Starting a Research Program at PUI: Practical Strategies (and Supportive Policies)

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Who am I?

4th year assistant professor at Trinity College

- About 2200 students total
- About 880 chemistry enrollments annually
- 14 chemistry faculty members
  - 10 research active
- 10-20 chem/biochem majors graduating per year
- ~90% participate in research
With thanks to:
Paul Flowers (UNC Pembroke)
Elizabeth Harbron (William & Mary)
Christine Hughey (James Madison)
Sandra Stenson (South Alabama)
Dwight Stoll (Gustavus Adolphus)
How can I meet the teaching expectations of a primarily undergraduate institution while simultaneously producing publishable research?

Be thoughtful about how you spend time preparing for class and grading.

(Be realistic about what faculty can do while teaching at your institution)
How can I meet the teaching expectations of a primarily undergraduate institution while simultaneously producing publishable research?

**Schedule your experiments**

*(Develop supportive policies for faculty to rejuvenate their research)*

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- Start with a clear plan
- Be cautious about pursuing too many projects
- Consider whether part of your research could be integrated with your teaching
- Consider the realities of undergraduate schedules
- Plan so you can use summers and sabbaticals effectively
How can I produce results with a fraction of the budget at a research-intensive institution?

**Be strategic about start-up**  
(New faculty need start-up)

Recent start-up funding levels at liberal arts colleges and comprehensive universities (biology departments, \( n = 23 \))

median = $30k

Money

How can I produce results with a fraction of the budget at a research-intensive institution?

Ask about internal support

(Internal pools of money jumpstart new projects and support a research culture)

http://www.trincoll.edu/Academics/dean/research/supported/committee/Pages/Grant.aspx
Money

How can I produce results with a fraction of the budget at a research-intensive institution?

Take advantage of external funding opportunities for faculty at PUIs

Federal

NSF (RUI)
NIH (R15/AREA)

Corporate

Edmund
HAMILTON

Private

ACSPRF
RESEARCH CORPORATION FOR SCIENCE ADVANCEMENT

The Camille & Henry Dreyfus Foundation, Inc.
PITTCON CONFERENCE & EXPO

(Provide administrative support to help faculty navigate grant submission and reporting requirements)
How can I produce results with a fraction of the budget at a research-intensive institution?

Consider equipment sharing and user facilities
How can I balance students’ education and professional development needs with research productivity?

**Encourage students to start early**
(Support curricular innovation to do this)

Interdisciplinary Science Program at Trinity College

- **Incoming students invited to participate**
- **Fall:** Seminar on scientific research
- **Spring:** Mentored research experience
- **Summer:** Stipend, housing to continue research
- **Optional:** Ongoing research
Training

How can I balance students’ education and professional development needs with research productivity?

Build shared opportunities for students
(Support these opportunities with budgets and staff)

- Guest speakers
- Alumni panels
- Career workshops
- Student symposia
- Safety training

Photo by John Atashian
How can I balance students’ education and professional development needs with research productivity?

**Safety has to be a priority**

*(Don’t make faculty reinvent the wheel – provide clear institution-wide policies)*

- Annual safety seminar for TAs and RAs
  - Proper waste disposal
  - Spills
  - Emergency contacts
- Additional lab specific training
- Online laser safety course thru LBL
- Formal policy against working alone

![Photo by Tim Curran](image-url)
Training

How can I balance students’ education and professional development needs with research productivity?

Promote good record keeping
(Provide IT support and server space for data back-ups)

Procedure for operating SpectraMax M4 Instrument
Kovarik Laboratory

Setting Up the Software
1. Open SoftMax Pro 7 (found on desktop)
2. Turn on instrument (see Setting Up the Instrument)
3. If instrument is not already connected to the computer, select COM3: SpectraMax M4 in the Instrument Connection Window or if this box does not pop up automatically, select Instrument on the Home tab
4. Click on Start Menu and select Open

5. If there is already a method for your experiment: To the right of File Name, click the drop down menu and select Protocol Files (*.spr)
How can I balance students’ education and professional development needs with research productivity?

Let students take some responsibility

Name: ___________________________  Semester: Fall/Spring 20________

Undergraduate research is a unique experience in most students’ college coursework. Every student’s experience is different, and different students have different expectations and goals for their experience. Based on your goals, select how much of your grade you want to be determined by each of the components listed below, staying within the percentage guidelines given for each criterion. The total should add up to 100%. You should make your decision by the end of the first week of research and submit a signed photocopy/scanned copy of your choices to me.

Research Effort (20-40%)
Time spent in the lab doing experiments, preparing reagents, collecting and analyzing data, etc. and the responsibility with which these activities are conducted. An “A” student will spend ≥5 hours in lab per 0.5 credit units during the times specified above every week all semester and will respect lab resources, by using equipment as directed and cleaning up after all experiments.

Research Productivity (20-40%)
Actual data produced. This is a measure of what you have accomplished irrespective of the time spent. An “A” student will produce at least one figure of data under optimized conditions with multiple samples per data point.

Research Paper (0-25%) *Students completing a senior thesis must count this for 25% in spring* An “A” student will produce timely drafts, respond to comments, and complete a well-written and edited manuscript with publication quality figures and text in keeping with the Guidelines for Authors of Analytical Chemistry.

Lab Notebook (10-15%)
A record of your plans, methods, and results. An “A” student keeps an up-to-date notebook at all times, in legible ink, with numbered pages, useful headings, accurate and complete information, including all raw data, file names and electronic data locations, safety measures, conclusions, and a table of contents. An “A” student also responds to my comments in the lab notebook and updates the record accordingly.

• Give students the opportunity to specialize in a certain technique or work on a specific aspect of a project as part of a team

• Ask experienced students to train new lab members

Adapted from a syllabus by Laurel Rodgers
Don’t underestimate what your students could contribute
How can I solve problems when I’m the only expert in my field on campus?

Identify collaborators

(Provide opportunities for faculty members to invite collaborators to campus)

\[ n = 52 \]

articles

How can I solve problems when I’m the only expert in my field on campus?

Attend conferences regularly

(Provide financial support for faculty travel)

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How can I solve problems when I’m the only expert in my field on campus?

Find your niche

Research areas of recent analytical publications from PUIs

- spectroscopy: 17
- separations: 6
- mass spec: 4
- electrochemistry: 3
- microfluidics: 2

*n = 52 articles*


Cell types investigated using microfluidic chemical cytometry

- 22 mammalian
- 3 insect
- 1 plant

*(Based on a sample of 26 papers)*
Analytical chemistry research at primarily undergraduate institutions: training tomorrow's investigators

Michelle L. Kovarik*

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Allie Tierney
Zachary Garber
Jessica Duong
Casey Crowley
Kathy Rodogiannis
Joshua Knopf
Julia Clapis
Greg Kalminskii

Funding:
Trinity College
NSF
Research Corp.
How can I balance students’ education and professional development needs with research productivity?

Encourage students to present their work
(Fund student travel to conferences)

Pittcon 2014

College-wide meetings and lab meeting presentations help too!

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