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ASSESSING A FORESTRY EDUCATION: THE NORTHERN ARIZONA UNIVERSITY EXPERIENCE

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ABSTRACT: In an attempt to provide students with a strong generalist education, the faculty at Northern Arizona University's School of Forestry has presented its undergraduate forestry education in a unique, integrated, team-taught approach for over 20 years. Over this same period of time, higher education has experienced profound changes. Within the discipline, the technical knowledge expected of undergraduates has expanded greatly. Simultaneously the demand for accountability in higher education has increased. Students, parents, state legislators, governing boards, and taxpayers alike have questioned the importance, relevance, and value of higher education. The so-called "student-as-consumer" model in higher education is but one manifestation of this increased demand for accountability. A fundamental question arises: How well does the forestry program at NAU prepare students educationally as foresters?

Assessing student academic achievement with respect to educational outcomes provides one way of answering this question. Such a process can help determine how well students master a set of defined skills, knowledges, and competencies. Such an approach requires a defined set of desired educational outcomes.

The faculty at the NAU School of Forestry have been engaged in this process for over three years. Although not complete, we have begun to identify both desired educational outcomes and means for assessing their achievement. This effort has involved a variety of approaches, including a comprehensive survey of School of Forestry alumni. This work reports on the results of this latest effort, the alumni survey.

INTRODUCTION

The operational environment for higher education has experienced profound changes recently. Both student populations and demographics have changed, with a smaller proportion of "traditional students" in a four-year degree completion cycle coming to universities directly from high school graduation. Students have different expectations about the value of higher education. Such changing expectations include both the content of higher education and the form of delivery.

Coupled with changing expectations about the higher education process, is an increasing complexity and volatility of employment. The massive mergers, acquisitions, and downsizings in the private sector during the 1980s and 1990s have fundamentally altered employment relationships. Public sector employment, especially in natural resource agencies at the Federal level, has experienced similar downsizing changes. Such changes have placed a premium on individuals with marketable skills, while the increasing rate of technological change results in the rapid obsolescence of such skills.

Higher educational institutions, and their governing boards, have altered their outlooks and operations in response to these changes in expectations, employment relationships, and technological volatility. For example, the growing interest in post-tenure review may be viewed as a response demanding greater accountability on the part of faculty members. Some colleges and universities have increased the flexibility of degree programs, especially in terms of delivery venue (*e.g.*, web and web-based courses, the growth in distance education, and the move toward the "virtual university") in response to the demands of students. In addition, accreditation bodies have put increased emphasis on assessing student academic achievement as part of the accreditation criteria for member institutions.

Assessing student academic achievement focuses on a set of three key educational issues:

1. What are the core knowledges, skills, and attitudes that students should have upon graduation, or "What should students know and know how to do"?

2. How can educational systems best help students acquire these knowledges, skills, and attitudes, or "How do we best help students learn what we think they need to learn?", and

3. How can educators and educational institutions assess the efficacy of educational systems, or "How do we determine if students know what we as educators think they should learn?"

Faculty in the School of Forestry at Northern Arizona University have internally begun answering question one for its professional forestry curriculum (Fox *et al*. 1996a,b). This paper reports on the latest assessment activity in the School (an alumni survey) and describes on-going and planned assessment activities.

ALUMNI SURVEY

Faculty had a belief supported by anecdotal data that the integrated, generalist curriculum of the School well- prepared students to move into forestry and related natural resources careers. More specifically, faculty believed that although perhaps not receiving the depth in certain areas that other forestry programs provide, NAU forestry graduates received a breadth of information, along with synthesis and integrative skills, that serve as effective trade-offs for any lack of depth. Such content breadth, along with synthesis and integrative skills, would allow them to succeed in land management careers over the longer term. As the faculty identified core knowledges and competencies, a logical next step was to determine from the graduates of the forestry program the knowledges, skills, and attitudes that best served them in their careers. A formal survey was seen as the best way to acquire the desired assessment data. Specifically, the survey had the following five objectives:

1. To assess whether the skills, knowledges, and attitudes acquired by graduates of the forestry program prepared them for their first professional position after graduation;

2. To assess whether the skills, knowledges, and attitudes acquired by graduates of the forestry program prepared them for their current professional position;

3. To assess the overall quality of instruction, advising, and career counseling in the forestry program;

4. To determine the demographic profile of NAU forestry graduates, including employment; and

5. To determine the overall satisfaction of graduates with the integrated forestry program.

Methods

Beginning in 1996, the administrative leadership of the School identified the need and desire to survey forestry alumni. Over the course of approximately six months a survey instrument was generated, working closely with the Social Research Laboratory (SLR) in the College of Social and Behavioral Sciences at Northern Arizona University. An initial decision was made to involve the SLR because of its expertise and a desire to remove the School's faculty and administrative leadership from direct participation in the survey. This would help create a climate of anonymity for respondents with the hope of generating more direct and honest responses. The survey instrument allowed and encouraged comments from respondents on any aspect of the survey and the forestry program.

