



SUCCESSFUL MODELS FOR INTERDISCIPLINARY GRADUATE EDUCATION IN THE U.S.

Report of the Taskforce on Interdisciplinary Graduate Education Programs.

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Disclaimer: This report was produced for internal use by Oregon State University (OSU). It is not intended to be a fully comprehensive survey of interdisciplinary graduate education programs in the U.S., but rather, a review of selected programs of relevance to OSU.

Executive Summary

The mission of the taskforce was to examine interdisciplinary graduate education programs at a range of institutions around the US, and to identify successful models that could inform the revitalization of interdisciplinary graduate education at OSU. The taskforce examined programs at 29 universities of various sizes, including 11 land grant institutions. Five universities, including four land grant institutions (Purdue University, Texas A & M University, University of California, Davis, Virginia Tech, and the University of North Carolina, Chapel Hill) were visited in person for a day of conversations with administrators, faculty and students.

Institutions with the most successful interdisciplinary graduate programs (IDGPs) were identified as those in which IDGPs made a major contribution to the institution's overall graduate education mission, those in which the benefits of IDGPs have been most fully realized, those in which the challenges of IDGPs have been most successfully addressed, and those where IDGPs have most successfully sustained faculty engagement and student enrollment. Peer institutions in this category were identified as Purdue University, University of California, Davis (UC Davis), Virginia Tech, Texas A&M University and the University of North Carolina, Chapel Hill (UNC).

Interdisciplinary graduate programs (IDGPs) fell into two major categories, PhD granting programs and umbrella programs. Umbrella programs provide recruitment and various levels of training, but do not confer degrees; students typically receive their PhD from a department or program associated with their major professor. IDGPs could be housed in departments, schools, colleges, research centers or the graduate school.

Institutions with successful IDGPs reported major benefits to their research and training missions. The chief benefits were greatly increased quality, ethnic diversity, and technical backgrounds of incoming students, improved training of students in both "soft" and technical skills through professional development classes and laboratory rotations, increased interdisciplinary collaboration among faculty, increased success with research and training grant proposals, and increased institutional reputation. At UNC, participation of under-represented minority students grew from 6% to 33% over 10 years, after introduction of an umbrella graduate program for the life and biomedical sciences.

Student success at the undergraduate level was also promoted by strong IDGPs that attract strong, diverse graduate students because the interdisciplinary graduate students mentor undergraduate researchers, bring an interdisciplinary perspective to the classes they TA, and they act as role models for undergraduate students.

Two factors were repeatedly cited as critical for the success of IDGPs: (a) the presence of strong, consistent financial support from the central administration, which could also include contributions from colleges; and (b) a strong, committed, and energetic champion for IDGPs in the graduate school (or college or medical school) in the form of an Associate Dean tasked with this responsibility, and even better, a formal Office of Interdisciplinary Graduate Education.

Challenges existed for sustaining IDGPs, other than funding. These included: maintaining faculty engagement, staffing courses specific to IDGPs, competition between degree-granting IDGPs and departmental programs, and maintaining community among students and faculty. However, the best programs have developed strategies to mitigate these challenges, primarily through centralized leadership, and improved support for participating faculty and their units. Written contracts and MOUs regarding faculty responsibilities to IDGPs were also important.

Introduction

The mission of the taskforce was to examine interdisciplinary graduate education programs at a range of institutions around the US, and to identify successful models that could inform the revitalization of interdisciplinary graduate education at OSU. The taskforce examined programs at 29 universities of various sizes, including 11 land grant institutions. Nineteen universities were examined in more depth through phone and email conversations with faculty and administrators. Five universities, including four land grant institutions (Purdue University, Texas A & M University, University of California, Davis, Virginia Tech, and the University of North Carolina, Chapel Hill) also were visited in person for a day of conversations with administrators, faculty and students. Reports on each of the 18 institutions are appended.

Institutions with the most successful interdisciplinary graduate programs (IDGPs) were identified as those in which IDGPs made a major contribution to the institution's overall graduate education mission, those in which the benefits of IDGPs have been most fully realized, those in which the challenges of IDGPs have been most successfully addressed, and those where IDGPs have most successfully sustained faculty engagement and student enrollment. Peer institutions in this category were identified as Purdue University, University of California, Davis (UC Davis), Virginia Tech, Texas A & M University, and the University of North Carolina, Chapel Hill (UNC). Several other much larger, and much more well-funded institutions also appeared to successfully implement IDGPs (e.g. University of California-Berkeley, Stanford University, University of Michigan, Northwestern University, Washington University-St. Louis).

Structure and administration

Interdisciplinary graduate programs (IDGPs) fell into two major categories, PhD granting programs and umbrella programs. The umbrella programs provide recruitment and various levels of training, but do not confer degrees; students typically receive their PhD from a department or program associated with their major professor. Many institutions also offer interdisciplinary concentrations, curricula, or certificates that students can use to augment their degree study. IDGPs could be housed in departments, schools, colleges, research centers or the graduate school. Some included rotation programs for incoming students, some did not.

The institutions with the most successful IDGPs provided strong central support, either through their graduate school (UC Davis, Virginia Tech, Purdue, Texas A&M) or through their medical school (UNC).

At UC Davis, roughly half of the PhD-granting IDGPs are cross-departmental graduate groups administered and funded through the graduate school (Division of Graduate Studies). There are also many departmental PhD programs that include faculty and students from other departments. Many departments, especially in the College of Agricultural and Environmental Sciences, do not have PhD programs of their own and instead take advantage of the numerous graduate groups for recruiting students. Faculty can, and do, belong to multiple graduate groups. For administrative purposes, each graduate group has a nominal home department and college, but this unit does not control the funding or operation of the graduate group.

At Virginia Tech, until 2010, all PhD programs were departmental, except for Genetics, Bioinformatics, and Computational Biology (GBCB) and Macromolecular Science and Engineering (MACR). In 2010, with the support of the Provost and input from a faculty taskforce, the Dean of the Graduate School established the Interdisciplinary Graduate Education Program (IGEP). Over a period of three years, IGEP solicited proposals from groups of faculty that

resulted in the establishment of 12 new umbrella programs. The umbrella programs recruit students, arrange first year rotations, provide some additional courses, and then students join a PhD program of their major professor (either departmental or GBCB or MACR). Faculty, and even students, can belong to multiple IGEPs. Funding and administrative support for the IGEPs (including GBCB and MACR) is provided through the graduate school and overseen by an Associate Dean whose major responsibility is the IGEPs.

At Purdue University, there are a wide variety of IDGPs housed in departments, colleges, research centers and the graduate school. The flagship IDGP is the Purdue Life Sciences Interdisciplinary Program (PULSe). PULSe, established in 2004, recruits students and funds about 30 of them for their first year. The students enter one of 11 “training groups” within PULSe. These training groups are distinct from departments, and have their own curricula. Students graduate with a Ph.D. in the home department of their major professor, and thus are full members of those departments. Nevertheless, they receive all their coursework and mentoring through their training group. Departments also recruit students directly, outside of PULSe. Faculty can, and do, belong to multiple training groups. PULSe is housed in the graduate school, in the Office of Interdisciplinary Graduate Programs (OIGP). The OIGP director provides strong leadership, oversight, and advocacy for the umbrella programs housed within it, primarily PULSe.

At UNC, the Biological and Biomedical Sciences Program (BBSP) is a centralized umbrella admissions portal and first year graduate program for 14 degree-granting departments or cross-cutting curricula (e.g. Neuroscience). The program has no required curriculum except for participation in the “first year groups” and three required, 11 week rotations in year 1. The year-long “first year groups” courses function as a type of “home room” for students in the large program. In the groups, students and faculty discuss professionalism, how to choose rotations, finding a thesis lab, applying for grants, practice communication, etc. Also included in the first year groups are senior students who act as “peer mentors”. All courses are taught within departments and are open to all students. After the first year, the student joins a department or program associated with their major professor. Departments and programs do not accept students outside of BBPS. The program was started, with input from a faculty taskforce, by the Dean of the School of Medicine. It subsequently expanded to other Colleges/Schools, but still is directed by the Associate Dean of Graduate Education of the School of Medicine. Funding is provided by the School of Medicine and standardized contributions from units.

Texas A&M University hosts a number of degree-granting IDGPs (8 Ph.D., 9 M.S.). All graduate programs, both interdisciplinary and disciplinary, are overseen by the Office of Graduate and Professional Studies (OGAPS). OGAPS provides financial support to every graduate program, according to a formula that is based on enrollment in the most recent three years. Until recently, funding for IDGPs (and in many cases also oversight) was contributed annually by unit heads, which required the director to ‘pass the hat’ year after year. This difficulty was solved by having the funding reorganized to pass through OGAPS. Oversight by contributing unit heads was unwieldy, and many unit heads were disengaged; that too was improved by having oversight pass to OGAPS.

Resources and Funding

Without exception, the most successful IDGPs flourished where institutions provided consistent, predictable and, at least adequate, funding centrally. Typically, this funding was provided by the upper administration because of the value placed on the numerous benefits provided by interdisciplinary graduate education. Where there was a single, high profile umbrella program

(e.g. Purdue, UNC) the funding level was stable. Where there were multiple IDGPs (e.g. UC Davis, Virginia Tech, Texas A&M), funding levels were adjusted annually based on a three-year rolling average of enrollment. In some institutions, central funding was supplemented by funds from colleges; this was collected in various ways. At Virginia Tech colleges were expected to match the funds from the graduate school. At Purdue, colleges permanently relinquished a slice of their central funding to help create the permanent funding stream for PULSe. At UNC, a re-charge was levied on all participating departments, research centers and NIH T32 training grants based on a three-year rolling average of the numbers of students entering these units from BBSP.

Where strong central support offices existed (e.g. Purdue and UNC), staff assisted program directors and students in seeking additional external and internal sources of funding.

Where there was little or no central funding was provided to IDGPs, heavy responsibility fell on program directors to solicit contributions from colleges, and to pursue external and internal sources of funding.

Training grants were an important source of funding, especially as a supplement to consistent central funding. However, except for the biomedical sciences where long term NIH training grants were a possibility, most training grant funding was ephemeral. Furthermore, training grant success was greatest where there was strong, centralized support for IDGPs.

Faculty engagement was strongly connected to support from the upper administration. Where faculty saw that their enthusiasm for IDGPs was matched by the upper administration, and that top-quality students were attracted, they were willing to put in the time and effort required to administer the IDGPs, often joining multiple IDGPs (UC Davis, Virginia Tech, Purdue, and UNC). The majority of IDGPs required an assessment of faculty engagement in order to renew membership; at Purdue and UNC this was formalized into written contracts and MOUs that faculty and their department heads had to sign. Institutions that explicitly valued faculty contributions to service and teaching in IDGPs as part of the promotion and tenure process (e.g. UC Davis, Virginia Tech) were most successful in soliciting faculty engagement. At institutions where that was not the case (e.g. Texas A&M, Washington University, St. Louis), faculty engagement was a constant challenge even when there was a well-funded umbrella program.

Teaching of courses required by IDGPs invariably required some level of negotiation with department heads who controlled faculty FTE and teaching assignments (as well as TAs). Faculty were most motivated to teach in IDGP courses when the subject matter was very different than that typical of their home department, e.g. a Rangeland Science faculty member teaching Advanced Topics in Ecology. This challenge was further mitigated where dollars and credit for teaching flowed directly back to the department that contributed the instructor (e.g. UC Davis, Virginia Tech). In models where students did not commit to a PhD program until after their rotations (e.g. Purdue and UNC), departments competed to offer the broadest, most foundational courses that would attract the largest numbers of uncommitted students.

