Evaluating the Effectiveness of Faculty Workshops

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Abstract

Faculty workshops provide an efficient, economical approach for disseminating the many new ideas and approaches created in the engineering education research and development efforts. Usually, workshop leaders use post-workshop surveys in a formative evaluation process to determine the participants' likes and dislikes, but data on the effect of the workshop on the participants' awareness, understanding, and implementation of these new ideas are lacking. The present report outlines a process for collecting summative evaluation data and provides some results from eight workshops, showing that they can impact faulty development.

Introduction

Engineering education research and development efforts have led to many new ideas and approaches for improving teaching and learning. Faculty workshops, typically lasting two to four hours, have become a common approach for disseminating these new concepts and approaches in engineering education. The recent increases in workshop activity at the ASEE and FIE national meetings and the appearance of special workshop conferences, such as the Share the Future Conference (1), provide evidence of this new emphasis. In addition, many individual institutions are now organizing workshops to introduce their faculty to these ideas. Although the short-duration workshop has become a standard approach for dissemination, there are no data on the effectiveness of them in changing attitudes and behavior.

Most workshop leaders conduct some form of post workshop evaluation, but these are usually formative, intending to provide information for improving the workshop. They address questions like: "How the workshop could be improved to better meet the participants' goals (or needs)?", "What the participants liked (or disliked)?", and so on. Usually, there is little attempt to evaluate the effect of the workshop on the participants' attitudes toward the workshop concepts, their understanding of these concepts, their commitment to using these concepts, and actual changes in their behavior. In other words, these formative post workshop evaluations can not assess the effect on the participants' attitude or behavior, as a summative assessment would do. This paper describes an effort to begin collecting this summative data

There is little in the literature on summative evaluations of engineering faculty workshops. The NSF commissioned a fairly extensive evaluation of the workshops it sponsored under the

Undergraduate Faculty Enhancement program (2). Because the workshops in this program were much more extensive, ranging from 5 to 21 days, the results are not directly comparable. However, their report did indicate that almost all participants learned new concepts, pedagogies, or lab techniques and that approximately 80% applied what they learned by developing or revising at least one course. Factors associated with workshop success included the length of the workshop, the inclusion of teaching methods or technology, and the development of classroom material. Neither completing the material at the workshop nor having face-to-face follow-up activities seemed to affect the workshops success.

Methods

In an effort to characterize the effectiveness of selected short-duration workshops, we have undertaken two summative evaluation studies. The first is a retrospective study involving four earlier workshops and the second is a prospective study involving four additional workshops.

Retrospective study: In the retrospective survey, we asked participants in workshops held six to twelve months earlier to complete a survey form asking about their attitude toward the practices described in the workshop, their understanding of them, and their experiences in implementing them. The four workshops were:

- "Teaching EC 2000 a-k Skills" at the 2002 ASEE Annual Conference
- "Writing Effective Education Proposals" at the Share the Future Conference III in 2002
- "Teaching EC 2000 a-k Skills and Capstone Design" at Institution 1 in May 2002
- "Student Teams" at Institution 2 in November 2001

The retrospective survey form contained twelve questions. The first two concerned the participants' continued interest in the topic, asking if they had read the workshop notes or other related material since the workshop. The remaining questions probed the participants' impression of two specific practices emphasized in the workshop. These questions asked about their views on the importance of the practices, their ability to explain them, their ability to use them, their experiences with them, and their success in these experiences.

Prospective Study: The prospective study involved the following four new workshops:

- "Learning Objectives and Classroom Assessment Tools" at Institution 3 in July 2002
- "Learning Objectives and Classroom Assessment Tools" at Institution 4 in October 2002
- "Teaching EC 2000 a-k Skills" at Institution 5 in October 2002
- "Teaching EC 2000 a-k Skills" at Institution 6 in November 2002

The prospective study utilized a pre-workshop instrument on attitudes and understanding, two post-workshop instruments (one dealing with attitudes and understanding and the other dealing with commitment to use the concepts), and finally a follow-up instrument to measure the degree of follow-through.

The pre-workshop instrument asked participants to indicate their level of confidence in their

ability to define, to explain, and to implement the two practices addressed in the workshop. These survey questions were derived directly from the workshop's learning objectives. As an example, the first three learning objectives from the "Learning Objectives and Classroom Assessment Tools" workshop were:

- Participants should be able to define a learning objective.
- Participants should be able to explain the usefulness of learning objectives in the teaching-learning process.
- Participants should be able to write learning objectives.