In the Spring of 1997 the survey was sent to 1,098 School of Forestry graduates, from an alumni mailing list generated by the School. A reminder postcard was sent out one week after the first mailing. Approximately one month after the first mailing, a second survey packet was sent out to all those alumni that had not yet returned their surveys. Seventy-two questionnaire packets were returned as undeliverable. A total of 400 questionnaires were returned. This response rate of 39% was judged acceptable by the SRL for such a survey.

The Social Research Laboratory compiled and tabulated all responses, including the verbatim comments. The final report was delivered to the Chair of the School of Forestry in September 1997. In addition to providing the mailing list and administrative time working with the Social Research Laboratory in design of the survey, this survey cost approximately $6,000.

Results

Demographically, some 82% of the alumni respondents identified themselves as male, and 90% identified themselves as "white." Of those responding, 56% went on to pursue graduate or other undergraduate education after their forestry degree, with 48% of these studying forestry and another 23% in business.

First post-graduation employment was overwhelmingly in the general area of forestry (79%), but this value dropped to 59% for the current positions. Of the positions in forestry, the majority of the first positions were with government agencies (65%), with this value dropping to 57% for current positions. Private sector employment totaled 26% for first positions, and comprised 24% of current positions. Alumni currently hold positions in a wide range of organizations including federal, state, provincial, tribal, county, and municipal governments, school districts, non-governmental organizations, forestry and wood products firms, and consulting firms. Specific current career pursuits outside the general area of forestry included law, medicine, education, the clergy, ski industry, real estate, and state and municipal recreation.

Overall, forestry alumni returning the survey felt that they received high quality instruction, with 93% rating the quality of the instruction as "good" or "excellent" (Table 1). Although still high, the ratings for the quality of academic advising were below those for instructional quality (Table 1). In the area of career counseling, alumni ratings dropped considerably, with only 35% of the respondents feeling they received good or excellent assistance in this area (Table 1).

Table 1. Alumni rating of the quality of instruction, advising, and career counseling (percent of respondents)

Rating	Instruction	Academic advising	Career counseling
Excellent	45	23	11
Good	48	37	24
Fair	7	26	33
Poor	1	8	18
Never met w/ advisor	na	6	11
No opinion	--	1	4

As part of the survey, we were interested in determining how well the forestry program developed certain skills the faculty felt were important for students to have. Overall, responding alumni thought that the program did best in developing writing, critical thinking, problem solving, quantitative, job preparation, and forestry field skills (Table 2). The development of managerial, analytical modeling, oral communication, and creative thinking skills received lower ratings (Table 2).

Table 2. Alumni rating of the forestry program in developing selected skills and abilities (percent of respondents)

Rating	Writing	Oral comm.	Critical thinking	Creative thinking	Problem solving	Quantitative skills
A great deal	26	10	22	15	23	17
Considerably	40	36	45	40	48	51
Somewhat	24	37	28	32	25	24
Very little	7	14	4	9	3	5
Not at all	2	3	1	3	1	2
No opinion	—	1	1	1	1	2

Table 2 continued. Alumni rating of the forestry program in developing selected skills and abilities (percent of respondents)

Rating	Managerial skills	Analytical modeling skills	Forestry field skills	Preparation for further study	Job prep. skills
A great deal	10	8	53	22	33
Considerably	27	32	35	42	35
Somewhat	33	32	9	22	19
Very little	19	16	2	4	7
Not at all	10	7	1	1	2
No opinion	1	5	1	9	4

We next asked alumni about the value of certain skills and abilities to both their first post-graduation and current positions. Forestry field skills overwhelmingly topped the list of the most valuable skills for the first post-graduation position (Table 3), but also ranked second as the least valuable skill (Table 4).

