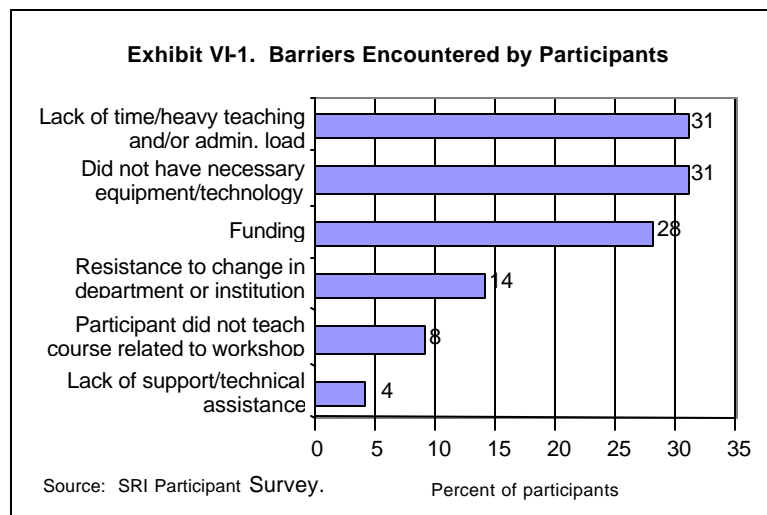


VI. BARRIERS TO AND REASONS FOR WORKSHOPS' SUCCESS

Barriers Encountered When Developing Courses or Majors

The road to developing or revising courses or majors was not always smooth. More than half (56%) of participants who did so had to surmount some type of barrier. As shown in Exhibit VI-1, the most common barriers included lack of time (often due to heavy teaching or administrative loads), lack of equipment or technology, and lack of funding. Nevertheless, the vast majority of participants overcame whatever barriers they faced and went on to develop or revise courses or develop programs or study.



Reasons for UFE Workshops' Success

Despite the presence of barriers for so many participants, approximately 80% of participants made at least moderate changes to their courses or developed new courses. What accounts for this high success rate of the UFE workshops? We addressed this question in two ways. First, we used multivariate analyses to investigate the associations between a positive outcome and various factors. Second, we examined participants' own answers concerning why they attended the workshops and the features of workshops that they felt contributed the most to what they got out of the workshop.

Statistical Associations between Workshop Characteristics and Success

Our indicator of a "successful workshop" was participants' making at least moderate changes to their existing courses and/or developing one or more new courses. We examined the association of workshop characteristics with this outcome, controlling for characteristics of participants and characteristics of their institutions. Exhibit VI-2 shows the variables included in various models we estimated.

Exhibit VI-2. Variables Included in Models		
Characteristics of Workshops	Participants' Characteristics (Control)	Participants' Institutions (Control)
Length of workshop (days) Workshop focus <ul style="list-style-type: none"> • Included content • Included teaching methods • Included lab techniques • Included new technology Materials worked on at workshop <ul style="list-style-type: none"> • Textbooks • Lecture notes/handouts • Problem sets, project descriptions, or lab exercises Completion of materials at workshop Participant gave presentations Type of follow-up <ul style="list-style-type: none"> • Formal session • Informal gathering • Participant site tested materials Participant received technical assistance from workshop PIs and/or staff	Years on faculty at institution Academic rank Tenure status Discipline Motivation for attending workshop <ul style="list-style-type: none"> • To develop or revise a course • To modify teaching methods • To become a better teacher • To increase the use of labs/improve labs • To learn to use new technology • To develop a program of studies • To keep current in subject area • For personal enrichment Participant's discipline <ul style="list-style-type: none"> • Astronomy • Chemistry • Computer Science • Engineering • Geosciences • Life Sciences • Mathematics • Physics • Social Sciences • Non-SMET • Other 	Institutional type <ul style="list-style-type: none"> • 2-year • 4-year • Comprehensive • Doctoral • HBCU

