Chapter 6 — Special Emphasis: Synergies across the Disciplines

Purdue’s self-study special emphasis, Synergies across the Disciplines, is integrated with its 2008–2014 strategic plan, New Synergies.

Introduction — The Evolution of a Synergistic Culture

Purdue has identified Synergies across the Disciplines as a special emphasis theme for the 2009–2010 accreditation evaluation cycle. This theme stems directly from the University’s 2008–2014 strategic plan, New Synergies, and is intimately woven through all of the core components of the accreditation criteria. The New Synergies plan will be cited throughout this chapter to highlight the manner in which synergies across the disciplines, particularly across the sciences and engineering, and the liberal arts and social sciences, are playing increasingly important roles in the mission and current strategic initiatives of the University.

It is important to note the sequence of events that led to the establishment of this special emphasis to be able to fully appreciate its significance. Following the 1999 North Central Association visit and receipt of the final reaccreditation report in summer 2000, Purdue hired its tenth president, Martin C. Jischke. His tenure, which spanned August 2000 through July 2007, included deliberate and focused initiatives to address the concerns and suggestions of the 2000 report. These initiatives have been highlighted throughout the previous chapters. The overarching achievement during that period of Purdue history was the creation of a new culture of campus strategic planning, detailed assessment of progress, and corresponding resource alignment. This culture continues with France A. Córdova, who was installed as Purdue’s eleventh president in July 2007.

After conducting a listening tour, including town hall meetings and online feedback, Dr. Córdova charged eight teams of faculty, staff, and students to focus on areas for potential improvement. This process served to identify a number of key areas that needed focused attention in order for the University to make progress toward its new aspirational goals. These goals are described and addressed throughout previous chapters of this self-study report.

In August 2007, Interim Provost Victor L. Lechtenberg began preliminary steps to launch the campus self-study associated with the 2010 reaccreditation visit by the Higher Learning Commission (HLC). Committees of faculty, staff, and students were appointed to evaluate University compliance and progress for each of the five criteria since the last HLC visit. This effort, completed in spring 2008, occurred in parallel with the campus’s new strategic planning activities. The five core criteria committees worked alongside the eight strategic planning teams charged with addressing issues identified during President Córdova’s listening tour. In hindsight, the two processes were “synergistic” as campus leaders and the greater campus community worked together, and in tandem, on both projects. By late spring 2008, a draft strategic plan titled New Synergies was being considered and Purdue proposed a “synergies
across the disciplines” special emphasis for its upcoming accreditation visit. The importance of synergies across the disciplines is made clear in the preamble to the 2008–2014 strategic plan [1]:

“Purdue students, faculty, and staff, face a present and a future in which the problems we attempt to solve and the subjects we investigate are global in scope and require knowledge, expertise, and commitment from all disciplines — in a new culture of working together with cooperation and collaboration. Because the challenges we face require not only technical solutions from the sciences and engineering, but also the social awareness and cultural competencies fostered in the liberal arts, the recognition, importance, and centrality of this concept of connections, i.e., ‘synergy,’ quickly became the hallmark of the strategic plan.”

Both the strategic plan and self-study special emphasis proposal were approved in summer 2008, and since that time, progress has been made on numerous initiatives defined by the New Synergies plan.

The role of interdisciplinary research activity, and by implication, synergies, was also an important part of Purdue’s 2001 strategic plan, although not its primary focus. That plan had a strong emphasis on synergies in the area of discovery (e.g., research) and led to the creation in 2001 of Discovery Park, a group of centers and faculties focused on interdisciplinary research. In Purdue’s 2008–2014 strategic plan, the importance of synergies is recognized across all aspects of the University’s tripartite mission: learning, discovery, and engagement.

While the importance of synergistic activities is widely recognized, developing and sustaining these activities requires concerted effort and constant focus. In some cases, such as Discovery Park, the benefits of these synergistic activities are emerging; in many cases, the synergistic work is just beginning. For this reason, much of what follows in this chapter is a description of promising new ideas and initiatives that are still in their formative stages. In five of the eight study areas addressed by the strategic planning teams — student success and the student experience, large-scale research, economic development, globalization, and synergies across the disciplines — synergies play a prominent role. In the following paragraphs, examples of synergistic initiatives and activities will be outlined from each of these areas. Connections will be noted where it is believed that the synergies initiative is making direct impact on one or more of the five HLC criteria.

Like many universities, Purdue’s organizational structure is siloed and centered around the traditional disciplines. While this organization is effective for maintaining strong core disciplines, such a structure can be a barrier to interdisciplinary activities. Since the 1999 HLC reaccreditation, the University has devoted considerable effort to removing these barriers, leading to many new interdisciplinary initiatives and activities that bring together faculty and students from widely diverse disciplines. The development of an increasingly synergistic culture that is more conducive to collaboration among disciplines requires extensive changes at many levels.

A persistent barrier to interdisciplinary learning is created by rigid disciplinary curricula that limit student contact with other disciplines to a relatively small number of electives. Many of these are introductory courses that typically do not expose students to the elective discipline at a high level of sophistication. To bridge two or more disciplines, students often find that they need a minor or double major, which often increases the time to graduation.
The creation of individualized plans of interdisciplinary study would benefit students who envision working across two or more disciplines, increasing their exposure to the methods, theories, and practices of disciplines outside their majors. Adopting individual, interdisciplinary plans of study would also help the University prepare the next generation of leaders to approach complex problems from more than one disciplinary perspective.