The corresponding survey questions in the pre-workshop instrument asked the responders to indicate their agreement on a five-valued scale (Strongly Disagree to Strongly Agree) with the following statements:

- I am confident in my ability to define a learning objective.
- I am confident in my ability to explain the usefulness of learning objectives in the teaching-learning process.
- I am confident in my ability to write learning objectives.

The post-workshop attitude and understanding instrument, the second tool, asked the same questions that were on the pre-workshop survey. In addition, the survey form also asked the participants' to indicate their perception of the improvement in their ability to do each task. For example, "I am confident in my ability to define a learning objective." was augmented by "My ability to define a learning objective increased as a result of this workshop."

The third tool, the post-workshop instrument to assess commitment, asked participants to select one of five choices indicating their commitment to use the workshops practices in the next semester. Response choices ranged from "I have no interest" to "I have limited experience with the practice and I will implement it fully in one of my courses" with two other in-between choices indicating a commitment to use the practice in several classes or to try it at least once. A fifth choice was provided for those who already had experience with the practice but would continue to use it. Since each workshop dealt with two practices, these forms contained twelve questions.

The last tool was a follow-up survey to assess the participants' use of the practices and their success with them. It asked the participants to indicate the level of their utilization during the last semester with response choices ranging from "None" to "Fully implemented throughout a course" and the degree of success with response choices ranging from "Lot's of problems" to "Worked very well". Because these four workshops occurred late in 2002, no participant has had a semester to implement the practices and so this tool has not been used.

Results -- Retrospective Study

The retrospective study includes responses from 48 of the 114 total participants in the four workshops. Table 1 shows the number of participants at each of the four workshops and the number and percentage who responded to the retrospective survey. These percentages ranged

from 15% to 57%, reflecting a substantial workshop-to-workshop variation in the response rate. This large amount of variability occurred with nearly all the measures reported in this paper, making conclusions based on data from a single workshop suspect. To deal with this variability, overall averages were computed by pooling the responses from all four workshops into a single population. Using this method, the overall response rate in the retrospective study was 42%. The fact that this large a fraction of workshop participants responded to a mail survey six to twelve months after the workshop suggested a good deal of lingering interest.

Table 1. Workshop participants and survey responses in the retrospective study

Workshop	Participants	Responses	Percentage
"Skills" at ASEE	29	8	28
"Proposals" at Share the Future	28	16	57
"Skills" at Institution 1	20	3	15
"Teams" at Intuition 2	37	48	57
Overall	114	48	42

Table 2 shows the distribution of the responses on rereading of the workshop notes and on reading other related articles and websites. Overall, 52% reread the workshop notes at least once; percentages for individual workshops ranged from 17% to 86%. Similarly, 54% read at least one article or website related to the workshop material with individual workshops ranging from 17% to 63%. The fact that over one-half of the responders read the notes and related material after the workshop indicated that participants developed a sustained interest in the workshop ideas.

Table 2. Percentage of responders that reread workshop notes and read other material in the retrospective study

Workshop	Reread Workshop Notes			Read Other Article or Website		
	0	1	>1	0	1 or 2	>2
"Skills" at ASEE	57	0	43	43	14	43
"Proposals" at Share the Future	31	56	13	38	44	19
"Skills" at Institution 1	83	17	0	83	0	17
"Teams" at Intuition 2	48	43	10	43	33	24
Overall	48	38	14	46	30	24

As shown in Table 3, which summarizes the responses to the statement on the importance of the practices discussed in the workshops, a strong majority at all four workshops indicated that the practices were essential. Overall, 68% felt the practices were "essential", while 32% felt they were "helpful but not essential"; no one selected the third choice, which indicated that they were unimportant. These positive responses suggested that the workshops created favorable impressions of the practices, impressions that seemed to encourage a large fraction of the participants to try these practices as reported in Figure 1 below.