Benefits

Numerous major benefits of strong IDPGs were cited by faculty, students, and administrators at multiple institutions

Benefits cited by faculty and administrators:

1. Progress in achieving program diversity, by concentrating resources and conducting admissions across all programs, with dedicated staff. UNC in particular grew its participation of under-represented minorities (URMs) from 6% to 33% over 10 years.
2. Success in attracting exceptionally good students, and students with different training and interests, compared to students applying to departmental programs. Some faculty commented that the students they wanted were not attracted to departments with “boring” names such as Biology or Rangeland Sciences. Some universities (e.g., University of Michigan) described their IDPGs as the jewel in the crown of the university that attracts the best graduate students and makes their university competitive with Ivy League schools.
3. Faculty can belong to multiple training programs, providing the opportunity to have students with diverse disciplinary expertise mixing in their labs.
4. Rotations help junior faculty recruit top students; otherwise they have difficulty in competing with senior faculty for direct admits due to lack of name recognition.
5. Rotations across programs help recruit students to more specialist topics (e.g. Systems Biology, or Neuroscience) that students may not have been exposed to as undergraduates; this was especially true for URM students and students from under-served backgrounds.
6. Students arrive in labs better prepared, having received better training through rotations and cross-disciplinary curricula, and especially better training in “soft skills.”
7. Stimulation of inter-departmental research collaborations and increased opportunities to work with colleagues across disciplinary boundaries; this was mentioned numerous times.
8. Increased success in obtaining research grants. Stronger, better trained students combined with a richer interdisciplinary environment translated into more competitive grant proposals and innovative research by faculty and faculty teams.
9. Increased success in obtaining training grants. The funding, administrative support, centralized data collection, and programming provided by the best umbrella programs were major factors in increasing training grant success. Training grant success translated into increased resources for the central office, as well as student support.
10. Where provided by umbrella programs, centralized collection provided much better data on student and program success, not only as a basis for training grant proposals, but also as information for stakeholders including the upper administration, college Deans and department heads.
11. Fostering of innovation through exploration of new areas of research, especially topics attractive to those from other disciplines. Particularly where institutions (e.g. Virginia Tech and University of Nevada, Reno) had well-structured mechanisms to rapidly establish new IDGPs, as well as to phase out faltering ones.
12. Enhancement of the reputation of the university as a cutting-edge institution in the US, both through the quality of graduate education provided, and through offering training in cutting edge topics.
13. Diverse, flourishing IDGPs that attract top class students are major attractors for faculty recruitment.
14. IDPGs provide a sense of community that extends across departmental and college boundaries

15. IDGPs foster best practices in graduate education through communication about what works and what does not, as well as peer pressure due to competition between departments and IDPGs.
16. Student success at the undergraduate level was also promoted by strong IDGPs that attract strong, diverse graduate students because the interdisciplinary graduate students mentor undergraduate researchers, bring an interdisciplinary perspective to the classes they TA, and they act as role models for undergraduate students.

Additional benefits cited by students:

17. IDGPs provide a much richer set of opportunities to explore possible research topics and possible major professors, especially if there is a rotation program. Many students stated that they only considered applying to IDGPs, for these reasons.
18. Where provided by umbrella programs such as those at Purdue and UNC (and others), students strongly valued professional skills training, community building, mental wellness and resilience workshops, and peer-to-peer mentoring, especially when they were concentrated during the first year. Such activities were a major attractor during recruitment.
19. Where required, students appreciated that formal training in mentoring was required of faculty who wanted to join an IDGP.
20. URM students were attracted to IDGPs, such as UNC BBSP, and were more successful in them, where the programs had made visible progress in increasing diversity.

Challenges, and how they've been addressed

1. Consistent, predictable and adequate funding was the biggest challenge cited by almost all IDGPs we talked with. This challenge was greatest when program directors had to go cap-in-hand every year to college deans and the upper administration. It was also a challenge when IDGPs were parked in colleges that were less-than-fully committed to their support. As described in detail above, the most successful IDGPs existed where there was consistent, predictable and, at least adequate, funding from the central administration.
2. Consistent faculty engagement, including recruitment and retention of program directors, was mentioned as a challenge by many IDGPs. As discussed in more detail above, faculty engagement was strongest when (a) faculty saw that the upper administration supported interdisciplinary graduate education with funding and leadership; (b) where salary buyouts or add-ons were provided to IDGP directors; (c) where adequate administrative assistance was provided to IDGP directors; and (d) where contributions of service to IDGPs were explicitly valued in the P&T process.
3. Staffing courses specific to IDGPs was also a challenge. Some IDGPs simply minimized the number of courses specific to the program, especially umbrella programs which passed students on to departmental programs at the start or end of the first year. As noted above, staffing courses specific to IDGPs was easiest when (a) dollars and credit flowed back to the department of the instructor; (b) the topics were very different than departmental curricula; and (c) contributions of teaching to IDGPs were explicitly valued in the P&T process.
4. A sense of competition between IDGPs and departmental programs was a challenge when the IDGPs were degree granting. At some institutions (e.g. Colorado State University) this was mitigated by a formal "dual citizenship" model in which students were fully members of

both the IDGP and the department. In other cases, faculty so much preferred the IDGP model that they abandoned their departmental program (e.g. Plant Science at UC Davis), or expanded their departmental program into one or more IDGPs (Plant Pathology and Computer Science at UC Davis, Food Science at Purdue, Genetics at UNC). At Purdue, although students receive all their coursework, mentoring and even Prelim exams through their PULSe training group, they ultimately receive their Ph.D. from the department of their major professor.

5. Building a sense of community among students and faculty geographically spread across a large campus was another challenge cited by a number of IDGPs. This challenge was most successfully met where there were (a) strong first year programs that brought students together (outstanding examples included the “first year groups” organized by UNC BBSP and an international symposium in Ecology run by mentored first year students at Purdue); (b) centralized support, encouragement, and funding from umbrella programs and/or graduate school to organize social events (Virginia Tech, Purdue); (c) formalized peer-to-peer mentoring programs that partnered incoming students with more senior peers (Purdue and UNC); and (d) strong support for faculty engagement (see above).
6. Where there was a flow of students from umbrella programs into departments, and especially where there was a flow of dollars from departments/colleges back into umbrella programs, anxiety about fair distribution of resources arose as a challenge. This was most successfully managed by high levels of transparency and very active communication. At Purdue and UNC, for example, senior umbrella program administrators met with unit heads as often as every 2 weeks.

Synthesis

IDGPs deliver huge value to research-intensive institutions, the chief benefits being increased quality, ethnic diversity, and technical backgrounds of incoming students, improved training of students in both “soft” and technical skills, increased interdisciplinary collaboration among faculty, increased success with research and training grant proposals, and increased institutional reputation.

A common feature of the most successful IDGPs was a rotation program for incoming students, though some successful programs did not include them, for example in the environmental sciences. Rotation programs enabled recruitment of better students (and new faculty), broader training of students, professional development of students, equitable access to top students for junior faculty, promoted the success of URM of students, and fostered community and network building for students.

Student success at the undergraduate level was also promoted by strong IDGPs that attract strong, diverse graduate students because the interdisciplinary graduate students mentor undergraduate researchers, bring an interdisciplinary perspective to the classes they TA, and they act as role models for undergraduate students.

Two factors were repeatedly cited as critical for the success of IDGPs: (a) the presence of strong, consistent financial support from the central administration, which could also include contributions from colleges; and (b) a strong, committed, and energetic champion for IDGPs in the graduate school (or college or medical school) in the form of an Associate Dean tasked with this responsibility, and even better, a formal Office of Interdisciplinary Graduate Education.

A central office also plays an important role in assessing metrics of success and collection of data to support training grants, and to provide accountability to stakeholder, including central administration and colleges.

Challenges existed for sustaining IDGPs, other than funding. These included: maintaining faculty engagement, staffing courses specific to IDGPs, competition between degree-granting IDGPs and departmental programs, and maintaining community among students and faculty. However, the best programs have developed strategies to mitigate these challenges, primarily through centralized leadership, and improved support for participating faculty and their units. Written contracts and MOUs regarding faculty responsibilities to IDGPs were also important.

ADDENDUM

Reports based on site visits, online surveys, and telephone and email conversations

Purdue University (land grant)	2
Texas A&M University (land grant)	5
University of California, Davis (land grant)	8
University of North Carolina, Chapel Hill	11
Virginia Tech (land grant)	14

Reports based on online surveys and telephone and email conversations

Colorado State University (land grant)	17
Duke University	18
Emory University	19
Georgia Tech	20
Northwestern University	21
Stanford University	22
University of Arizona	23
University of California, Berkeley	24
University of Florida	26
University of Michigan	28
University of Minnesota	30
University of Nevada, Reno (land grant)	32
University of Washington	33
Washington University, St. Louis	35
List of universities surveyed online only	36
Questionnaires used	37

PURDUE UNIVERSITY

1. Structure of the Interdisciplinary Graduate Programs

Purdue allows a diversity of different models for interdisciplinary graduate education. Some programs are Ph.D. granting programs, some are umbrella programs, and some are concentrations. At Purdue, a concentration is a program offered by a unit different than the degree-granting unit, but with the agreement of the degree-granting unit. Administratively, four (all umbrella) programs are housed in the Graduate School's Office of Interdisciplinary Graduate Programs, seven (5 Ph.D., 2 concentrations) are housed at the College level, three (2 Ph.D., 1 umbrella) are housed at the Department level, and three (2 Ph.D., 1 concentration) are housed in Research Centers.

Two umbrella programs housed in the Graduate School were examined in depth, the Purdue Life Sciences Interdisciplinary Program (PULSe) and the Ecological Sciences and Engineering interdisciplinary program (ESE). The Office of Interdisciplinary Graduate Programs (OIGP), which is directed by Associate Dean Colleen Gabauer, provides strong leadership, oversight and advocacy for the umbrella programs housed within it, including these two. This is Dr Gabauer's full time responsibility and she is supported by two full-time staff (a student services coordinator and a secretary). Each umbrella program also has its own Director. Dr Gabauer has a doctorate in higher education administration and was specifically recruited to set up PULSe; her responsibilities have subsequently been expanded.

PULSe is the flagship interdisciplinary program in the life sciences at Purdue. 190 faculty from 27 departments are affiliated with PULSe. As an umbrella program, it recruits students and funds about 30 of them for their first year, while they are on rotations. The students enter one of 11 "training groups" within PULSe. These training groups are distinct from departments, and have their own curricula and preliminary exam requirements. Students graduate with a Ph.D. in the home department of their major professor, and thus are full members of those departments. Nevertheless, they receive all their coursework and mentoring through their training group. Departments are not allowed to impose their own course requirements on PULSe students (though many faculty encourage their PULSe students to take some relevant departmental courses). Departments also recruit students directly, outside of PULSe. PULSe students make up 5% to 50% of individual departments' students. Students recruited and funded directly by departments may also participate in PULSe training programs, if the student and major professor agree. Faculty may join multiple training groups, and many do so (typically up to four).

Students acquire a PULSe identity from the very beginning. They are recruited together and take first-year required coursework together. The student-led PULSe graduate student activities board is active and funds are available from the graduate school to support socials. OIGP makes sure that the graduate student association is active and helps to coordinate activities. Peer liaisons organize activities within the training groups. Second year PULSe students organize an annual symposium for program students and faculty. PULSe students tend to be very active in student governance across campus at Purdue.

Each training group has a director, and executive committee, and a faculty. Dr. Gabauer meets with the Executive Committee of PULSe, composed of the training group directors, once a month. She and the PULSe director are responsible for communication and coordination with Deans and Department heads – role that she strongly emphasized as essential for success. Each training group contributes one representative to the PULSe admissions committee.

