Self-Instruction Program

The Self-Instruction Program was developed primarily to provide educational opportunities to employees who, because of heavy travel commitments or remote work location, are unable to participate in the usual programs. The program has since expanded to include employees who prefer individual study to formal classroom activity. To date there have been approximately 700 course enrollments and over 200 course completions.

Self-instruction courses are provided in a variety of media, including programmed self-instruction, structured texts, video and audio tapes, and teaching machine filmstrips. Subject matter is also varied, including business administration, chemistry, computer science, electrical engineering, physics, and secretarial skills. Most are at the undergraduate level.

Crafts Programs

Various training programs have been developed at Sandia Laboratories to help maintain the high standards of craftsmanship required by the Laboratories; to develop qualified journeymen in electrical, mechanical, and structural skills areas; and to provide opportunities for skills upgrading and job advancement. Included among the Crafts Programs are apprenticeship, on-the-job, and skills and enrichment programs.

Apprenticeship Program

The Apprenticeship Program includes three major skills areas: electronics technician, machinist, and plant technician. The last, plant technician, provides separate training programs for electrical technicians, pipefitters, refrigeration technicians, carpenters, and millwrights. All programs require four to five years for completion, and involve extensive on-the-job training as well as related classroom instruction, both in-hours and out-of-hours. To date, over 200 employees have successfully completed the Apprenticeship Program.

On-the-Job Training Program

The OJT program was developed to train technicians whose work assignments require an understanding of the physical and chemical characteristics of materials.

Skills Enrichment

The Skills Enrichment program was developed to provide a series of work assignments and formal courses which qualify the journeyman machinist for upgrading.

Management Training

Several short courses for managers have been very successful. The United Science and Engineering (USE) course provided 6 weeks of full-time study to update engineering managers in mathematics and physics and other specific Sandia job-related areas. Special courses of shorter duration have been given in integrated circuits, materials science, and statistics.

Other Continuing Education Opportunities

The education and training programs described up to this point are formal programs which are fairly well defined; eligibility extends to a large segment of Sandia employees. Other opportunities for continuing education exist at Sandia which are not defined as formal education programs, but nevertheless can play an important part in self-development. Examples are attendance at short courses, research colloquia, participation in professional societies, research and teaching appointments at universities or other laboratories, and availability of a very good engineering library.

I'll close with some questions and comments. (1) Do I feel that Sandia educational opportunities are outstanding? Yes, because essentially every type experience or aid is available to the individual learner. Much more important is the fact that most of the educational opportunities are heavily job related and require some investment of each participant's own time. (2) Do I believe the costs of such programs are justifiable? Yes. I find the total cost of such programs to be less than 1% of the overall Laboratories budget, and since Sandia is highly technology oriented, I believe their output would decrease by much more than this percentage in a very few years if

all such helps were stopped. (3) Can a company completely solve the technical obsolescence problem by providing such opportunities? No, of course not. I have emphasized that the methods of staying current are individual, so are the desires to stay current. Most companies have some people who will not avail themselves of any opportunities. Managers are partly responsible if obsolescence is a problem in their organization. They can help their staff through proper job assignments and support of each individual's plan of progress. The main culprit, however, is the individual who either because of apathy or over involvement in outside activities spends no time developing himself for performing better today or for future assignments.