Table 3. Percentage of responses on the importance of the workshop practices in the retrospective study

Workshop	Unimportant	Some Importance	Essential
"Skills" at ASEE	0	7	93
"Proposals" at Share the Future	0	16	84
"Skills" at Institution 1	0	8	92
"Teams" at Intuition 2	0	59	41
Overall	0	32	68

Table 4 shows the distribution of the responses on the ability to explain and the ability to implement the practices described in the workshops. Most indicated that they could provide some explanation with an overall average of 53 % indicating that they could give a good explanation. Similarly, most indicated that they could implement the practice with 70% of all responders indicating that they could fully implement the practice and only 2% indicating that they could not do it at all. With about one-half of the participants expressing confidence that they could explain these practices and seven out of ten saying they could implement them, it seems that the workshop activities developed a real understanding of these practices.

Table 4. Percentage of responses on the participants' ability to explain and implement the workshop practices in the retrospective study

Workshop	Could You Explain?			Could You Implement?		
	No	Some	Yes	No	Some	Yes
"Skills" at ASEE	0	21	79	0	31	69
"Proposals" at Share the Future	19	39	52	6	19	74
"Skills" at Institution 1	0	67	33	0	50	50
"Teams" at Intuition 2	0	52	48	0	26	74
Overall	3	45	52	2	28	70

As shown in Figure 1, a plot of the distribution of the level of implementation that the participants reported several months after the workshop, a good majority of the participants at each workshop indicated that they tried some implantation of the practices discussed at the workshop. Overall, 78% tried some implementation with almost half of them trying a full implementation. About one-fifth of the responders did not try to use the practices discussed and the percentages for individual workshops ranged from 0% to 33%. The fact that nearly four out of five participants actually tried the ideas developed in the workshop indicated that these activities were convincing and informative enough to motivate this level of experimentation.

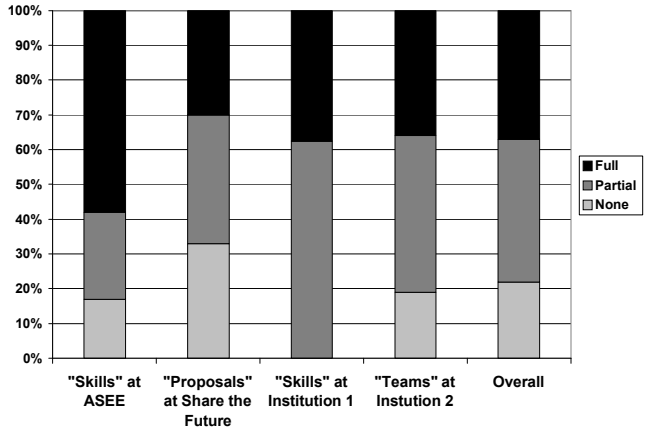

Figure 1. Percentages of responders that implemented the workshop practices in the retrospective study

In computing the percentages on the level of success, individuals who indicated on the preceding questions that they did not try any implementation were excluded. Thus, the reported percentages represent the fraction of the responders who actually tried some implementation. Figure 2 shows the distribution of the responses on the level of success achieved by those who tried an

implementation. As with all other responses, there was considerable variation from workshop to workshop, but these percentages indicated that almost everyone who tried some implementation had some success with an overall average of 42% indicating a high level of success and another 56% indicating partial success.

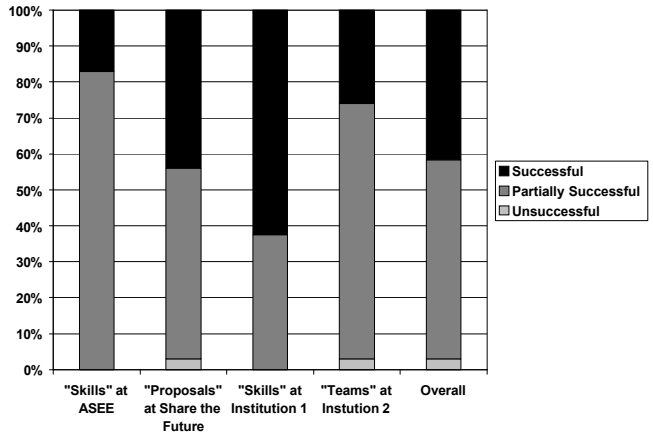

Figure 2. Percentages of responders indicating the various levels of success in their implantations in the retrospective study

Results -- Prospective Study

The prospective study included data from 53 participants at the four workshops. Table 5 shows the number of participants at each workshop and the number that was there at the start and end to complete both the pre- and post-workshop forms.