ESE is set up more like a traditional umbrella program. It recruits students, finds homes for them, and funds most of them for their first year. It provides some enrichment courses in year 1,

notably a high profile student-run colloquium, but there are no rotations. Students enroll in the Ph.D. program of the department of their major professor from the outset.

2. Resources and Funding

Funding for PULSe, including the 30 first year fellowships (and associated tuition waivers), is provided by the Provost to the Graduate School. The funding was provided to the Provost by Colleges that were previously supporting four different umbrella programs.

Funding for ESE comes from a wide diversity of internal and external funding sources, which are rounded up by the ESE Director. Since moving to the Office of Interdisciplinary Graduate Programs (3 years ago), ESE has received 7 fellowships a year from the Provost.

The privilege of receiving PULSe students requires faculty to commit time and effort to PULSe; this is defined and enforced via MOUs signed by the faculty and their department heads.

3. Benefits

Purdue faculty reported the following benefits of PULSe.

- Faculty can (and do) belong to multiple training groups, hence opportunity to have students with diverse disciplinary expertise
- PULSe attracts much better and different students (than departments). This was driver for the formation of PULSe, initially
- PULSe rotations helps junior faculty recruit top students; otherwise they have difficulty in competing with senior faculty for direct admits.
- First year funding is a plus
- PULSe brings in more URM student applicants (but yield of accepted offers still needs improvement)
- Ph.D. model mitigates competition between IDPs and departments
- PULSe students receive better training through rotations and cross-disciplinary curricula, and especially better training in “soft skills”
- PULSe is highly catalytic for interdepartmental research collaboration (Mentioned often)
- Centralized record keeping for all the PULSe students provides an outstanding data resource for training grant proposals

PULSe graduate students reported the following benefits of PULSe

- PULSe provides strong supportive “care-and-feeding” of students. Students feel valued and cared for.
 - New workshops on mental wellness & resilience; mentor communication
 - New grad certificate in inclusive excellence
- Students highly value rotations – they say 7 weeks is ideal for getting to know potential mentor and research topic.
- Students highly value PULSe’s formal peer-to-peer mentoring program
- PULSe was a big attractor for recruitment
- Peer pressure from PULSe has stimulated improvements in departmental programs

Similar benefits were reported for the ESE program.

4. Challenges, and how they’ve been addressed

- Students from training groups and departments get same Ph.D. degree but different training (some viewed this as a plus, not a disparity)
 - Convergence of departmental practices towards those of PULSe has mitigated this

- Students on rotations are accepted into labs at the end of spring semester 9 months behind (or 3 months ahead) of students admitted directly to labs in the Fall.
 - Advice from peer mentors about communication with potential mentors has mitigated this
- Some programs (esp. plant biology) feel their identity is submerged inside PULSe
 - Mitigated by ability of departments to recruit students directly
- Transparency and political issues around how PULSe fellowships are distributed across training groups
 - Mitigated by having all training groups represented on the PULSe admissions committee
- Ongoing challenge to hold faculty and departments accountable for contributions to interdisciplinary programs.
 - Mitigated by use of signed MOUs and contracts for faculty who join PULSe and their department chairs
- Disagreements over acceptability of common PULSe curricula have inhibited more programs (e.g. from Engineering) from joining PULSe.
 - Partly mitigated by allowing training groups to set their own curricula
- Funding for students has been a constant challenge for ESE (but not PULSe)
 - Joining the Office of Interdisciplinary Studies has brought 7 fellowships a year to ESE

5. Synthesis and Other insights

The consensus from all faculty, students and administrators was that PULSe and ESE were highly valued programs, and a major benefit to life sciences education and research. The improved training experience and mentoring provide through PULSe is a big attractor for students, and faculty appreciate the improved quality and training of PULSe students, compared to their departmental students. Due to its size and impact, PULSe can act as a role model across campus for best practices in graduate education across the broader campus.

PULSe, especially, owes much of its success not only to a centralized and consistent funding stream independent of individual colleges' annual budgets, but also from having dedicated and engaged leadership from the Office of Interdisciplinary Programs and its Director, Colleen Gabauer. This leadership provides structure and continuity as leadership of individual programs changes, as well as accountability by the program directors. Dr Gabauer also acts as an advocate for students and the programs as a whole across the campus and to leadership.

The ability of the OIDP to directly document the widespread benefits of the umbrella programs is important in maintaining the support for the programs from faculty, department heads, colleges, and the provost.

Because PULSe, ESE, and several other programs are umbrella programs, with Ph.D.'s awarded in the departments of the major professors, these programs strengthen rather than compete with departmental Ph.D. programs.

More broadly across campus, Purdue's philosophy of supporting diverse models of interdisciplinary graduate education has allowed different cross-sections of the campus to adopt models customized to the needs of their faculty and students.

Links

Office of Interdisciplinary Graduate Programs <https://www.purdue.edu/gradschool/oigp/>

List of Interdisciplinary Graduate Programs <https://www.purdue.edu/gradschool/oigp/programs>

PULSe <https://www.purdue.edu/gradschool/pulse/>

ESE <https://www.purdue.edu/gradschool/ease>

TEXAS A&M UNIVERSITY

1. Structure of the programs

All graduate programs, both interdisciplinary and disciplinary, are overseen by the Office of Graduate and Professional Studies (OGAPS). Some Interdisciplinary Graduate Programs (IDPs) offer Master's only, some offer Masters and Doctoral programs (see table below) All programs are collaborations among multiple units, and some (e.g. marine biology) are collaborations with other A&M campuses. Most programs are homed for the purposes of administrative support in departments or Colleges. For example, Neuroscience is in Biology, Toxicology is in Veterinary Medicine, and WMHS in the College of Geosciences. Academically, the IDPs are homed in Interdisciplinary Faculties, which are formal academic units set up foster interdisciplinary research collaboration and teaching. The Interdisciplinary Faculties report to the Vice-Provost for Academic Affairs and Strategic Initiatives, similar to the way that departmental faculty report to their college dean through their department chair. The Masters in Energy, by contrast, is in the Energy Institute. Most IDPs have 20-30 students enrolled; WMHS and genetics are the largest, with 50-60. Energy is new and is a one-year professional program taught in 10-day modules over the course of 10 months. In the most recent year, their second, they had 25 students; they expect to cap enrollment at 50 soon. OGAPS also oversees the reviews of graduate programs every 7 years, required by Texas law.



- HOME
- ABOUT
- BLOG
- PROSPECTIVE STUDENTS
- NEW & CURRENT STUDENTS
- FACULTY & STAFF
- CONTACT US

INTERDISCIPLINARY DEGREE PROGRAMS

Program	Masters	Doctorate
Agribusiness	MAB	
Agribusiness and Managerial Economics		PhD
Biotechnology	MBIOT	
Ecology and Evolutionary Biology		PhD
Energy	MS	
Genetics	MS	PhD
Marine Biology	MS	PhD
Molecular and Environmental Plant Sciences	MS	PhD
Neuroscience	MS	PhD
Toxicology	MS	PhD
Water Management and Hydrological Science (WMHS)	MS, MWM	PhD

2. Resources and Funding

OGAPS provides financial support to every graduate program, according to a formula that is based on enrollment in the most recent three years. With this support, the IDP may support a portion of the director's time (though some directors use in-kind support from their department)

and a part-time coordinator. In addition, the University has merit and diversity fellowships, and must provide match for the Toxicology Program's NIH T32 training grant. Some IDPs provide full support for graduate students in their first year. Students in the MS in Energy pay their own way (many work in the energy industry in the nearby Houston area).

3. Benefits (institutional, faculty, and student perspectives)

A primary benefit at the institutional level is reputational: the opportunity to build a reputation in an area that is considered in national rankings of universities (e.g., neuroscience), without investing in the creation of an entire department.

Faculty expressed several reasons for appreciating IDPs: IDPs often attract stronger students, or students whose specialized interests more closely match those of faculty in a large department (e.g., neuroscience in Biology). They also appreciate the way IDPs promote collaboration across campus, and the opportunity to co-advise graduate students with faculty in other units.

Students benefit from having IDPs that match their specific interests, or provide more focus than a broad degree. Some IDPs cover the first year of a graduate degree without expectations to teach or do research. Some IDPs offer (partial) travel scholarships to participating students, or social activities, or seminar series. For the Genetics program, attendance at a weekly seminar is a requirement for eligibility for travel grants, which improves attendance and interaction among students from different units.

4. Challenges and how they have been addressed

Until recently, funding for IDPs (and in many cases also oversight) was contributed annually by unit heads, which required the director to 'pass the hat' year after year. This difficulty was solved by having the funding reorganized to pass through OGAPS. Oversight by contributing unit heads was unwieldy, and many unit heads were disengaged; that too was improved by having oversight pass to OGAPS.

Faculty receive no formal recognition for participation in IDPs, which discourages involvement by junior faculty, though one IDP (WMHS) provides a letter for inclusion in the faculty member's P&T package. Most faculty who devote time to IDPs seem to do so out of passion and interest, and there seems to be enough of that.

Small departments may view IDPs as threats, because a program that fails to graduate 10 PhDs in 5 years is at risk, so some smaller programs have been less willing to cooperate with IDPs out of fear of 'losing' students.

The most commonly noted problem with IDPs is that there is no dedicated space for those students - they are generally distributed among participating departments. This dispersal also diminishes the opportunities for them to interact with each other once their coursework is complete. One IDP overcomes this by (as noted above) requiring attendance at a weekly seminar.

5. Other insights

IDPs succeed because of enthusiasm. Faculty and students (and the administrative staff) associated with IDPs are excited about the topic, and about the opportunity to interact with

experts in another field. In every case an enthusiastic director creatively built and sustained support for the program.

Some IDPs have an executive council or other select group of faculty. Such an arrangement leads to a higher level of engagement by those faculty, more visible identity especially within the units of faculty on that council, and also provides leadership development opportunities for those faculty - either as potential future IDP directors or other roles.

Links

Interdisciplinary Degree Programs

<http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/interdisciplinary/#doctoraltext>

UNIVERSITY OF CALIFORNIA, DAVIS

1. Structure of programs and homes

There are two types of graduate programs at Davis: graduate groups and departmental programs, roughly in equal numbers. Departmental programs are traditional programs where most if not all participating faculty are housed within the same department. Groups can have participating faculty from across the university, but typically have a home department (or at the least a lead Dean). Some departments, such as Plant Sciences, have no Ph.D. program of their own but instead recruit students solely via graduate groups (Plant Sciences lists 10 relevant graduate groups). All graduate groups get a coordinator (staff person) paid for by the Division of Graduate Studies, and the Division of Graduate Studies provides a modest stipend to the faculty chair of the graduate group.

UC Davis began as the university farm for UC Berkeley, so collaboration between folks at the two locations was a key element from the beginning of the campus. As the location grew and began developing its own programs, ties with Berkeley were eventually cut, but the culture of collaboration and interdisciplinarity remained.

A good example of a graduate group is Ag-chem. It was formed by disciplinary scientists (chemists) that worked in various ag-related departments (pomology, rangeland, etc.). They saw the use of a separate program that focused on a specialized part of agriculture and worked together to create it. Another is the Genetics graduate group (now called Integrative Genetics and Genomics) which was formed by geneticists and molecular biologists spread across UC Davis' numerous production departments). The culture of collaboration and cooperation between folks from different schools/college, regardless of department, is long standing for UC Davis, and is strengthened and sustained by the graduate group structure.

