

Capturing Immediate Learning Outcomes of Undergraduate Internships

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When viewed from the broadest employer perspective, student programs such as internships or co-op generate positive outcomes in three general areas:

1. Student competencies (learning)
2. Useful productivity (task completion)
3. Retention into the workforce (graduation, advanced degrees, employment)

Traditionally, metrics collected for NASA internships focused solely on retention outcomes. While important, retention outcomes require years to emerge as students complete their undergraduate degrees, decide whether to pursue graduate programs, and finally enter the workforce. Because of this long time lag between participation in the experiential program and the eventual hiring into the workforce, retention data can be a poor tool for managers looking to implement continuous improvements to their programs in the short term.

Outcomes in the areas of student learning and productivity hold the promise of providing more immediate information to program managers in monitoring the rigor and challenge of student experiences, maximizing the quality of the selection process, and capturing student growth in areas directly related to the Accrediting Body for Engineering and Technology demonstrated abilities criteria (ABET a-k criteria). Additionally, data gathered in the area of productivity can be used to estimate the value of the work produced by students to the organization—a metric that can carry significant weight in defending student program budgets during difficult economic times.

In 2008, managers of NASA's Undergraduate Student Research Program (USRP) instituted new end-of-internship surveys for both students and mentors. These surveys were designed to better capture outcomes generated in the areas of student learning and productivity.

The data presented here are derived from 724 student surveys and 517 mentor surveys collected from spring 2008 through fall 2010. The data represents internships at all NASA centers, and in spring, summer, and fall sessions.

Student Learning: Cognitive Skills

Table 1 shows the percentage of USRP interns who indicated their experience provided them growth opportunities in areas closely aligned to ABET a-k criteria. These are areas deemed critical to career success in engineering and technology careers. Overall, these data indicate that USRP internship experiences are appropriately rigorous and challenging, providing students ample opportunity to grow in many of the areas considered critical in producing a highly qualified pool of future engineers and scientists for the nation's technical workforce.

Table 1. Percentage of Undergraduate Student Research Program Interns, Indicating Growth in Key Skill Areas

Professional/Technical Communication	98%
Conceptual/Analytical Ability	99%
Learning/Applying Knowledge	99%
Professional Qualities	98%
Teamwork	93%
Leadership	88%
Technology	97%
Work Culture	99%
Organization/Planning	97%

Student Learning: Attitudinal Change

USRP interns were asked a series of questions designed to determine how their USRP experience affected their commitment and attitude in regard to their current career path. Table 2 shows the student responses to these questions. The percentage given represents the number of interns who expressed agreement with the statement. Considering that about 50% of USRP interns are seniors, the results are another indication of the strong impact that hands-on experiential opportunities have on student development.

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continued

Table 2. Student Responses to Affective Questions in Undergraduate Student Research Program Survey

This experience helped me determine my own strengths and weaknesses	96%
This experience increased my professional self-confidence	98%
This experience increased my academic motivation	96%
This experience increased my understanding of my chosen profession	95%
This experience helped me to clarify my career plans and options	97%
This experience helped prepare me to achieve my career goals	98%

Student Productivity

Another outcome of internships and co-op that has not been captured previously is useful technical productivity. These data are captured for USRP by asking mentors to compare the output of their student intern to a typical fresh-out new hire in their organization. While this opinion can only lead to an approximation of the actual value, results have remained consistent across the nine sessions for which these data have been captured. The following equation is used to generate a dollar value:

Productivity (\$\$) = mentor rating x ave. starting salary+benefits x total length of USRP internships

Using this equation and the average mentor ratings of their students, USRP interns have generated approximately \$20.8 million in useful technical work, which helps to further NASA's technical missions. This represents a positive return on investment of approximately \$2.1 for each dollar spent to fund USRP internships.

The Value of Student Learning

In an attempt to create a value metric for student learning similar to that for student productivity, USRP project managers asked the following question on student surveys:

“Please relate the total value (educational learning, professional growth, etc...) of your internship experience to the value you get from a typical semester (or quarter) at your institution. Please quantify your answer in terms of credit hours.”

The average response to this question was 13.7 credit hours. Applying this value to all internships resulted in an estimated quantity of learning generated by USRP internships equivalent to 13,000 credit hours over the 3-year span for which data were collected. Converting this figure to a dollar amount was somewhat more complex than the conversion for productivity. Depending on whether a strict cost per credit hour national average was applied, or the total average cost for a semester of school was reviewed, the dollar value equivalent could range widely. However, when using a \$10,000 per semester figure and 12 credit hours as a full load, this figure converted to approximately \$11 million.

The Value of Immediate Outcomes for Internships and Co-op

USRP internships generate approximately \$3.1 in immediate student learning and useful technical productivity for each dollar invested, based on 3 years of data collected across every NASA center. The capture of these outcomes provides strong evidence for the observed connection between healthy student programs and a healthy organization seen in science, technology, engineering, and math employers in both the private sector and government.