In relation to skills and abilities needed by alumni in their current position, writing skills topped the list (Table 5), moving up one notch from its ranking in the first post-graduation position (Table 3). Verbatim responses for the "Other" category (Table 5) for the most valuable skill included "ability to learn new skills", "confidence," "forest hydrology", and "persistence". Forestry field skills ranked as the least valuable skill for alumni in their current position (Table 6).

Table 3. Most useful skills, knowledges, and abilities developed in the forestry program for first post-graduation employment (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Forestry field skills	32
Writing skills	16
Other	14
Silviculture	9
Analytical	8
Communication	8
Problem solving	8

Table 4. Least useful skills, knowledges, and abilities developed in the forestry program for first post-graduation employment (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Range management	13
Forestry field skills	11
Wood technology	11
Other	9
Analytical modeling	8
Recreation	8

Table 5. Most useful skills, knowledges, and abilities developed in the forestry program for current employment (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Writing	23
Other	20
Problem solving	9
Analytical	8
Communication	8

Table 6. Least useful skills, knowledges, and abilities developed in the forestry program for current employment (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Forestry field skills	16
Range management	12
Wood technology	9
Recreation	8
Analytical modeling	6

The survey also asked alumni to identify the skills and abilities needed in their careers that the forestry program did not provide. Although the rankings differed somewhat between first and current position needs, the top five responses had a high degree of overlap, with five of the skills sets appearing on both lists. Computer and human resources/personnel/supervisory and law/policy/legislation skills ranked very high for both first position (Table 7) and current position (Table 8) needs. The "Other" entry for untaught skills and abilities for the first position (Table 7) included such verbatim responses as "tree planting skills", "safety", "technical how-to information", "orientation toward detail", and "ability to assimilate different ideas".

Table 7. Skills and abilities not taught in the forestry program but needed in first post-graduation position (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Other	16
Personnel management/ human resources/supervisory	15
Computer skills	11
Other forestry courses	10
Fire management	9
Law/policy/legislation/NEPA	9
Other non-forestry courses	9

Table 8. Skills and abilities not taught in the forestry program but needed in current position (top 5 responses, percent of respondents)

Skill/knowledge/ability	Percentage
Computer skills	20
Other non-forestry courses	18
Personnel management/ human resources/supervisory	10
Law/policy/legislation/NEPA	9
Other forestry courses	9

Overall, over 70% of the alumni felt that the forestry program provided a good or excellent preparation for their first post-graduation position (Table 9). This dropped to 65% for their current position (Table 9).

Table 9. Rating of overall effectiveness of the forestry program in developing the necessary skills for the first post-graduation and current employment position (percent of respondents)

Rating	First position	Current position
Excellent	22	17
Good	51	48
Fair	19	21
Poor	5	9
No opinion	4	6

Comparing themselves to graduates of other programs 62% of the responding alumni felt that they were better prepared by the integrated program than graduates of other forestry programs for a forestry career, with only 8% feeling they were not as well prepared.

Discussion

Given that the 39% return rate represents an unbiased sample of NAU forestry alumni, what do these survey results tell us? Overall on the positive side, it appears that alumni feel that they received a good education. For those experiencing the integrated curriculum, most felt that this approach has served them well in their careers, although somewhat more so for first positions as opposed to current positions. And alumni believe that the program did a good job of developing certain key skills that faculty have identified as important (namely writing, critical thinking, problem solving, quantitative, job

preparation, and forestry field skills). On the negative side, alumni feel that the forestry program could be improved in the area of career counseling and in developing other key skills, such as oral communication, managerial skills, and creative thinking. Verbatim responses provided a wide range of opinions about the program. Many alumni comments supported the program and the education received. These positive comments came from alumni that had and had not continued their careers in forestry. However, many were highly critical of the program and employment opportunities for forestry graduates.

In terms of specific skills, one of the most interesting results was the responses about forestry field skills. The response that field skills are not useful for current position performance is not surprising, given the general move away from field work that often occurs with career advancement. Also not surprising is the response that field skills were highly valuable for many alumni as they entered their first post-graduation position. But that 11% of the respondents felt that forestry field skills were not important for first position performance is surprising, and perhaps reflects the diversity of employment that graduates obtain. The high amount of overlap between the set of skills felt valuable for first and current employment (writing, problem solving, analytical, and communication skills were common to both rankings, albeit in different orders) seems to indicate that the forestry program has done a good job, at least in part, of identifying key core skills for both short-term and long-term career benefits. Unfortunately, the alumni respondents believe the program could be improved in some of these areas, notably oral communication, analytical modeling, and managerial skills.