Criteria for creating a graduate group include positive answers to the following: Are there faculty who *can* teach core courses for this program? Are there faculty who *want* to teach core courses for this program? Is there student interest in this particular type of program? Is there a market for the skills gained/degree earned from this program?

All graduate groups report to the Dean of the Division of Graduate Studies (equivalent to the Dean of the Graduate School here at OSU). Within a graduate group, faculty have the opportunity to participate in other programs but are not required to. Some faculty are members of 2-3 graduate groups in addition to their departmental Ph.D. program. A core group of faculty does most of the heavy lifting—via student advising, courses, committee, etc. For example, there may be 50 faculty listed as affiliated, but only 8-10 are active. Affiliated faculty are required to show participation to be listed in the graduate group, which can be as simple as advising a PhD student, participating in a survey course, etc. Participation is evaluated in a 3 year rotating window to allow for periods of less involvement. Allowance is also made for faculty contributing heavily to other graduate groups (e.g. as Director).

2. Resources and funding

Funding for graduate groups mainly comes from the Division of Graduate Studies. The extent of funding is based on enrollment in the program. Overall, the Division of Graduate Studies provides funding and support for graduate groups in the following ways:

- Full support for group coordinator. Some smaller programs may share this staff person.

- Small contribution to salary of the faculty chair
- Funding for graduate student recruiting (this is often supplemented by the home department for the group, or the “lead Dean”)
- block grants to graduate groups to be used as the groups see fit (e.g., 1st year fellowships for incoming students)
- Promotion/advertising of grad program

Graduate Groups are academically housed within the Division of Graduate Studies, as each one is comprised of faculty from multiple departments. Students are awarded a degree from their Graduate Group, rather than from a department. For administrative support and financial management, graduate groups typically have a home department where administrative duties are handled. The money associated with students in the group, including the block grant, is assigned to the home department to be used in support of the graduate group.

In addition to the funding from the Division of Graduate Studies, some graduate groups also fund themselves via IGERTS/National Research Traineeships.

3. Benefits for institution, faculty, and students

The graduate group model for interdisciplinary graduate programs has several benefits:

- It enables delivery of truly interdisciplinary programs with participating faculty across multiple departments and colleges
- It is great for recruiting. Graduate groups attract better quality and more diverse students. Students like access to broad training and opportunities to work with faculty outside of their chosen field. There is survey evidence that UC Davis graduate students really like the interdisciplinary group model.
- The graduate group interdisciplinary model allows for the quick creation of programs that focus on teaching and research in “hot” areas. A relatively short time is required to start a grad group (2 years) compared to the time to create a department (~10 years). Often, if there’s enough interest, a department will arise from a grad group.
- It strongly stimulates interdisciplinary collaboration, which can lead to large interdisciplinary grants. UC Davis offers grant writing support for large interdisciplinary grants
- Davis has a hiring initiative to bring in faculty who would not normally be hired by a traditional department. This helps bring new faculty into groups. About 10% of faculty lines are held back by the provost for these types of positions.

4. Challenges and how they’ve been addressed

The main challenges associated with delivering interdisciplinary graduate programs at UC Davis are:

- Encouraging teaching in interdisciplinary graduate groups is difficult, especially when the group spans multiple colleges. Teaching is typically assigned by the department chair and priority is typically given to courses within the department.

- TA support for students in graduate groups is not provided. TAs are allocated to departments based on the needs of the undergraduate programs.
- Hiring new faculty into groups can be challenging. Hiring is typically a departmental process and it can be difficult to meet the needs of a group since they do not have a mechanism for hiring faculty directly.
- Faculty participation can be a challenge, particularly for teaching the core courses. This is addressed by requiring some level of participation in order to be a member of the graduate group.

5. Perspectives for OSU

We have some programs at OSU already that are administered out of the Graduate School, but there is not a uniform approach for administering interdisciplinary graduate programs. For instance, some interdisciplinary programs are currently housed in home departments (e.g., Materials Science). It would be possible to move towards a more uniform approach to administering graduate programs, but this would require an assessment of impacts on budgets. There may be improved efficiencies associated with administration of interdisciplinary programs out of the graduate school.

Links

UC Davis graduate programs

<https://grad.ucdavis.edu/programs>

Graduate groups <https://grad.ucdavis.edu/programs/graduate-groups>

UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL

Biological and Biomedical Sciences Program

1. Structure of the program

This is a centralized umbrella admissions portal and first year graduate program for 14 departments or curricula (e.g. Neuroscience) that started in the School of Medicine but has expanded to other Colleges/Schools (e.g. includes plant and microbial biology now). The program was started to coordinate recruitment; a task force wrote a white paper. BBSP is directed by the Associate Dean of Graduate Education of the School of Medicine, who is supported by 6 Ph.D. level support staff.

BBSP encompasses both departmental Ph.D. programs and cross-cutting curricula that are usually based around T32 training grants. The Genetics department dissolved their Ph.D. program and replaced it with two curricular programs.

Recruitment involves bringing 300 students onto campus in winter term for interviews and selecting 200 for admissions, eventually yielding 80 to 100 matriculating students. Intensive surveys of department chairs and graduate program directors determine which students are given admission based on detailed analyses of faculty capacity and research areas across all departments and programs. These analyses are fine grained to match incoming class size and interests to faculty capacity to support students. Balance is achieved when about 90% of requesting lab spaces are filled. There was a feeling that they need to be at a bit less than 100% of capacity to make sure that all students are able to find lab homes with sufficient funding.

Admissions/applications reviews are conducted by four committees organized around common research areas. Applicants must choose an area and faculty of interest as part of the application to assure routing to the most appropriate committee. Departments and programs have agreed to not accept students outside of the BBSP and they are maintaining a strict rule regarding no end runs around the system or direct admits.

After admission, the students are brought in for a thorough joint orientation, and are then divided into "first year groups". The year-long "first year groups" courses function as a type of "home room" for students in the large program. In the groups, students and faculty discuss professionalism, how to choose rotations, finding a thesis lab, applying for grants, practice communication (elevator speech, poster, short oral presentation, written research description), etc. all in the first year. Faculty promise to provide constructive, comprehensive feedback to students. Also included in the first year groups are senior students who act as "peer mentors". The "first year groups" mix students with varied interests to some degree.

Students remain uncommitted to a Ph.D. program during their first year, and are actually enrolled as non-degree students during that year. This took some coordination with the Graduate School.

The program has no required curriculum except for participation in the "first year groups" and three required, 11 week rotations in year 1. All coursework is taught within departments, and courses in all affiliated departments are open to all students.

After the first year, the student joins a department or graduate program associated with their major professor's lab.

To assure that departments remain committed to the program and to solve small problems

before they become big, the Program Director or Assistant Director (0.5 FTE each) meets monthly with the departmental program directors and biweekly with Department Chairs as a full participant in the School of Medicine Dean's Chair meetings.

2. Resources and funding

The first year stipend and tuition costs are funded by a tax on departments and centers which is assessed on a rolling three year average of number of students entering the unit. Training grants are used to fund second year students, so faculty often only need to fund three years for a normal PhD student. Program administration, which includes 6 full time staff, is funded by the Dean's office.

In discussion with the Program Director, it was noted that budget transparency is key to keeping department chairs moderately happy with the level of "taxation" required to support students in the first year of the program.

Since students don't commit during the first year, departments have been motivated to put on courses that service the widest numbers of first year BBSP students. BBSP also pays faculty \$5000 to teach two semesters of their first year professional skills courses.

3. Benefits

The program has an incoming class that is 33% under-represented domestic minorities (URMs) this year, up from 25% last year, and up from 6% in 2006 (the program started in 2008). The program has seven NIH T32 pre-doctoral training grants, and the success in attracting and supporting URMs play a major role in training grant acquisition.

Faculty with NIH funding can request supplements to support URMs, thus further reducing costs of supporting students.

The centralized program collects and analyzes a lot of data to support training grant proposals, to use to make strategic decisions, and to quell the fears of anxious administrators. The program also appears to be highly efficient in disseminating information. Students are of exceptionally high quality with multiple offers from the best programs in the country. The program receives 1200 applicants for 80 to 100 spots.

Recruitment has dramatically increased since formation of the umbrella program. Students interviewed during the site visit reported that they were only interested in applying to multidisciplinary programs and didn't look at single department-based programs. Students also reported that the size of the program was a big attractant. URM students felt more comfortable with a large cohort of similar students.

Having a wide variety of programs on cutting edge topics has boosted recruitment to departments with generic names like Biology. The rotation program has boosted recruitment into specialty programs, such as neuroscience, that undergraduates may not have been aware of; especially true for URM recruits.

Students report that they were attracted because the program seems like it cares about them. Program is able to offer training in professionalism, research ethics, grant writing, and other soft skills, and incorporate best practices more efficiently with a large group of students.

4. Challenges

When the program started, the involved units/departments feared giving up control of recruiting.

Strong support (and coercion) from upper administration—the School of Medicine Dean-- was hugely important in convincing departments to join the program.

Departmental program directors always worry that they will not get “enough” students into their department labs. So far, by all reports, it works out but admission offers have to be managed carefully. Competition for students has had the effect of causing departments to improve their programs by offering better advising, more relevant prelim exams, higher quality coursework, and friendlier departmental cultures.

Department chairs still complain about the annual cost (“tax”) assessed on the programs to support first year students. Data provided by the program demonstrate that overall costs are lower to the department to have admissions, data collection for T32 grants, advising, training in professionalism, and other functions handled centrally.

Department chairs or center directors (unit heads) must now sign off on a contract between students entering a lab and the major advisor. If a major advisor loses funding, the unit has to commit to supporting the student. If the unit head will not sign off, the student has to find a different lab. Students are counseled in first year groups to ask faculty directly about funding capacity before choosing rotation labs.

“Divorces” between students and advisors create special problems. Students will need to do a fourth rotation that sometimes isn’t funded leaving them to self-fund for a term. If the fourth rotation doesn’t result in finding a new lab home, the student must leave the program. These special situations are closely monitored with lots of advising.

Faculty diversity is not keeping up with student diversity.

5. Other Insights

Nearly everyone interviewed during the site visit noted that such a program needs a strong and committed leader who believes in the goal and importance of interdisciplinary programs.

Although the recruiting is centralized, it was important to faculty and some students to keep the degree identity for each program.

Forcing a common curriculum was too hard. Students need to decide fairly early which program is going to be their home, otherwise, they take a lot of courses in the 2nd year to meet department/unit requirements.

The BBSP program provides/requires faculty mentoring. Faculty are either required to complete a required training or have a proven track record as a good mentor to diverse students. BBSP offers workshops on various topics including best practices in mentoring and supporting URM students.

Diversity recruiting practices are extensive, high-touch, begin way before receiving an application, involve direct outreach to URM-serving institutions (special partnerships with universities in Puerto Rico and the US Virgin Islands). Starts with high school students.

Links

BBSP <http://bbbsp.unc.edu>

VIRGINIA TECH

1. Structure and Home

Interdisciplinary graduate education programs (IGEPs) are similar to umbrella programs housed in the Graduate School. All but two of the IGEPs are non-degree granting programs, so the rewards (i.e. money for teaching courses, student credit hours, etc.) go to the departments. With the exception of those in the Genetics, Bioinformatics, and Computational Biology (GBCB) and the Macromolecular Science and Engineering (MACR) IGEPs, students are awarded their degree in the home department of their major professor. Special courses have been set up for GBCB and MACR, though they are open to everyone due to cross-listing (which is easy at VT, as dollars flow to the department(s) of the instructor(s), not through the course listing). The graduate school provides oversight for the programs through a dedicated Associate Dean, but also gives them a lot of freedom to organize themselves. Annual reports to the Dean include faculty and grad student achievements: publications, presentations, grants written/awarded, etc. Since most are not degree-granting, there are not the usual formal expectations, which allows for flexibility. IGEPs place a huge emphasis on building a sense of community between the students and faculty through student-led seminars, biannual BBQs, and annual retreats or activities.

