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Refueling the U.S. Innovation Economy: STEM Reform

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ITIF is public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington and in the states. ITIF focuses on:

- Innovation processes, policy and metrics
- Science policy related to economic growth
- E-commerce, e-government, e-voting, e-health
- ICT and economic productivity
- Innovation and trade policy
### Growth of Degrees: 2000 to 2007

<table>
<thead>
<tr>
<th></th>
<th>STEM</th>
<th>Non-STEM</th>
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<td>Bachelor’s degrees</td>
<td>16 percent</td>
<td>24 percent</td>
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<tr>
<td>Masters degrees</td>
<td>20 percent</td>
<td>34 percent</td>
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<tr>
<td>Doctoral degrees</td>
<td>38 percent</td>
<td>34 percent</td>
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STEM vs. Non-STEM Bachelors Degrees Awarded
Engineering Degree Trends
Mathematics/Computer Sciences Degree Trends
STEM Master’s Degrees Awarded by U.S. Institutions
Why Aren’t there More Professional Science Masters’ Programs?

[Graph showing salaries by education level and discipline]
STEM vs. Non-STEM Doctoral Degrees Awarded
STEM Doctoral Degrees Awarded by U.S. Institutions

The chart shows the trend in STEM doctoral degrees awarded by U.S. institutions from 1993 to 2007. The degrees are categorized into five fields: Physical sciences, Mathematics/computer sciences, Biological, agricultural, and environmental life sciences, and Engineering. The chart indicates an overall increase in degrees awarded across all fields during this period.
Share of Doctoral Degrees Awarded to Foreign Students by Detailed Field of Study, 1995-2007
Percent of Degrees Awarded to Temporary Residents
STEM Degrees Awarded to U.S. Citizens/Permanent Residents, 1995-2007
Natural Sciences and Engineering Doctoral Degrees per Thousand 20-24 Year Olds, 1993-2006
Problems with Assumptions of Current Approach to STEM

- Improving STEM is not Linear, Mechanistic Process
- Giving All Students Some STEM is Expensive
- More Money Won’t Solve the Problem
- More Requirements and Mandates Won’t Solve the Problem
- Educating Students in a Vacuum Won’t Solve the Problem
Limitations of the “Some STEM for All” Approach

“Some STEM for All” approach is to make sure that every high school graduate and a much larger share of college grads become proficient in STEM.

Interventions at the K-12 level include:
• boosting K-12 teacher quality (e.g., increasing teacher pay, requiring higher STEM teacher qualifications),
• more rigorous STEM standards (e.g., expanding requirements for STEM courses, more rigorous testing and assessment),
• improving curriculum, and
• boosting awareness among students of the importance and attractiveness of STEM careers
Need a new “All STEM for Some” Approach
Importance of Interdisciplinary STEM education

• Interdisciplinary graduate STEM work attracts more women (and perhaps, more minorities)

• Students want it. According to NSF more interdisciplinarity was an option that 75 percent of students want.

• Yet, Interdisciplinary programs are still rare.

Duke University is piloting a doctoral program to train engineers that can work across fields to find solutions to global challenges. University of Delaware is building an Interdisciplinary Science and Engineering laboratory that will locate classrooms next to Institutes focused on energy, environment, and public policy.
Policy Recommendations

• Expand funding for IGERT

• Develop an industry-ranked list of the best STEM departments that reflects the quality of students (as future employees) produced by that department.

• Create more “Olin’s” by changing the NSF “Transforming Institution” grants
Policy Recommendations

• Offer prizes of up to $35 million to colleges and universities that have dramatically increased STEM student STEM degrees and maintained those increases over 5 years.

• Increase industry co-funded academic research and graduate student fellowships.
Federal Ph.D. Fellowship Support
Policy Recommendations (Ph.D. Fellowships)

1) Provide a significantly (25 percent to 50 percent) higher stipend for fellowship recipients than research assistantship recipients.

2) Issue the fellowship award notifications prior to graduate school application deadlines. This allows the fellowship to influence which graduate school the recipient chooses to attend.

3) Offer fellowship recipients unusual enrichment opportunities such as a chance to visit with the President’s Science Advisor or tour a nuclear submarine.
Thank you

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