Title
Integrated Graduate Education & Research Traineeships (IGERT): Transportation Technology & Policy Executive Summary

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Publication Date
2005-12-01

Peer reviewed
Integrated Graduate Education & Research Traineeships: Transportation Technology & Policy Executive Summary

Patricia L. Mokhtarian
IGERT Principal Investigator

Joan S. Tolentino
IGERT Program Manager
FINAL REPORT

National Science Foundation
Integrated Graduate Education and Research Traineeships Grant

TRANSPORTATION TECHNOLOGY AND POLICY

Institute of Transportation Studies
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University of California, Davis
Davis, CA  95616

December 2005

Prepared by:

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IGERT FACULTY

More complete descriptions of ITS-Davis affiliated faculty are found in Appendix A.

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Co-Principal Investigators

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Robert Johnston, Environmental Science and Policy
Daniel Sperling, Civil and Environmental Engineering and Environmental Science and Policy
    Director of the Institute of Transportation Studies
Steven Velinsky, Mechanical and Aeronautical Engineering
    Co-director of the Advanced Highway Maintenance and Construction Technology Center

Faculty Advisors of IGERT Fellows (Names of Fellows)

Lee Branstetter, Economics (Nylander) – no longer at UCD
Andrew Burke, ITS-Davis (Gardiner, Herbert, Kornbluth)
Daniel Chang, Civil and Environmental Engineering (Held, Leeman)
Harry Dwyer, Mechanical and Aeronautical Engineering (Grupp) – emeritus
Robert Feenstra, Economics (Forest, Lepore, Sparber)
Andrew Frank, Mechanical and Aeronautical Engineering (Harmon, Kornbluth)
Joanna Groza, Chemical Engineering & Materials Science (Gardiner)
Susan Handy, Environmental Science & Policy (Hough, Nicholas, Winston)
Robert Johnston, Environmental Science & Policy (Clay, Rodier) – emeritus
Kenneth Kurani, ITS-Davis (Congleton)
Marshall Miller, ITS-Davis (Kershaw, McCaffrey)
Patricia Mokhtarian, Civil and Environmental Engineering (Clay, Ory)
Robert Moore, ITS-Davis (Sundaesan) – no longer at UCD
Debbie Niemeier, Civil and Environmental Engineering (Hendren, Kear, Morey)
Tayhas Palmore, Chemistry (Butlin, Melnick) – no longer at UCD
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    (Badrinarayanan, Brodrick, Caldwell, Chen, Eggert, Friedman, Hamilton, Lutsey, McCarthy,
    Rachlin, Rivasplata, Weinert, Williams)
Pieter Stroeve, Chemical Engineering & Materials Science (Quinlan)
Steven Velinsky, Mechanical and Aeronautical Engineering (Stiles)
James Wilen, Agricultural Economics (Salon)
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ACKNOWLEDGEMENTS

Some descriptive portions of this report have been taken from ITS-Davis Biennial Reports and the ITS-Davis electronic newsletter, e-news (see http://www.its.ucdavis.edu/news/index.html). These documents are mostly written by Jamie Knapp, with contributions from ITS-Davis faculty and staff.
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EXECUTIVE SUMMARY

The UC Davis IGERT grant for Transportation Technology and Policy (TTP) began October 1, 1998 and officially concluded September 30, 2005, although no students were funded in its seventh and final year. The TTP theme of the grant was shared by the degree-granting program of the same name (the students in which overlapped, but did not completely coincide, with IGERT recipients), and focused on the need to integrate the often-segregated policy and technology sides of transportation, so as to better prepare students to address today’s and tomorrow’s complex transportation-related challenges. The budget totaled $2.66 million, which directly funded 43 students in eight different degree programs (including research, teaching, international internships, and travel activities), 14 distinguished speakers, two graduate research conferences, a variety of recruiting practices, laboratory and computing equipment, project administration, and this evaluation. More than 2/3 of the budget directly funded students.

In less than 15 years, the Institute of Transportation Studies at UC Davis (ITS-Davis, established in 1991) has vaulted into the top ranks of university transportation centers. IGERT has had everything to do with this meteoric rise: the IGERT grant was active for nearly half of that period, and was seminal in supporting numerous and diverse research and educational activities of the Institute. Table ES.1 summarizes the growth in various key indicators during the approximate time the IGERT grant was in force.