The IGEP program was set up in 2010 as a result of a white paper commissioned by the Vice President and Dean for Graduate Education and developed by a task force (Interdisciplinary Scholars for Emerging Frontiers at Virginia Tech) led by the Fralin Institute for the Life Sciences. The two existing interdepartmental Ph.D. programs (GBCB and MACR) were grand-fathered into the IGEP program; their previous ad hoc funding by the graduate school was formalized within IGEP. New IGEP umbrella programs were selected via three annual calls for proposals by faculty. GBCB was formed in 2003 out of the existing Genetics Ph.D. program by the faculty of the newly formed Virginia Bioinformatics Institute in collaboration with existing faculty, and with funding from the newly arrived Provost, Mark McNamee (from UC Davis).

Students can join an IGEP in one of two ways. They can apply to the IGEP and then find a home department or they can find a department and then join an IGEP. Either way, they'll graduate with a degree from their home department but their training will be more closely related to their interests. Students can be affiliated with more than one IGEP as long as they complete the core coursework. Although the IGEPs are non-degree granting, a student's IGEPs are listed on their transcript next to their dissertation title.

Every semester the graduate school holds an event for all 14 IGRP programs, including posters. The Associate Dean summarizes achievements, awards, etc; this is a big networking and social event, and an important mechanism for sustaining community.

Core funding from the grad school is vital for the survival of the programs. Operational support funds are also critical for faculty. Some of the operating money goes into communication and publicity for the program—always with a focus on the students. For example, the Remote Sensing IGEP funds one science and technology student every year to encourage student participation. Fellowship and non-fellowship students are not treated any differently.

2. Resources and Funding

The Provost provides the Dean of the Graduate School with money that has been earmarked for interdisciplinary programs. The Dean then gives each IGEP \$100k annually: \$10k for administration, \$10k for recruitment, \$10k for operations, and two assistantships (which must be

matched by the colleges). Programs must maintain a minimum of 10 students to continue getting the money, which stays at and is administrated by the grad school to make sure it doesn't disappear. IGEPs will get an extra \$10k for the core course to be spent however the program director sees fit, but it's not intended to be a buy-out.

IGEP students also have access to a large number of resources on campus including, but not limited to, the Biocomplexity Institute (BI; formerly named the Virginia Bioinformatics Institute). Many of the GBCB students are housed in labs and perform much of the research that occurs at the BI. Virginia Tech also has a Graduate Life Center on campus, where any graduate student can access for extra advising, quiet spaces, or other similar services. GLC, which was formerly VT's conference center, even has dormitory housing for grad students.

3. Benefits

In speaking with the Dean and some of the faculty associated with IGEPs, these interdisciplinary programs have several benefits for faculty and for Virginia Tech itself. IGEPs attract a different type of students: those that may not have been the ideal fit for traditional disciplinary programs due to their broad, multidisciplinary training. Faculty have observed that these students are enthusiastic about integrating their learning to find answers to complex research questions. These programs push the limits of their fields and stimulate interdisciplinary discourse which generates transdisciplinary grant proposals. Faculty have freedom to teach and do research on topics that interest them. Additionally, members of faculty who are associated with the IGEPs are given the opportunity to change the reality of academia and show students that professorship can be a rewarding career. IGEPs also strongly stimulate interdisciplinary research collaborations.

From a student's perspective, IGEPs are very beneficial. They introduce some academic flexibility and, as with faculty, allow students to focus on the research that interests them. Guaranteed funding for two to four years in some programs also appeals to prospective students. Additionally, interdisciplinary programs introduce students to cutting edge technologies and provide a framework for extending their networks outside the boundaries of disciplinary departments. Some programs have even secured externships with their partners in industry, which are incredibly valuable for career development and network building.

IGEP students have been particularly active in student government and service, and many have won the Graduate Student of the Year award.

4. Challenges and how they have been addressed

Many of the challenges that the IGEPs at Virginia Tech have faced are also common among interdisciplinary programs at other universities. Funding for students in the form of assistantships was a major concern at the inception of the IGEP model, but it has been addressed by housing the programs in the graduate school and reclaiming some of the assistantships from the colleges. Additional assistantships are provided for the students by their major advisor and the home department.

Finding a committed faculty base for interdisciplinary programs—especially those that can be less motivated by credit—was another challenge that Virginia Tech had to navigate. This has been addressed by making IGEPs easy to start up and shut down, and by empowering faculty to propose programs that they are passionate about. Virginia Tech's culture values interdisciplinarity, so involvement in IGEPs has become a strong element in faculty promotion and tenure packages. In order to ensure the continued success of the IGEP model, both the

Provost and the Dean of Graduate Studies actively champion the interdisciplinary culture by allotting and disbursing funds specifically for these programs.

5. Perspectives for OSU

Most of the things that Virginia Tech has done particularly well in support of its interdisciplinary programs stem from the fact that their culture values those types of programs. They have two “champions” of the IGEPs, the Provost and the Dean of Graduate Studies, who constantly fought to build stronger interdisciplinary and interdepartmental programs and also ensure that these programs are sufficiently funded. Consistent and sufficient funding is vital for the success of any program, which is something with which interdisciplinary programs at Oregon State University often struggle. Meanwhile, Virginia Tech has incorporated a set amount of funding for their IGEPs into their budget, which allows their programs to thrive.

Apart from the two pre-existing Ph.D. programs, all of Virginia Techs’ IGEPs are non-degree granting, which is something that might be beneficial if implemented at OSU. While students there still get the broad training one would expect from an interdisciplinary program, their degrees are earned and awarded through their home department. Although students do not graduate with degrees from the IGEPs, their participation in the program is noted on their transcripts and they are awarded certificates so that their interdisciplinary training is officially documented. Core courses for each of the IGEPs do not compete with departmental requirements for students’ time, as they can be used to fulfill the required electives. This fact also allows students to participate in more than one IGEP, if they so desire, and provides a great deal of academic flexibility.

Another idea that OSU might benefit from is Virginia Tech’s faculty proposal-based model for the formation of interdisciplinary, interdepartmental, and transdisciplinary programs. This model ensures the presence of a core group of committed, engaged faculty so program directors do not have to spend as much time begging people to be involved. It also provides a platform for the generation of programs focused on hot, up-and-coming fields. Students will be drawn to the cutting edge programs, which are less likely to lose support thanks to their faculty interest-driven nature.

Overall, there are a number of things that OSU can take from Virginia Tech’s model for interdisciplinary programs. These programs are budgeted for, so both faculty and students feel well supported. Students are attracted to the IGEPs because they are interdisciplinary and they are focused on specialized and upcoming fields. Faculty members are willing to participate in these programs because they are the ones who propose them based on their own interests. Although most IGEPs are non-degree granting, students’ participation is still documented and their broad training makes them appealing to prospective employers. Virginia Tech has been using the IGEP model for more than ten years and it is still going strong. With a commitment from the administration and the faculty, it could serve Oregon State University just as well as it has served Virginia Tech.

Links

IGEP

<https://graduateschool.vt.edu/academics/programs/interdisciplinary-graduate-education/interdisciplinary-graduate-education-programs.html>

IGEP Annual Reports <https://blogs.lt.vt.edu/vtigel/igep-program-overview/>

GBCB <http://gbc.vbi.vt.edu>

COLORADO STATE UNIVERSITY

1. Structure of the Interdisciplinary Graduate Programs

CSU has three Ph.D-granting IGPs, Ecology (107 Ph.D. students), Cellular and Molecular Biology (CMB; 60 Ph.D. students), and Bioengineering (42 Ph.D. students). There are also ten non-degree Interdisciplinary Studies Programs (GISPs) that provide curricula that are noted on transcripts but not on the diploma. Ecology and CMB are administered from the Graduate School while Bioengineering sits in the School of Biomedical Engineering (see below).

2. Resources and Funding

Ecology and CMB receive about \$200,000 and \$120,000 a year from the university, respectively, enough for 0.25 Director support, some staff support plus 1-2 TAs. Additional support has to be scabbled from colleges and grants. CMB has an NSF NRT and is trying for NIH support. "Dual citizenship" model gives IGP students access to departmental TAs.

Early in their existence, Ecology and CMB were moved from the Graduate School into the colleges of their Directors. However, this was reversed after a few years because the programs were starved of funds by Deans who raided their budgets to address college budget challenges.

3. Benefits

As a land grant institution, CSU has many departments with a production or applied science mission. These departments also have many adjunct faculty who are scientists in federal, state, and non-profit agencies. Programs like CMB and Ecology attract students who would not apply to a production/applied department, and provides them with strong training in relevant fundamental sciences. In turn, this enables the departments to attract top faculty who have fundamental research interests that attract federal funding. Ecology is a longstanding (26+ years), nationally-ranked program that attracts applications from many top students. Programs complement, not compete with, departments, bringing different and better students.

4. Challenges, and how they've been addressed

Consistent funding is the biggest challenge, and has not been addressed. Recruiting faculty involvement is also a challenge. For IGP courses, dollars flow back to departments of faculty that teach them, mitigating Department head concerns.

5. Other insights

CSU is notable in that they have created Special Administrative Units (Schools) which span multiple colleges, and in one case (Public Health), multiple institutions. These schools house not only cross-departmental research programs, but also cross-departmental undergraduate majors and Ph.D. programs (e.g. Bioengineering). CSU has also created a formal "dual citizenship" model for students in interdisciplinary graduate programs; they are considered full students of both the IDP and the department of their major professor. Both concepts could find application at OSU. The longevity of Ecology and CMB means that alumni are now directing students to the programs, which further promotes sustainability.

Links

Interdisciplinary programs

<http://catalog.colostate.edu/general-catalog/university-wide-programs/interdisciplinary-studies/#graduatetext>

Cellular and Molecular Biology program <http://www.cmb.colostate.edu/>

Ecology <http://www.ecology.colostate.edu>

School of Biomedical Engineering <http://www.engr.colostate.edu/sbme/>

DUKE UNIVERSITY

1. Structure and Home

Duke strongly values interdisciplinarity and has a Vice-Provost of Interdisciplinary Studies. There is no single home for their interdisciplinary programs. Approximately 95% of the interdisciplinary degree programs are anchored in a department within one of the 9 colleges and the rest are housed in the graduate school. Each program has their own faculty governance and some of the programs have additional external advisory boards comprising of Duke alumni.

2. Resources and Funding

Duke is a private institution, so receives a lot more donation money than most public, land-grant institutions. Theoretically, the interdisciplinary programs at Duke are not supposed to have endowments but many of them have received philanthropic gifts, as this type of activity seems to really appeal to donors. Aside from these gifts, interdisciplinary programs are funded through their associated departments, as well as from the Provost's core allocation. Some programs have been successful at securing seed grants and training grants from funding Graduate students have an opportunity to compete for grant funds from the Provost's Office and they can also apply for some funds for 3-6 months of interdisciplinary training related to their research that can only be obtained at other institutions.

3. Benefits

The Vice-Provost of Interdisciplinary Studies at Duke believes that the university's progression from a fine regional college to a prestigious, world-class institution is a direct result of its interdisciplinary programs. Faculty are drawn in by the opportunity to perform curiosity-driven research and the interdisciplinary programs strengthen Duke's relationship with its philanthropic donors. These programs also attract higher quality students with a broader range of interests and skill sets to Duke. Tensions between interdisciplinary and departmental programs at the institution generate a great deal of creativity, which leads to more grants.

