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EXPERIENCES WITH FAST BREEDER REACTOR EDUCATION IN LABORATORY AND SHORT COURSE SETTINGS

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I. BACKGROUND

The breeder reactor industry throughout the world has grown impressively over the last two decades. Despite the uncertainties in some national programs, breeder reactor technology is well established on a global scale. Given the magnitude of this technological undertaking, there has been surprisingly little emphasis on general breeder reactor education--either at the university or laboratory level. Many universities assume the topic too specialized for including appropriate courses in their curriculum--thus leaving students entering the breeder reactor industry to learn almost exclusively from on-the-job experience.

II. THE PROBLEM

The problem with this situation is that many working professionals have difficulty obtaining a perspective of fast breeder reactor (FBR) technology. Either they enter FBR work from a Light Water Reactor background, or they come into some specialized aspect directly from the university. Upon publication of the Fast Breeder Reactors book,[1] we decided to see whether this resource could be used as the basis for a short course within an industrial or laboratory setting. The challenge was the recognition that working professionals participating in a short course of this type would likely not read the book in depth due to the lack of time. Likewise, they would not likely do homework assignments or take examinations on the material presented. Yet we wanted to accomplish the principal objective of providing working professionals with a solid overview of the technology.

III. RESPONSE

Our response was to cover essentially all of the material in the text (18 chapters) by packaging some 700 multicolored viewgraphs (using two overhead projectors) into a 40-hour lecture course. Recognizing the intensity of the

pace, copies of all the viewgraphs were reduced to fit a four-per-page format, and the entire set was printed and bound as lecture notes given to each participant at the start of the course. After an initial trial in-house course (during the final preparation of the text in April 1979), three live lecture courses have been conducted. As shown in Table 1, two were conducted at the Joint Center for Graduate Study (operated jointly by the University of Washington, Washington State University, and Oregon State University) in Richland, Washington. A third live course was conducted in-house at the Westinghouse Hanford Company, also in Richland.

Given the success of the early courses, it became apparent that some efficiency might be gained by videotaping a course and using these tapes for subsequent courses (either in a group or self-study format). The video course included in column 4, Table 1, was given from edited tapes created during the live in-house course conducted in January, 1982.

IV. EVALUATION

In order to evaluate these experiences, a detailed critique form was prepared and issued to each student at the conclusion of the course. Since responses to this critique were entirely voluntary, the data received were not complete. In fact, the form itself was not identical in all cases. Nevertheless, as shown from Table 1, we received sufficient feedback that we felt a reasonable evaluation could be made.

Although the prepared course material was essentially identical in all cases (approximately 40 hours of lecture and discussion), both JCGS courses were conducted over a one-week time span (8 hours/day) whereas the in-house courses were generally conducted Tuesday and Thursday afternoons over a seven to eight-week time span.

An additional challenge in conducting this type of course was the varied student background. As noted from Table 1 (where all student background entries are given in percentages), there was a broad mix of academic credentials,

disciplines and experience. As noted from the final entry, the majority of students were looking for a continuing education course of this type; they were not interested in taking the course for credit.

Table 2 contains the results of the critique. In gathering these results, students were asked to rate each area as poor, fair, average, good, or excellent. In order to provide numerical results, a 4.0 grading system was used; namely, the above rating categories were assigned values of 0, 1, 2, 3, and 4, respectively. Hence, a rating of 2.0 is average and 4.0 is excellent.

The critique is presented in three major categories: materials, instruction, and course value. For the live lecture format, the three principal materials used were the book, the viewgraphs, and the lecture notes. In most cases, students indicated they did not read much of the text; rather, they relied heavily on the presentation itself. An intercomparison of the live lecture courses may suggest the materials are better suited for the more intense, one-week format, although it is also possible that the expectation levels were higher in-house. For the video course, ratings were generally lower.

The instruction critique suggests generally favorable acceptance, with fairly uniform results--except for the video format. It is interesting that the same lectures (columns 3 and 4) had such different ratings using the live vs video format, especially for the category "maintaining interest." Even though live monitors were used for all video courses, there is clearly some loss in not being able to provide live feedback.

The final critique block, course value, is given on a percentage basis (since questions were answered yes or no). Here the results were quite gratifying. Despite differences in course format, most students felt the experience quite worthwhile. Even those taking the video class felt the course beneficial, and most felt the course had potential for off-site use.

V. CONCLUSIONS

Overall, the results from these four experiences of concentrated teaching suggest considerable success. The live format appears to be more favorably

received than the video tapes, although the latter format has the clear advantage of portability and potential for self-study. Hopefully, this experience will be useful in a broader setting as efforts are continued in bringing breeder technology into a commercial reality.

REFERENCE

1. Alan E. Waltar and Albert E. Reynolds, Fast Breeder Reactors, Pergamon Press, Inc., 1981.

TABLE 1: COURSE LOGISTICS AND STUDENT BACKGROUNDS

	JCGS		In-House	
	Live #1	Live #2	Live #3	Video
LOGISTICS				
Course Dates	April 81	May 82	Jan 82	Oct 82
Chronological Weeks	1	1	7	8
Lecture Hours/Week	40	40	6	5
Number of Students	19	20	43	41
Student Critiques Returned	13	16	36	35
STUDENT BACKGROUND (% Basis)				
Degree Level:				
Non-Engineering	0	7	2	5
BS	50	33	40	42
MS	30	33	46	32
PhD	20	27	12	21
Disciplines:				
Nuclear Engineering	25	35	14	13
Mechanical Engineering	17	35	25	20
Chemical Engineering	8	12	8	13
Electrical Engineering	-	18	11	7
Metallurgy	17	-	6	20
Engineering Physics	8	-	5	-
Physics/Health Physics	17	-	23	13
Chemistry	8	-	5	-
Computer Sciences	-	-	3	-
Non-Scientific	-	-	-	14
Experience:				
0→ 1 years	22	14	19	19
2→ 5 years	33	14	13	12
6→ 10 years	11	22	10	38
11→ 15 years	34	22	20	12
16→ 20 years	0	14	23	0
Over 20 years	0	14	15	19
Interested in Degree Credit?	45	-	35	30

TABLE 2: COURSE CRITIQUE

	JCGS		In-House	
	Live #1	Live #2	Live #3	Video
MATERIALS (4.0 Basis)				
Book (Fast Breeder Reactors)	3.40	3.50	3.08	3.06
Viewgraphs: Value	3.64	3.81	3.71	3.32
Quality	3.17	3.40	2.77	2.88
Lecture Notes	3.33	3.58	3.38	3.16
Video Tapes	--	--	--	2.81
Weighted Average	3.39	3.57	3.24	3.11
INSTRUCTION (4.0 Basis)				
Course Content	3.42	3.69	3.64	3.15
Course Organization	3.92	3.69	3.58	3.27
Instructor Knowledge	3.67	3.75	3.64	3.62
Maintaining Interest	3.67	4.00	3.76	2.71
Presentation Style	3.92	3.81	3.76	3.18
Weighted Average	3.72	3.79	3.68	3.19
COURSE VALUE (% Basis)				
Worth Your Time	100	100	100	94
Help in Present Job	92	88	91	84
Recommend to Others	100	100	100	97
Potential for Off-site Use	90	-	100	88
Weighted Average	95.5	96.0	97.8	90.8