Ultimately, after learning that none of the control variables had statistically significant associations with revising or developing courses, we estimated a model containing only the workshop characteristics.¹ Exhibit VI-3 presents the association of each variable with a participant's probability of revising an existing course and/or developing a new course. Variables with statistically significant associations are

¹ We used logistic regression to estimate a participant's likelihood of developing one or more new courses or making at least moderate changes to existing courses. Workshop characteristics were chosen for their theoretical interest and left in the model regardless of their statistical significance. We estimated the model with the workshop characteristics and sets of control variables. Regardless of the model's specification, none of the control variables were significantly associated with the dependent variable, and the associations of the workshop characteristics remained substantially the same.

We also estimated models of participants' likelihood of making *major* changes to one or more existing courses and/or developing one or more new courses. The results were substantially the same as those reported in the text.

presented first in each group of variables, and the level of significance is indicated by one or two asterisks.

As shown in the exhibit, participants who attended workshops that included a focus on teaching methods and/or new technology were considerably more likely to revise and/or develop one or more courses after the workshop. The former variable increased participants' probability of revising and/or developing one or more courses by 15 percentage points, and the latter variable increased the probability by 13 percentage points.²

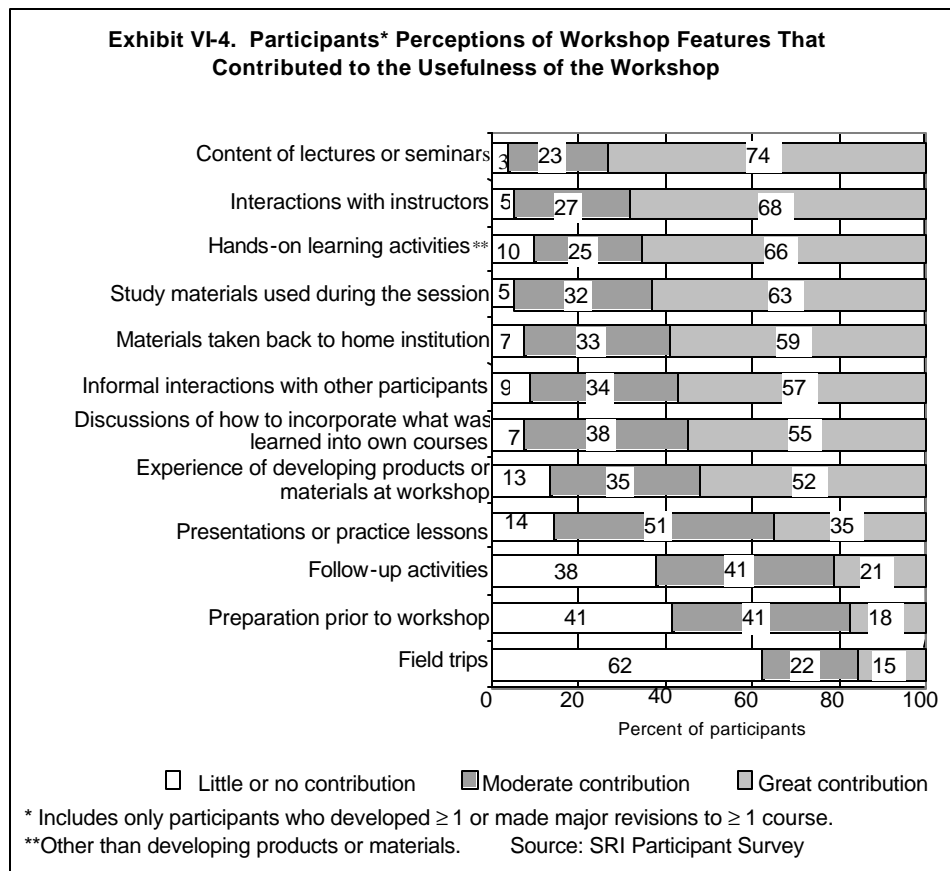
Exhibit VI-3. Associations of Variables with Participants' Probability of Revising/Developing at Least One Course	
	Change in Probability of Revising/Developing at Least One Course
Length of workshop (in days)	0.014*
Focus of workshop	
Included teaching methods	0.151**
Included new technology	0.131**
Included new content	0.005
Included lab techniques	-0.047
At workshop, participant:	
Worked on lecture notes/handouts	0.145**
Worked on problem sets, project descriptions, or lab exercises	0.153**
Worked on textbooks	-0.024
Gave presentation at workshop	-0.055
Completed materials at workshop	0.029
Participant's follow-up activities	
Site testing materials at own campus	0.062**
Received technical assistance from PI or workshop staff	0.050**
Formal follow-up session(s)	0.011
Informal gathering(s)	0.015
* $p < .05$	
** $p < .005$	