3. Challenges

While the administration at Duke views the tensions between interdisciplinary programs and departments as a catalyst for creativity, navigating and re-balancing these tensions is a delicate and time-consuming task. The Vice Provost of Interdisciplinary Studies also feels that other challenges are ensuring that faculty and students have the proper "soft-skills" for interdisciplinary study, taking care to not under-cut the programs, and the need to incentivize participation. He has addressed these problems by instituting intensive two-week soft-skills courses and giving the programs enough freedom to evolve on their own. The need to incentivize participation is something that the Duke administration is striving to address.

5. Perspectives for OSU

Most of the ways that Duke has addressed interdisciplinary programs are would be cost-prohibitive for OSU to implement, as we receive far fewer endowments. With that said, Duke has established a culture that values interdisciplinary study and participation for the common good. They have an opt-in, rather than an opt-out, culture around their interdisciplinary programs, which they find works better for them. The Vice Provost acts as a champion for this kind of program—something that OSU needs to have for our programs to remain viable.

Links

Interdisciplinary Studies <https://sites.duke.edu/interdisciplinary/>

EMORY UNIVERSITY

1. Structure of the programs

Emory has 8 Interdisciplinary programs in biology and biomedicine.

The Interdisciplinary Program of Immunology and Molecular Pathogenesis was examined more closely. Data were obtained by web consultation and telephone conversation with administrators and professors.

The program has approximately 70 students. Only Ph.D students are supported.

Three rotations are allowed during two semesters, before a definitive laboratory is chosen.

2. Funding and resources

Students are stimulated to obtain external scholarships. The program provides support for the application. Student who receive external scholarship, dependent on the amount, has opportunity to obtain help from the program.

Current stipend is \$30,000. With tuition the total is \$52,000, which is 100% covered. Students pay for fee (\$300/semester), and program pays for health care.

There are competitive fellowships provided by the University.

Program offers all the support for students.

Professors from different departments share the teaching of the program.

Links

Interdisciplinary programs in biology and biomedicine <http://biomed.emory.edu/>

GEORGIA TECH

Bioengineering, Bioinformatics, Ocean Science and Engineering

1. Structure of the program(s), including type of program and home

Interdisciplinary programs at Georgia Tech are standalone programs that are managed by a program administrator/academic advisor, and typically more than one faculty director. These programs fit into existing departmental structures at Georgia Tech by requiring students to select a “home department”. Students must follow the rules of the home department for things like teaching requirements, seminars, etc. Students are paid out of the home department.

Coursework is typically open ended, without a defined core. Instead students typically select among various existing courses in specified categories.

2. Resources and funding

Funding comes from the College that houses the interdisciplinary graduate program. Recruiting is typically a joint effort between the interdisciplinary graduate program and the home departments that students select when apply. Costs are shared for things like airfare, hotel, etc. The money associated with graduate tuition flows to the home department of the faculty advisor.

3. Benefits (institutional, faculty, and student perspectives)

The biggest benefit from the perspective of faculty is the quality of the students. For students, the biggest benefits are flexibility in course work and selection of an advisor.

4. Challenges and how they have been addressed

The biggest challenges are funding and visibility

Links

Interdisciplinary programs <http://www.grad.gatech.edu/inter>

NORTHWESTERN UNIVERSITY

1. Structure and Home

Northwestern has an umbrella structure for its interdisciplinary clusters and certificates. Students select a second program outside of their chosen cluster or certificate to serve as their disciplinary home. The interdisciplinary programs facilitate dual citizenship for their students. This aspect allows the student to receive departmental training and also participate in interdisciplinary curricula. Certificates are transcript visible and housed in related departments; clusters are not reflected on transcripts and are housed in the graduate school.

Northwestern has 3 Interdisciplinary clusters encompassing 34 programs. The clusters are: Mellon Clusters in the Humanities and Qualitative Social Sciences; Clusters in Interdisciplinary Approaches to Sciences and Engineering; Clusters in Life and Biomedical Sciences

2. Resources and Funding

Funding for the interdisciplinary certificates is dependent on the school in which their related departments are housed. Money for administrative staff and courses comes from the department's budget; meanwhile students receive fellowships, teaching assistantships, or grant-funded research assistantships. Colloquia offered through the clusters are voluntarily staffed by faculty and paid for by the graduate school. These are often "one-offs" but do count toward the instructor's course load.

3. Benefits

The interdisciplinary certificates and clusters promote a great sense of community and they provide broader training for students than what is offered through traditional departments. Students feel well supported by the structure. Faculty members value the high caliber students that opt to participate in these programs.

4. Challenges

The faculty see the act of balancing a program between multiple schools as a challenge, but they also feel that anchoring certificates in related departments has sufficiently addressed this. Another challenge facing faculty and students is funding, although Northwestern has a good reputation and brings in a decent amount of money. The institution sees tracking progress and outcomes as a challenge, particularly at the cluster level, but they are currently investigating ways to address this.

Links

Clusters (graduate school)

<https://www.tgs.northwestern.edu/academics/programs/clusters-and-certificates/how-to-apply.html#inter>

Interdisciplinary Biological Sciences programs <http://www.ibis.northwestern.edu/research/>

STANFORD UNIVERSITY

1. Structure of the programs

Stanford has 39 interdisciplinary programs.

Three programs were investigated, including telephone conversations

- Microbiology Immunology and Biochemistry
- Earth, Energy and Environmental Sciences
- Chemistry and Systems Biology

Students rotate in laboratories during 3 terms out of the years, and by the 4th term they have to decide on the laboratory.

If the PI has funds that pay for the student stipend and tuition, then the cost is taken from the grant. There is a limit on the number of students supported in each laboratory. Depending on the program, there is funding to the student through research grants.

The programs have between 30 to 80 students.

The program of Microbiology, immunology and Biochemistry are “separated”, however there large evidence of cross-fertilization among the programs.

The other two programs are truly multidisciplinary, involving many disciplines.

Professors from the different Departments are involved with the teaching in the program.

2. Funding and Resources

The university provides fellowships (competitive), Research Assistantships and Teaching Assistantships for all interdisciplinary Ph.D. programs. The University also provides tuition remission for all the graduate PhD candidates.

Links

Interdisciplinary programs <https://www.stanford.edu/list/interdisc/>

UNIVERSITY OF ARIZONA

Structure

There are 16 graduate interdisciplinary programs (IDPs) at the University of Arizona. IDPs are administered through a central program that provides GTA support and support for each program director. The GIDP office is quite small and most of the work is done by the programs themselves. This is a bottom up model in the sense that it is based on faculty initiative. If faculty want a new IDP there is a path to creating it. If faculty lose interest, an existing IDP will be eliminated. There are limited incentives to form IDPs and no obvious dis-incentives. Credit in various forms accrues back to home departments and colleges. All courses are located in departments, and credit follow the students and teaching faculty to home departments. Participation is voluntary, and the function is augmentation of departmental graduate education programs.

Funding

All IDPS at UA are administered through the small GIDP office, which is under the grad school. All funding comes from the central budget via the grad school. Each IDP receives support of 10K/year for a director. GTAs incentivize departments to participate, but there are also awards, such as travel awards, that the students are eligible for. Individual IDPs hold their own recruitments, with financial support from the GIDP. There is a GIDP council that among other things makes decisions on awards to students.

Benefits

700 faculty and 400 students participate. Issues that were emphasized:

- Graduate recruitment was a main incentive. This was especially true of faculty who felt their interests were somewhat peripheral to their home department's main themes, but they had colleagues across campus who shared their interests.
- Empowering bottom-up innovation in education and research rather than top-down.
- National and International visibility
- Improving Federal and industrial funding opportunities
- Advancement translational science

Challenges

The GIDP office tracks its students but they do not have independent graduate advisors separate from major professors. They are working towards implementing graduate advisors. Increasing funding for the program is a goal but competition for funds from the central budget is tight. No complaints were expressed by faculty, and the program administrators indicated they were not experiencing conflicts between departmental interests and IDP programs, since their IDP programs are structured to avoid such conflicts.

Other insights

This model favors faculty initiative over top-down structure that is expensive and difficult to decommission when it loses its effectiveness

Links

Graduate Interdisciplinary programs <https://gidp.arizona.edu/>

UNIVERSITY OF CALIFORNIA – BERKELEY

Energy Resources Group

1. Structure of the Program

Berkeley interdisciplinary programs are referred to as groups and they are run quite differently across campus with various models. One of the most organized groups was chosen for further consideration, the Energy Resources Group (ERG). ERG is currently housed in the College of Natural Resources and considers itself to be a collaborative community of graduate students, core faculty, over 150 affiliated faculty and researchers across the campus, and over 500 alumni across the globe. ERG awards MA, MS, and PhD degrees to students working across disciplines and departments. The faculty of ERG currently consists of seven core professors of Energy and Resources, one adjunct professor, and more than one hundred affiliated faculty members holding appointments in a wide range of departments across the Berkeley campus. ERG's chair is drawn on a rotating basis from among the affiliated faculty. 22 Energy Resources (ENERES) Courses staffed by core ERG faculty. ERG is also well staffed with program support: Head Graduate Adviser, Equity Adviser, Head Minor Adviser, Group Manager, Graduate Student Affairs Officer, Administrative Assistant. ERG's sixty plus graduate students are geographically and ethnically diverse. About half are in the Master's degree program and half in the PhD program. The students come from a wide variety of disciplinary backgrounds in engineering, natural sciences, social sciences, and the humanities; the characteristics they have in common are an ability to cross disciplinary boundaries, an interest in the complex problems at the interface of technology and society, and the intellectual credentials to succeed in a rigorous academic program.

There is no Graduate School at UC Berkeley. ERG used to report directly to the University Vice Provost before moving to the College of Natural Resources (CNR). ERG became part of the College a few years ago, after being courted by several colleges and choosing CNR, since this College had the most resources. Transition to CNR has been rough - less autonomy and now more like a typical department. Tension exists with faculty who remember what it was like with more autonomy.

2. Resources and Funding

ERG was well supported until budgets got tight and resources constraints are currently presenting challenges under CNR that were not previously experienced under the Vice-Provost. Each department at Berkeley is allocated a block of funds to distribute to new and continuing students at their discretion. Block Grant funds may cover fees, tuition, or living expenses for any student, regardless of residency or citizenship. However, the amount of annual Block Grant funding is not sufficient to cover the expenses for all newly admitted students. ERG evaluates all admitted students (20 admitted per year of approximately 350 applicants), for eligibility for Block Grant funds in competition with other students, based on need and merit.

3. Benefits (institutional, faculty, and student perspective)

According to its website, with its four-decade history of transformative teaching and research, the Energy and Resources Group (ERG) has reframed ecological and social problems in terms that borrow from, and yet can be understood across, many traditionally separate disciplinary cultures. The ERG model combines a rigorous core curriculum, a shared learning environment, and the freedom to access the entire Berkeley faculty. The core curriculum provides students with relevant analytical tools from ecology, economics, engineering and the social sciences.

ERG research is strongly evidence-based and hypothesis-driven; its interdisciplinary culture equally encourages student-and faculty-led research. The value of such a culture is hard to quantify: it has evolved through the commitment to systemic thinking, and the vision of a just and sustainable planet, over generations of ERGies. ERG cultivates a strong sense of community and unique culture and exposure and ability to communicate and training across many disciplines. ERG provides exposure to all sorts of disciplines. One of their greatest assets is fostering this broad ability to communicate.