The forestry program did not provide some skills that alumni feel would have been beneficial for first and current positions. The commonality of these skill sets (personnel management/human resources/supervisory, law/policy/legislation/NEPA, computer skills, other courses, both forestry and non-forestry), especially taken with some of the verbatim responses, provides important evidence for the faculty to investigate and further analyze. Of perhaps equal importance is the alumni perceptions about those subject areas least useful in either first or current positions. Such information should provide the faculty and administrative leadership with the impetus for further revision and refinement of the program's offerings.

The drop in forestry and forestry-related employment from first to current position, coupled with the overall rating of career counseling and many of the verbatim responses, identifies an important element of the professional program beyond the usual academic issues of academic content, skill sets, and delivery methods: employment of graduates. This issue is being addressed by the School, as discussed in the next section.

In summary, this survey provides evidence that will assist faculty and leadership in the School to identify desired changes in the professional program. Much of the evidence from this survey, especially with regard to general skills sets desired for forestry careers, supports many of the conclusions already reached by faculty and leadership. And as noted previously, the survey also yielded some surprising results.

CONCLUSIONS AND ACTION ITEMS

This survey has provided one set of assessment data to use in the evaluation of the professional forestry program at Northern Arizona University. On the positive side, alumni generally feel that they received a good education at NAU. Both alumni and faculty agree on many of the skills that are important for career success. But the diversity of responses should cause some deep reflection. The general question that arises is how to best incorporate the information from this survey to improve the program. Specific questions that need to be asked, and answered include:

* How best to achieve these mutually desired educational outcomes?
* Should the program be restructured to add those subject areas that alumni find valuable that are not offered?
* Should the program be restructured to delete those subject areas that alumni found of least value?
* Should the program provide greater career counseling, and if so, how?

With respect to this last question, even before completion of the survey the faculty recognized the need to provide more assistance to students in the area of career counseling. Looking holistically at student needs over time, the faculty agreed to reprogram funding available for a faculty line position into a staff support position with the triple objectives of recruitment, retention, and placement. The faculty felt that these three elements are inextricably linked. The School's new coordinator of Recruitment, Retention, and Placement joined the staff in November 1997. Part of his initial assignment will be to help develop close contacts and working relationships with the University's Career Services (placement) office to help formalize, strengthen, and expand the employment contacts available to students in the School.

The faculty has also greatly strengthened the development of computer skills in the past few years. We also plan to ask the SRL to revisit the survey data to categorize computer skills-related responses by graduation year group in an attempt to get a better picture of how the changes in computer development have impacted alumni.

And the faculty has embarked on a major writing-across-the-curriculum effort to strengthen the written communication skills of forestry graduates (see Souder 1998).

Survey results such as presented here must be used in the context of triangulation or converging evidence. Based on the findings here, a case could potentially be made to strengthen

or reduce the offerings of just about any particular subject area offered. As a faculty, we need to carefully review these findings, adding them to at least three other assessment mechanisms: On-going faculty-led assessments of program structure and content; course and program evaluations from current students; and surveys from employers. All these efforts require time, energy, and financial resources. Given the rapidly changing higher education and employment environments, time may be the most scarce of these requirements, especially given the needs for program delivery and the pattern of the academic calendar (*e.g.*, nine month contracts for many faculty) that greatly reduce the amount of time available for faculty to work on curriculum reform. But failure to undertake such activities courts disaster to the extent that current practices no longer fit student and greater societal needs.

LITERATURE CITED

Fox, Bruce E., Thomas E. Kolb, and Ernest A. Kurmes. 1996a. "Benefits and costs of an integrated forestry curriculum: The Northern Arizona University experience." In: *Proceedings First Biennial Conference on University Education in Natural Resources*. College of Agricultural Sciences, The Pennsylvania State University.

Fox, Bruce E., Thomas E. Kolb, and Ernest A. Kurmes. 1996b. "An integrated forestry curriculum: The Northern Arizona University experience." *Journal of Forestry*. 24. 94(3):16-22.

Souder, Jon A. 1998. "Writing across the curriculum efforts at Northern Arizona University." In: *Proceedings Second Biennial Conference on University Education in Natural Resources*. Department of Forest Resources, Utah State University.