Working on lecture notes and/or course handouts at the workshop and working on problem sets, project descriptions, or lab exercises also were associated with participants' increased probability of revising or developing one or more courses, with an increase of approximately 15 percentage points for each variable. Completing the materials at the

workshop was not important, but it was important that participants *continued* to work on materials at their own campuses and that they received the technical assistance they needed. Site testing workshop materials at their own campuses was associated with an increase of 6 percentage points in participants' probability of revising or developing at least one course, and receiving technical assistance from the workshop PI or staff was associated with an increase of 5 percentage points. Contrary to the conventional wisdom, neither formal follow-up sessions nor informal follow-ups showed associations with participants' probability of revising or developing courses.

Participants' Perceptions of Importance of Workshop Features

As stated earlier, we also asked participants themselves what features of workshops



² Unfortunately, the changes in probability presented in the exhibit are *not* additive. However, we present coefficients that can be used to calculate the changes in probability associated with several variables at a time and a formula for calculating such changes in Appendix E.

they felt had contributed most to what they got out of the workshop (see Exhibit VI-4). Among participants who made *major* changes to existing courses and/or developed new courses, the three most highly valued features of the workshops (cited as making a “great contribution” by 66% or more of respondents) were the content of the lectures or seminars, the interactions with instructors, and the hands-on learning activities. Five other features were cited as having made a great contribution by more than half of respondents (see Exhibit VI-4). Consistent with the findings of our multivariate analysis, relatively low ratings were given to presentations and follow-up activities. Similarly, most participants did not feel that preworkshop preparation or field trips were important features.

Participants' Motivation as a Factor in Workshops' Success

In interpreting these findings, it is important to bear in mind that the UFE participants were not a random sample of all U.S.SMET faculty. In general, they were a highly motivated group. In fact, when asked in an open-ended question why they attended the workshops, 80% of respondents who were queried gave reasons that related to changes they wanted to make in their courses. Thus, these findings may not apply to all SMET faculty professional development.

Why some survey respondents attended UFE workshops:

“I was looking for ideas to revise the course and looking for ideas and materials to start revising.”

“To get information that I needed to develop a new course and also information that would help me prepare my students for grad school.”

“To broaden my knowledge and to learn new things in my research and to incorporate materials and revise some courses.”

“To develop some active-learning strategies and to add realistic content to my classes.”

Summary

More than half of UFE participants who developed or revised courses overcame some type of barrier to do so. The most commonly reported barriers concerned lack of time to work on courses because of a heavy teaching and/or administrative load, not

having the necessary equipment or technology, and lack of funds. Other faculty's resistance to change was not a commonly reported problem.

Neither characteristics of participants nor those of their institutions were associated with their likelihood of revising or developing a course after a UFE workshop. Characteristics of the workshop that were found to be important were: its duration, the inclusion of teaching methods and/or new technology, and activities that included work on lecture notes, handouts, problem sets, project descriptions, and/or lab exercises. It was not important whether participants completed their materials at the workshop. Neither was it important whether participants took part in face-to face follow-up activities. In contrast, site testing materials at their home institutions and receiving technical assistance from the workshop PI or staff were associated with an increased probability of developing and/or revising courses after the workshop.