Table ES.1: Growth in Key Transportation Indicators at UC Davis

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<th>1997-98</th>
<th>2004-05</th>
<th>Percent increase</th>
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<tr>
<td>Faculty associated with ITS-Davis</td>
<td>37</td>
<td>54</td>
<td>46%</td>
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<tr>
<td>Departments/organizations of all faculty associated with ITS-Davis</td>
<td>12</td>
<td>18</td>
<td>50%</td>
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<td>Depts./orgs. of core transportation faculty</td>
<td>6</td>
<td>9</td>
<td>50%</td>
</tr>
<tr>
<td>Transportation graduate students</td>
<td>40 (est.)</td>
<td>80</td>
<td>100%</td>
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<tr>
<td>Industry and foundation support</td>
<td>$500 K</td>
<td>$1.5 M</td>
<td>200%</td>
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<td>Total research expenditures</td>
<td>$2.12 M</td>
<td>$2.96 M</td>
<td>40%</td>
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As shown by the table and discussed at greater length throughout this report, the IGERT grant enabled ITS-Davis to:

- attract more, and more diverse, students to the study of transportation;
- encourage the campus to create more transportation faculty positions;
- attract outstanding new transportation faculty members in several different departments;
- broaden and deepen the curricular offerings in transportation;
- foster new research and education collaborations;
- develop innovative research approaches, discoveries, and solutions; and
- enrich the learning experience at UC Davis in a variety of ways.

Although the evaluation of the program is necessarily largely qualitative, a number of observations can confidently be made. In this section we highlight some of the key impacts of the
IGERT program at UCD; other valuable observations can also be found in Chapters 2 and 3 of the report.

- IGERT was a significant factor in leveraging new faculty positions in transportation for the campus, and played a role in making the campus transportation research and education milieu an attractive one to prospective faculty hires. The outcome was an increase in the number of transportation faculty on campus (at least six new full-time tenured or tenure-track appointments during the life of the IGERT program, in four departments), extraordinarily high-caliber new faculty, and a firm commitment to interdisciplinary education in general and the TTP program in particular on their part.

- The IGERT grant appeared to help increase the gender diversity of transportation students at UCD, as 23% of IGERT recipients were female, compared to 19% of non-IGERT transportation students enrolled during the same period. This is likely due in part to our higher-than-average proportion of women faculty: 11 (20.4%) of the 54 faculty associated with the Institute of Transportation Studies (ITS-Davis) are women, compared to an average of 8% women faculty in engineering colleges nationwide. However, targeted efforts to recruit underrepresented minority students were not effective and were difficult to sustain.

- Although the transportation program at UCD has had little difficulty in recruiting sufficient qualified students through relatively ad hoc methods, there are some challenges to doing so in a more systematic way, given the relative lack of visibility of transportation as a field of study to undergraduates, and the diverse disciplinary avenues by which students can arrive at an interest in transportation.

- Perceptions of the effectiveness of their graduate program at UCD differed little between IGERT and non-IGERT alumni, with average ratings for both groups falling between “good” and “very good” on most aspects. Transportation students who did not receive IGERT support directly still benefited in numerous indirect ways from the IGERT grant.

- Due in large part to the consciousness raised by the emphasis of the IGERT program on the subject, ethics issues are now taught in a number of core and elective classes taken by transportation graduate students at UC Davis.

- Although the international internship opportunity offered through IGERT was not heavily utilized, students continue to take part in significant international collaborative activities outside the rubric of IGERT.

- IGERT fellows and their co-authors have produced at least 33 journal articles, conference proceedings, and book chapters, and 56 research reports. The research covers a wide variety of topics, including telecommuting, work status choice, smart parking, carsharing, regional transportation and land use models, attitudes toward travel, hydrogen-fueled and/or fuel-cell vehicles, light-duty diesel vehicles in Europe, rural vehicles in China, heavy-duty truck auxiliary power units, low-speed modes, air quality policy and modeling, and transnational comparisons of transportation modeling and planning. Much, perhaps most,
of this research would not have occurred without IGERT, including studies using the
equipment that IGERT made it possible to purchase.