Table 5. Number of participants at workshops in the prospective study and the number who completed both the pre- and post-workshop survey forms

Workshop	No. of Participants	No. Completed All Forms
"Objectives" at Institution 3	**17**	**16**
"Objectives" at Institution 4	**25**	**19**
"a-k Skills" at Institution 5	**20**	**14**
"a-k Skills" at Institution 6	**12**	**4**

Figure 3 summarizes the overall average data from the pre- and post- workshop attitude surveys. In the pre-workshop data, 63% of the overall participants indicated that they could define the practice (i. e. selected either "Agree" or "Strongly Agree"); in the post-workshop data, this percentage increased to 84%. The corresponding percentages for the ability to explain were 56% and 78%, respectively; for the ability to implement, they were 55% and 78%, respectively. All three increased by more than 20%, indicating a substantial gain in knowledge.

In comparing the individual pre- and post-workshop responses, 47% of the participants selected a more positive response on their ability to define the practice, while 13% selected a less positive response. Corresponding values for the ability to explain the practice were 34% and 12%; while they were 37% and 15% for the ability to implement the practice. On the average 41% selected a more positive response after the workshop than they selected before the workshop, supporting the notion that these participants experienced a substantial increase in their understanding of the workshop practices.

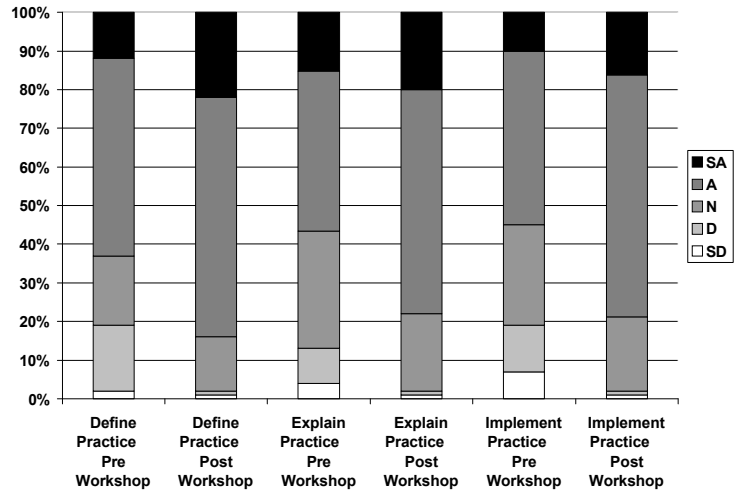

Figure 3. Overall average response percentages on the ability to define, explain, and implement the workshop practices in the prospective study pre- and post-workshop surveys

Table 6 shows the distribution of the participants' responses on their ability to define or justify the workshop practice, to explain them, and to implement them. Overall, 88% indicated an increase in their ability to define the topic, while only 2% indicated a decrease. The corresponding numbers for changes in the ability to explain the practices were 86% and 1%, respectively; the numbers for the ability to implement the practices were 86% and 1%, respectively. These data indicate that about nearly five out of every six participants indicated an improvement in their ability to define, explain, and implement the practices described in the workshop.

Table 6. Percentages of participants indicating a decrease (D), no change (N), and an increase (I) in their ability to define, explain, and implement the workshop practices in the post-workshop survey in the prospective study

Workshops	Define			Explain			Implement		
	D	N	I	D	N	I	D	N	I
"Objectives" at Institution 3	0	15	85	0	21	79	0	24	76
"Objectives" at Institution 4	2	6	92	0	10	90	2	10	90
"a-k Skills" at Institution 5	5	8	88	5	8	88	5	10	85
"a-k Skills" at Institution 6	0	17	83	0	36	57	0	30	70
Overall	2	10	88	1	13	86	1	12	86

In computing the percentages on the level of commitment to implement the practice, participants who selected the response indicating that they were experienced with the practice (26% overall) were deleted. Thus the reported percentages represent the choices made by the 76% who had limited experienced with the practice. Figure 4 shows the distribution of the level of commitment the inexperienced participants reported at each of the four workshops and the overall averages. With all four workshops the vast majority indicated that they would use the topic throughout an entire course (the weighted average was 66%). Another 33% indicated that they would try it on a more limited basis. Only a few participants at one of the workshop indicated that they had no interest in trying the approach. As with the retrospective implementation data (Figure 1), the results in Figure 4 indicated that the workshop activities motivated the participants to experiment with the workshop practices.