4. Challenges and how they have been addressed

Though the quality and quantity of applicants are high, ERG experiences retention problems due to unevenness and inconsistency of funding. Energy has good and consistent funding. However, Environmental Justice faces challenges every semester. There is high competition for social science and humanities TA and other positions.

As academia has evolved, less time is available for faculty to provide service and engagement of affiliates has dropped off. Previously great participation though connections are a legacy. It's difficult for faculty to contribute time when it doesn't advance their career nor receive credit for participation. Ongoing issues are still presenting challenges that were exacerbated by the move from central administration (direct report to Vice-Provost) to a college.

Links

ERG <https://erg.berkeley.edu/>

UNIVERSITY OF FLORIDA

1. Structure

The University of Florida offers a number of interdisciplinary (ID) programs, ranging from 12 to 24 over the past several years. These have been developed over time in an ad hoc manner. Some programs are their own majors, such as the Ph.D. in Interdisciplinary Ecology. Most ID programs, however, serve as concentrations and minors within other non-ID programs. All ID programs are housed in academic units, not in the Graduate School. They are developed by faculty who want to create them. Faculty design the program (curriculum, degree level, requirements, etc.) and have to find a home in one of their units. Typically the home unit delegates a director to administer the new ID program from among the faculty who developed it.

2. Funding

Funding for ID programs is variable, and there is no general revenue formula to fund them. Funds flow to departments based on SCH. Since the coursework used in ID programs consists largely of classes that are already offered in various units, and not new courses specific to the ID programs, there is not a set funding stream. This results in some competition for resources, as ID programs have to negotiate with Chairs and Deans to allocate funds for the ID programs. One idea floated has involved trying to figure out new incremental SCH production based on the creation of an ID program, but this has not yet produced any tangible actions or results.

ID programs are staffed differently throughout the university. Salary and/or course reductions for running an ID program are negotiated on an ad hoc basis with the home unit Chair or Dean. There doesn't have to be a single ID program director (the role can be filled by a faculty governing board, which the Graduate School requires for each ID program). Faculty assignments might explicitly state that faculty will get support and credit for directing or working with ID programs, and this can be a formal part of one's position description, but this happens on a case-by-case basis within units. There is no centralized funding mechanism for graduate students, who may or may not be funded by their major advisors or within the unit that houses their respective ID programs.

3. Benefits

The Graduate School believes that the university earns reputational benefit from its ID programs, and that the programs are helpful in attracting new students and faculty. It is also the case that many funding sources from federal and state entities require interdisciplinary elements to qualify for funding, so ID programs and their affiliations within various units add strength to such proposals. Lastly, the variety of program structures allows for a great deal of ease and flexibility in creating and administering ID programs.

4. Challenges

The biggest challenges to ID programs tend to be administrative. Programs are housed in different academic units and colleges, and they all have different structures, authorities, staffing and funding. Faculty participation is not incentivized, as hiring and tenure is based on departmental work and affiliation unless one's responsibilities and position description are specific with respect to ID programs and students.

In addition, the Graduate School does not have a clear sense of participation in ID programs. While ID programs create learning outcomes, assessment reports, and periodic reviews, this information is derived and kept at the unit level. UF has roughly 12,000 graduate students, and the Graduate School estimated that about 500 students are in ID programs. In addition, many students create ad hoc ID concentrations informally, building their own ID curriculum as part of their degrees, but no information is collected on this.

Links

There is no single link to ID programs at UF, which is one of the challenges to information collection and program monitoring.

Graduate Catalog <http://gradcatalog.ufl.edu/content.php?catoid=11&navoid=2484#graduate-degrees-offered-by-the-university-of-florida->

Agriculture and Life Sciences <http://cals.ufl.edu/students/graduate-majors-contacts.php>

College of Liberal Arts and Sciences <http://www.clas.ufl.edu/ids/index.html>

UNIVERSITY OF MICHIGAN

1. Structure of the Programs

UMichigan has 110 PhD programs, of which 19-21 are interdepartmental (IDP) and cross institutional borders; 14 of these are in the biomedical sciences. There are 560 IPD PhD students, 10% of the overall PhD student population. IDPs cross 18 schools/colleges, and all (except law school) are in the Rackham Graduate School (Rackham grants the degrees). Emphasis is on the PhD programs. They have 5 categories of IDPs:

- IDPs that cross school and college borders; some of these are long-standing, some new.
- IDPs that cross disciplines within a School.
- IDPs that fall within one unit.
- At least one is in a center, not an academic unit.
- IDPs in biomedical sciences in the medical school; the PhD is granted through Rackham.

There is also a medical science training program (MD/PhD), with various units engaged in the PhD. The social science IDPs tend to be targeted within subset of disciplines. They also have 60+ explicitly interdisciplinary certificate programs, which are important ID niches and some gestate into degree programs. Rackham also has ID working groups developed by students with 1 faculty advisor.

2. Resources and Funding

Historically, Rackham has been an incubator for IDPs, providing support and funding, as well as serving as an advocate. Over time, the IDPs get farmed to an administrative department, which then picks up the costs. The specific arrangement is individually negotiated, highly variable, and brokered by Rackham. Rackham is well-funded and is a significant funder of IDPs. They give block grants to IDPs (over 3 million last year) that allow programs to support IPD students. From all sources (e.g., cost-sharing), they gave over \$10 million to IDPs last year. This does not include external funds. Prior to candidacy, distribution of tuition dollars is as follows: 75% of tuition goes to Dean of the college in which the IDP is located (the “unit of registration”, who then gives most of that to the IDP); 25% goes to the unit for the course that the student enrolled in (the “unit of enrollment”). This budget model was created to distribute funds to motivate and support IDPs. After candidacy, all goes to the “unit of registration.” All students are advised by faculty; many are co-advised. Each program has a graduate coordinator, which the front-line problem-solver. These coordinators are vital for the success of the programs.

3. Benefits (institutional, faculty, and student perspective)

They consider themselves to be on the cutting edge (i.e., new fields, carry out investigations that otherwise would be difficult to do). Some departments have become inherently interdisciplinary, others less so. IDPs open great new spaces where innovation can occur. When faculty recruit students and faculty, they emphasize the ease of crossing borders, how easy it is to do interdisciplinary work. They cannot compete with the Ivy leagues in terms of student funding but they can provide flexibility. The Graduate School can facilitate that. IDPs are hugely significant for their reputation. The IDPs are the university’s “jewels in the crown” – part of the institutional fabric.

4. Challenges and how they have been addressed

- Allocation of credit to faculty and departments for mentoring IDP students depends on chair, and this inhibits effectiveness and is the big issue. The Provost does not tell Deans how their chairs should give credit, which is a problem.
- Quality of mentoring. Because the assignment of credit when there are multiple mentors is not clear, attention to students may not be as strong. In some programs, IDP students can be treated as second-class citizens. These are not serious or major issues.
- Physical distance between labs, which may be spread out across campus. In these instances, community building can be challenging.
- Strong leadership can overcome the challenges. Issues are discussed in the program reviews, and then are addressed by the programs.
- Conflicts arise but are responded to quickly.
- In 2000, the university's reaccreditation focused on interdisciplinary work and how it affects faculty, education, and research. All else was secondary.

Links

Rackham Graduate School <http://www.rackham.umich.edu/>

IDPs in biomedicine <https://medicine.umich.edu/medschool/education/phd-programs>

University of Minnesota

1. Structure of the program(s), including type of program and home

Several structural models are represented among the UMN research-based IDPs. The most prevalent model is a Ph.D. program that is anchored within a department, but that includes additional faculty from other departments (e.g., Ph.D. programs in Biomedical Science; Neuroscience; American Studies; Microbiology, Immunology, and Cancer Biology; Biochemistry, Molecular Biology, and Biophysics; Plant Biological Sciences; Conservation Biology). A few of the Ph.D.-granting IDPs are associated with a college rather than a department, (e.g., Ph.D. programs in Cognitive Science (Liberal Arts), Human Factors and Ergonomics (Design), and Water Resources Science (Food, Agricultural and Natural Resource Sciences). The Ph.D. program in Health Informatics is housed within the interdisciplinary Institute for Health Informatics. In addition, the graduate school hosts Interdisciplinary Graduate Groups, which do not have formal curricula but facilitate collaboration among faculty, students and staff with interdisciplinary interests that span established departments and academic programs.

2. Resources and Funding

Funding is typically provided through the budgeting process of individual college units. Some IDPs have endowment funding, particularly for graduate student support. At the University of Minnesota, most funding for graduate programs, including IDPs, is derived from tuition income that is allocated to departments according to a set formula. Tuition generated by enrollment in University courses is allocated to colleges according to an institutional formula with a portion allocated to the college that “owns” the course designator. Tuition revenue is automatically divided into two parts: For any course in which a student enrolls, 75% of the tuition is allocated to the college that owns the course designator and 25% of the tuition is allocated to the college that owns the student’s academic plan. Colleges are not obligated to return the 75% of tuition to the departments that generated it; rather college deans have discretion in how they deploy these funds. For interdisciplinary courses that cross collegiate boundaries, the Graduate School strongly recommends that participating colleges sign an MOU that documents agreement regarding the allocation of tuition revenue, administrative and academic oversight, whether teaching the course will count toward the faculty member’s regular course load, etc.

Because the programs are aligned within specific colleges and departments, those units provide administrative support. The Water Resources Science program, for example, has two faculty Directors and the College (Food, Agricultural and Natural Resource Sciences) funds one full-time graduate program coordinator, who works with faculty committees on recruitment and advising, including graduate degree program tasks, working with students, coordination of events, working with the student organization.

3. Benefits (institutional, faculty, and student perspectives)

Benefits include the intellectual stimulation and new insights that come from examining a research question from the lens of other disciplines, and opportunities for new collaborations and research partnerships. In the Water Science program, establishment of a full-time coordinator position and the efforts of the coordinator to build community seem to have paid off tremendously in the past few years. Students definitely have a stronger sense of community, are active in the program, and report high levels of satisfaction. Return on investment for ID Graduate Groups and Fellowships are perceived as very high.

4. Challenges and how they have been addressed

Challenges reported include issues related to the allocation of teaching credit, expectations about faculty workload and salary, and, teaching across units, course enrollment requirements, and course-related costs (e.g., TA salary, materials, copyright, space, etc.). Funding is probably the most significant challenge.

Links

Graduate courses https://apps.grad.umn.edu/programs/select_program.aspx?l=t

Interdisciplinary Graduate Groups

<https://www.grad.umn.edu/projects-priorities-interdisciplinary-initiatives/idgg>

UNIVERSITY OF NEVADA, RENO

1. Structure

The University of Nevada, Reno offers twelve interdisciplinary (ID) degree programs, and two ID certificates. Seven ID degree programs are housed in the Graduate School, while the other five ID degree programs are in one of three colleges: Liberal Arts, Science, and Engineering. One certificate is housed in Engineering and the other is in Liberal Arts. Many ID programs reach well beyond their home units, attracting participation from many other colleges and units such as the College of Medicine, the Desert Research Institute, and the College of Agriculture, Biotechnology and Natural Resources. ID programs are developed by faculty who want to create them, and each has a Director whose academic home is in one of the units participating in the ID program. There is one staff person in the Graduate School to support ID programs housed in the Graduate School. This person manages and monitors budgets, admissions, progress tracking, student programs and graduation audits.

2. Funding

Funding for ID programs varies across the campus, particularly with regard to programs housed in the colleges. Programs in the Graduate School get a budget, including a small stipend to program directors, and a per student allocation that goes to the unit of the student's major advisor. There is also some funding provided to ID programs for graduate student assistantships each year. Funding is considered to be a perennial challenge with respect to supporting faculty and students in ID programs. However, program directors have noted that they are able to support programs by piecing together a number of funding sources such as faculty grants, agreements with participating units, and even partnerships with industry.