- The presence of the IGERT grant contributed substantially to the image and reality of
ITS-Davis having a vital, thriving program that warrants further investment on the part of
others. Thus, it was instrumental in:
  - attracting other key sources of funding (US Departments of Transportation and
    Energy; University of California Transportation Center; Honda endowment;
    industry, foundation, and individual support);
  - generating and supporting major new initiatives (Fuel Cell Vehicle Modeling
    Program; Transportation and the Hydrogen Economy; Road Ecology Center;
    Pavement Research Center; China Center for Energy and Transportation;
    fundraising campaign with the College of Engineering; new faculty positions
    approved for campus-wide Transportation and Energy for the Future initiative);
    and
  - fostering closer ties with other parts of campus, notably the Graduate School of
    Management through its Business Development Certificate Program and Little
    Bang/Big Bang entrepreneurship competitions (see Appendices C and D).

- Many if not most of the elements of the TTP IGERT program have been institutionalized
at UCD. The TTP degree program per se is certainly here to stay. New faculty are
soliderly rooted and are likely to make outstanding careers here. New courses are making
their way through the course approval process. The internship program is likely to
remain small in scale, but unquestionably valuable.

- At the campus level, a number of institutionalization activities have occurred and are
underway, including establishing a new administrative position, holding regular meetings
of key personnel across all current and prospective IGERT grants, offering centralized
support of recruiting and professional development activities, and offering financial and
other support of new IGERT proposals (see Section 3.4.2 for details).

The TTP IGERT grant has not only offered a tremendous benefit to transportation research and
education at UCD, we believe that the IGERT program nationwide has had a galvanizing effect
on graduate education in the United States. We have only three suggestions to offer to NSF with
respect to the IGERT program:

1. Judging by the experience at UCD, multiple IGERT grants on the same campus generate a
synergistic effect in terms of visibility to the administration, and administrative support in
response, that exceeds the sum of their parts. Thus, we would hope that at a minimum, the
prospect of a future IGERT award constituting the third or fourth award to a given univer-
sity would not be considered a liability. At a maximum, that outcome could arguably be
considered an asset, and hence counted as a merit rather than a demerit of a given proposal.

2. Only two of our IGERT recipients took advantage of the international internship opportu-
nity offered through IGERT (although several others had significant international experien-
ces outside of IGERT). As indicated, the typical internship lasts at least three months, and the international internship program was set up to allow periods of two months to a year. For many students, an absence of even two months (especially in a foreign country) could be difficult to manage, particularly for those with families (young children, working spouses, etc.). In addition, the barriers of distance, language, and culture do make it more difficult to lay the initial groundwork for the connection between student and host. Thus, our recommendation with respect to such programs in the future is to support “mini-internships” of much shorter durations – e.g. a week to a month. In this way, a student can travel abroad, often in connection with an international conference that will be an invaluable experience in its own right, and then stay behind (or come early) to work with an international host for a few days or weeks. Making one or two such visits a year for the several-year duration of one’s PhD program could be extremely effective, especially partnered with modern communication technologies that enable the continuation of any collaborations from a distance.

3. As we understand the policy, NSF sets the stipend rate for its training programs, and requires that any fellowship recipient be paid at that rate. When the stipend rate was $15,000 a year, as it was at the outset of the grant, that was roughly commensurate with (actually a few hundred dollars less than) the typical engineering research assistant’s (RA’s) salary at UCD. As the set rate kept rising, however, it eventually far outstripped the standard RA salary. The NSF stipend has now doubled to $30,000 a year, whereas annual RA salaries for TTP and CEE students at UCD are $18,285 – 23,602 (for 50% time during the nine-month academic year and 100% for the three summer months). The specific salary within that range is not at the discretion of the program, but is tied to educational milestones such as whether the student has an MS degree or has passed the PhD qualifying exam or not. Thus, a new graduate student without a prior MS would receive a 64% higher stipend as an IGERT fellow than as an RA. Such a large disparity in support between two students in the same degree program naturally led to some resentment and jealousy of the “haves” on the part of the “have-nots”. We urge NSF to allow programs at least some flexibility in setting stipend amounts, to more closely reflect local circumstances and practices.