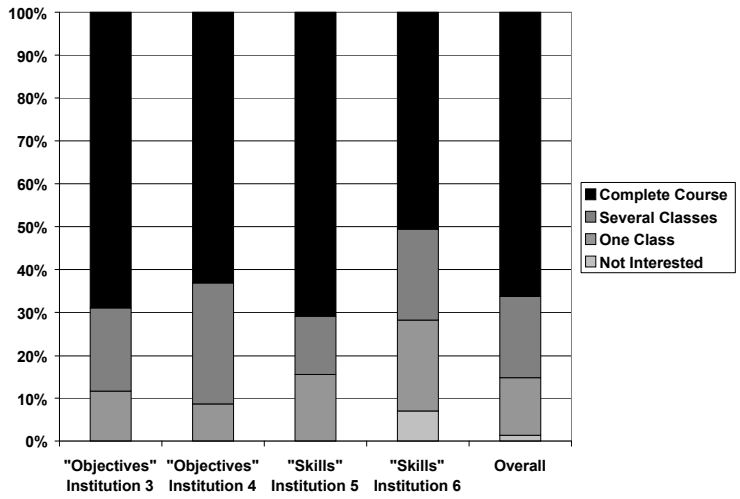

Figure 4. Percentages of responses on the participants' commitment to implement the workshop practices in the prospective study post-workshop survey

Discussion

Engineering education research has and will continue to lead to many innovations; however, the real impact of any development will occur only when it is widely adopted throughout the educational system. For this to happen, individual faculty members must become aware of these developments, must develop interest in them, must acquire knowledge of them, must make a commitment to try them, and must have some success in these initial attempts. We believe that short-duration faculty workshops offer an efficient, effective mechanism for helping faculty members through these steps.

The data presented in this report suggests that short-duration faculty workshops can help provide the interest, awareness, knowledge, commitment, and initial success needed to disseminate innovative engineering education ideas. For example, the retrospective data showing that about one-half of the responders reread the workshop notes and related material and that virtually all of them believed in the importance of the ideas demonstrated that workshop participants developed an awareness and interest in the new practices. Moreover, both the retrospective data showing that nearly all the responders felt that they could explain and implement the workshop practices and the prospective data showing major increases in the participants' ability to define, explain, and implement the workshop practices indicated that workshop participants acquired knowledge. Similarly, both retrospective data indicating that about four out five inexperienced faculty members tried some implementation and the prospective data showing that almost all the participants agreed to try some implementation indicated a real commitment was developed through the workshop. Finally, the retrospective data indicating that nearly all of the responders who tried some implementation experienced some degree of success showed that implementation resulting from short-duration workshops were successful. Although there are other possible explanations for these positive reactions, we believe that the workshop experience provided an important contribution in changing attitude and behavior.

Although the data supporting the effectiveness of short-duration workshops in faculty development presented in this report are encouraging, some caveats should be mentioned. First, the results that were presented are limited to faculty members who had enough awareness and interest to volunteer to participate in the workshops. Results might be different with a randomly selected group of faculty members. Second, the retrospective study results were derived from the 42% of the participants who completed the surveys – it is more than likely that the percentage of positive response would be much lower among the other 58% of the participants. Finally, the results are limited to workshops facilitated by the author. Results might be different for workshops facilitated by other leaders.

Further, the report illustrates a process for collecting data on the effects of workshop on the knowledge and practice of the participants. Rather than soliciting formative data for improving the workshop, the process collects data directly connected with the learning objectives for the workshop. A crucial step in implementing this process is the identification and articulation of learning objectives for the workshop. Once the learning objectives are specified, then the necessary survey instruments can be readily generated. Therefore, the report illustrates a process that would be applicable to any workshop which has constructed learning objectives.

Conclusion and Recommendations

The results of this study indicate that short workshops can make engineering faculty aware of new developments in engineering education and, more importantly, can provide them with enough background and motivation to explore these approaches in their classrooms. Engineering schools should consider establishing a regularly scheduled workshop program to provide their faculty with an exposure to new ideas and approaches in engineering education. Similarly, funding agencies should consider expanding their support for workshop programs as a vehicle for disseminating the innovation developed by their grantees.

Acknowledgments

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Biographical Information

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