3. Benefits

Program directors noted that their ID programs are strong and have a good reputation across campus. These programs have attracted high quality students with wide ranging interests, and to that end, faculty often are greatly interested in working with and mentoring students in ID programs. This, in turn, facilitates departmental/college/unit participation in ID programs. The ID programs also provide an impetus to interdisciplinary collaboration among faculty from different units.

4. Challenges

There appears to be inconsistent support for ID programs across units. While some programs described their experience as one of toleration or resistance by colleges and departments with respect to potential competition for resources and students, others noted that there was little competition, as students in their programs tended to share similar faculty, classes and resources with the students in non-ID programs housed in units that also participate in an ID program. Ensuring consistent strength and entrepreneurship in leadership and succession is an important element of the ID programs. These programs rely heavily on their directors, whose efforts to establish relationships on and off campus, and to secure funding provide the key supports required to ensure the vitality of their programs.

Link

<https://www.unr.edu/grad/degrees-and-programs/interdisciplinary>

UNIVERSITY OF WASHINGTON

1. Structure

At the University of Washington (UW) interdisciplinary degree- or certificate-grating groups are formed by interested faculty coalescing around a common theme who then develop a proposal. Faculty appointments remain within traditional departments.

Interdisciplinary graduate groups are housed in the Graduate School at UW when there is not an obvious college home. Proposals for new groups include the submission of a letter of interest to the Graduate School Dean and the formation of an interdisciplinary committee which then pursues the formation of an interdisciplinary graduate group. There are currently ten degree-granting interdisciplinary graduate groups at UW of various sizes that follow this structure plus one additional interdisciplinary program that is an umbrella admissions program.

Interdisciplinary graduate groups are administered by a program committee chair and an academic program director (sometimes the same person in both roles). The UW Graduate School provides a standardized administrative supplement for each chair/director. The Grad School has a full-time interdisciplinary graduate groups coordinator who works with program directors on budgets, recruiting, fundraising opportunities and activities. The coordinator sets clear expectations about support, resources and limitations, and tries to help with long-term projections and capacity.

2. Funding

Funding is variable. Revenue-generating MS programs are self-supporting and have their own budgets, and control over tuition and fees. PhD programs are not revenue generating, so the Graduate School provides funding for recruitment and for first-year support for students in the interdisciplinary graduate groups. The Graduate School thus controls the size of the program. After the first year, PhD students are then required to be supported by their major advisors. Some graduate groups have agreements to obtain GTA positions from certain highly-involved colleges. There is some budget that comes to the Graduate School through activity-based budgeting based on program enrollment. Formation of new interdisciplinary groups have sometimes been accompanied with seed funding from highly-involved colleges; Molecular Engineering was given as an example.

Staffing of courses was admitted to be a challenge to the groups. Most graduate groups use courses taught within departments by graduate group faculty. The graduate groups have very little leverage if courses or staffing changes. However, the Graduate School has stuck to the principle that it will NOT pay for teaching of courses in the graduate groups.

In conversation it was noted that only strong interdisciplinary groups with highly research-active and well-funded faculty remain viable. Faculty see a benefit if interdisciplinary students are better than departmental students. The groups crumble if that changes. The university does not provide any credit in the budget model to faculty or departments who welcome or mentor IDP students.

The one umbrella admissions program allows students to graduate with a degree in the department of their major advisor. The benefits are more apparent for a department in this structure.

3. Benefits

Among the benefits noted in the phone interview was the ability to relatively quickly create new graduate degrees focused on innovative and cutting-edge fields to attract new students. Another benefit was an expanded sense of community provided by membership in the graduate .

4. Challenges

Among the challenges is a need to be proactive in maintaining and fostering a sense of belonging to the graduate group after students join labs. There is no gathering space available for students in the interdisciplinary groups. The graduate group director needs to work at intentional community building. Some interdisciplinary groups have an annual symposium and/or regular seminars to bring students and faculty together but this is dependent upon fund-raising.

Competition with departmental programs is another on-going challenge because no budget flows to departments for hosting interdisciplinary graduate group students. The attraction for maintenance of the interdisciplinary groups is the provision of high quality incoming graduate students.

Another big challenge is funding PhD students all of the way through their program as funding gets tighter and labs lose grants. UW is addressing this by providing increasingly greater oversight of the interdisciplinary programs by the Graduate School interdisciplinary program Coordinator.

5. Other insights

A strong graduate group director with a good transition program is important for long term sustainability. Associate Directors are an important piece to build in. Succession planning is really important for program directors.

Links

Interdisciplinary programs

<http://grad.uw.edu/about-the-graduate-school/interdisciplinary-programs/>

WASHINGTON UNIVERSITY, ST. LOUIS.

1. Structure of the Interdisciplinary Graduate Programs

At WUSTL all Ph.D. programs in the life and biomedical sciences are combined into the Graduate Division of Biology and Biomedical Sciences (DBBS), which sits within the Graduate School of Arts and Sciences. All other Ph.D. programs outside DBBS are departmental. There are 11 cross-departmental Ph.D. programs within DBBS (each with 40-80 students) and the participating departments have no Ph.D. programs of their own. Students are recruited centrally through DBBS, come into a program right away, but can rotate in any lab within DBBS. Individual programs are run by a Director and a Steering Committee. DBBS is administered by the Vice Provost & Associate Dean of Graduate Education, supported by 13 full time staff.

2. Resources and Funding

DBBS has a 40 year history. It has an endowment and university funds are used to fund PhD students for the first 16 months, then PI funds the student. Staffing of courses and committees is on a volunteer basis (requires lots of begging). There are multiple NIH training grants.

3. Benefits

Faculty can be members of multiple Ph.D. programs, providing access students with diverse backgrounds and interests. Rotations provide wide range of opportunities for incoming students, and give junior faculty opportunities to recruit them. Centralized tracking of student outcomes by DBBS staff supports training grant renewals.

4. Challenges, and how they've been addressed

Advancement at WUSTL is based purely on research. So teaching and service suffer accordingly. There's no compensation or formal credit for teaching and service. Committed program directors create excellent support and mentoring environments for their students, but there's no formal reward for this and not all program directors are equally committed. Motivation to do a good job stems from need to keep NIH training grants renewed.

5. Other insights

Although DBBS is well-funded however, the quality of the training programs is inconsistent due to lack of formal incentives to participate in teaching and service. This highlights the need to connect expectations of faculty contributions to access to student funding.

Links

DBBS <http://dbbs.wustl.edu>

OTHER UNIVERSITIES SURVEYED ONLINE

Arizona State University (land grant)

<https://newcollege.asu.edu/interdisciplinary-studies-ma>

Iowa State University (land grant)

<https://www.cs.iastate.edu/interdisciplinary-graduate-programs>

Missouri State University (land grant)

<https://graduate.missouristate.edu/catalog/interdisciplinary.htm>

University of Alaska, Fairbanks

<https://www.uaf.edu/gradsch/classes/interdisciplinary-program/>

University of Iowa

<https://www.grad.uiowa.edu/programs/interdisciplinary-graduate-programs>

University of Missouri

<https://gradstudies.missouri.edu/about/interdisciplinary-programs.php>

University of Montana

<http://www.umt.edu/grad/Interdisciplinary%20Graduate%20Programs/default.php>

University of Texas, Austin

<https://gradschool.utexas.edu/academics/programs/interdisciplinary-degree-programs>

Washington State University (land grant)

<https://gradschool.wsu.edu/interdisciplinary-degrees/>

QUESTIONNAIRES USED TO GATHER INFORMATION FROM OTHER INSTITUTIONS

Questions targeted to individual programs

1. What is the structure of the program? e.g. standalone Ph.D. granting program; “umbrella” structure for recruitment and coordination of course offerings; departmental program with affiliate faculty from multiple units as major advisors in the graduate program?
2. What is the administrative home for the program – graduate school, college, department, or other? What is the rationale or history behind this arrangement?
3. Does the program compete directly with departmental graduate programs, or does the program provide graduate education for departments that do not have their own programs?
4. How many faculty and students belong to the program?
5. What is the governance structure of the program(s) in terms of leadership and committees. Does the program have an Advisory Board. If so, how is it constituted?
6. How is the program funded (student support; leadership; staff; recruitment; teaching)? Does it have endowment funding?
7. How are the courses of the program staffed? What if any flow of dollars is there that incentivizes faculty and departments to support the courses of the program?
8. How does the program incentivize faculty involvement, especially where it competes with a departmental program, e.g. recruitment; mentoring students; committee involvement; teaching?
9. How is credit allocated to faculty and their departments for mentoring the program’s students?
10. How are students recruited? e.g. individual effort, multi-program effort? How is this funded?
11. How does the program track student progress and learning outcomes. Does it have independent graduate advisors (separate from major professors)?
12. What do students and faculty report as the benefits and challenges of belonging to this IDP?
13. How does the IDP foster a sense of community among its students and among its faculty, both of whom may be scattered across campus? Does the program have an active student association?
14. How would the program describe its relationship with departmental programs at the same institution – positive and collaborative, or competing and/or conflicted.
15. What does the program see as its biggest ongoing challenges? How is it addressing those?
16. Does a program have a recent five-year or ten-year review that the program would be willing to share?

Questions targeted to institutions

1. What are the structures of the IDPs at this institution? e.g. standalone Ph.D. granting programs; “umbrella” structures for recruitment and coordination of course offerings; departmental programs with affiliate faculty from multiple units as major advisors in the graduate program? A mix?
2. What is the administrative home for IDPs at this institution – graduate school, college, department, or other? Is this uniform for all programs? What is the rationale or history behind this arrangement?
3. Do IDPs compete directly with departmental graduate programs, or do the IDPs provide graduate programs for departments that do not have their own programs?
4. How many faculty and students belong to the interdisciplinary programs at each institution (may be hard to gather for institutions with numerous IDPs without a series of phone calls; maybe target a couple of programs similar in discipline to ours).
5. Do IDPs at your institution have Advisory Boards
6. How are interdisciplinary programs funded at your institutions (student support; leadership; staff; recruitment; teaching)? Do any of them have endowment funding?
7. How are the courses of the IDPs staffed? What if any flow of dollars is there that incentivizes faculty and departments to support the courses of the IDPs?
8. How is credit allocated to faculty and their departments for mentoring IDP students?
9. How are students recruited into IDPs? e.g. individual effort, multi-program effort? Is it coordinated across interdisciplinary and departmental programs? How is this funded?
10. How do the IDPs track student progress and learning outcomes. Do they have independent graduate advisors (separate from major professors)?
11. What do students and faculty report as the benefits and challenges of belonging to IDPs?
12. How do the IDPs foster a sense of community among their students and among their faculty, both of whom may be scattered across campus? Do the programs have active student associations?
13. How does the institution encourage a positive sense of community across departmental and interdisciplinary graduate programs?
14. Are there points of conflict between IDP and disciplinary programs at the institution - where do the breakdowns occur and why?
15. What benefits has the institution seen from their interdisciplinary programs? How do IDPs advance the goals of the institution, goals of the colleges and departments, as well as the interests of the faculty and students? Have they measured these benefits?
For example:
 - National and International visibility

- Improving Federal and industrial funding opportunities
- Attract more and better applicants
- Advance translational science
- Empowering bottom-up innovation in education and research rather than top-down? Re-energize the academic community.

16. What does the institution see as the biggest challenges facing its IDPs, individually and collectively?

17. Does institution have a recent five-year or ten-year review of their IDPs as a whole that they would be willing to share?