For faculty, barriers to interdisciplinary endeavors often arise from long-standing institutional practices that can be difficult to overcome. Collaborative research findings that appear in journals, for example, may be undervalued in promotion and tenure deliberations if the research is outside the faculty member’s primary discipline. Consequently, it can be challenging for faculty engaged in interdisciplinary projects to demonstrate the significance and impact of their individual contributions to team-based research.

Interdisciplinary initiatives associated with Discovery Park have been accompanied by an emphasis on hiring faculty with joint appointments between two or more academic departments, colleges, or schools. The number of joint appointments has grown dramatically in recent years, as shown in Figure 6-1, below.

**Figure 6-1. Number of Purdue Faculty Holding Joint Appointments**

Overcoming the obstacles for faculty involvement in interdisciplinary activities also requires rewards and incentives. To this end, the University is considering changes in its promotion and tenure system, especially with regard to documenting faculty members’ interdisciplinary activities and fully assessing the role and value of interdisciplinary work in decisions on promotion and tenure.
This revision process has been driven by the Interdisciplinary Initiatives Committee, an ad hoc group formed by the University Senate to propose general guidelines for how interdisciplinary activities might be considered in faculty promotions. This committee's recommendations include:

- all faculty promotion documents should include categories for interdisciplinary discovery, interdisciplinary learning, and interdisciplinary engagement;
- all annual faculty activity reports should include categories for interdisciplinary discovery, interdisciplinary learning, and interdisciplinary engagement; and
- senior faculty should provide mentorship to junior colleagues about the value of interdisciplinary activity [2].

This committee's recommendations are under consideration by the provost. In addition, the colleges of Science and Engineering have drafted proposals to evaluate promotion cases for faculty with appointments spanning two or more departments or colleges. Both proposals call for the full extent of a faculty candidate's interdisciplinary activities to be accounted for at each stage of the promotion decision, especially at the department and college levels.

**Synergies in Learning**

The first of three primary goals of the University’s 2008–2014 strategic plan is Launching Tomorrow’s Leaders, a goal focused heavily on student success. Purdue is taking a two-pronged approach to this success, first recruiting outstanding students into the University, and then providing them with the support to be successful. One of the characteristics of this goal, as articulated in the plan, is:

“... [providing transformational] learning opportunities that actively engage students to discover, expand, and apply knowledge within their disciplines, across disciplines, and with respect to global issues.”

There have been many suggestions for how to achieve this broad and ambitious goal, and several of the initial University-wide initiatives that have recently been launched in conjunction with the *New Synergies* plan and specifically focused towards teaching, learning, and student success will be described in this chapter.

**A Common Core Curriculum**

One of the central student access- and success-focused ideas articulated in the *New Synergies* strategic plan is:

“[undertaking] the initiatives toward a University-wide core curricular experience for integration into all degree programs in response to the need for core competencies the graduates must demonstrate, reflecting the value of curricular synergies that render them as informed graduates in a global society.”

While proposals for a common core curriculum that would apply to all undergraduates have been made numerous times in Purdue’s history, there is currently neither a common set of core courses nor a common core experience required of all students. Rather, curricular decisions are made in a decentralized manner by each college or school, with each having its own set of general education requirements.
In direct response to renewed faculty interest in considering the idea of a core curriculum for undergraduate students and mention of a potential core in the strategic plan, the provost teamed with the University Senate’s Steering Committee in the spring of 2009 to appoint a task force to further visit the initiative [3]. The 33-member task force, led by a faculty member, is comprised of faculty representatives from the ten colleges and schools, Libraries, Office of the Provost, one regional campus, and alumni. The task force was charged with two outcomes: determining the desirability and feasibility of a core curriculum, and, if desired, designing the curriculum and developing a plan for its implementation. “Boundaries” for a core were established, including the premise that the core must be faculty driven and designed; feasible to offer (both in terms of cost and being manageable for an undergraduate student population of approximately 30,000); offer equivalencies for students who transfer and those in “change of degree objective” (CODO, Purdue’s designation for changing majors) status; and not extend the time required to graduate.

While the scope and content of a core curriculum are under consideration, certain curricular outcomes have become clear. The task force has found a significant degree of overlap when comparing the current college-based core curricula. For example, all, or nearly all Purdue curricula require competency in mathematics, science, oral and written communication, social sciences, and the humanities. Many, but not all, of the colleges also have core requirements in global/multicultural/diversity issues and a senior capstone course in the major area of study.

Core curricula at peer institutions have been reviewed by the task force, which is drawing upon lessons learned from the 2007 development and implementation of Purdue’s College of Science core curriculum. That curriculum is based upon four learning objectives: mastering the knowledge in a discipline, developing the ability to think clearly and critically, writing effectively, and communicating well orally. The task force agrees that a core will be based upon learning outcomes, and that a plan for assessment of the outcomes must also be developed and implemented. Rather than a traditional “distribution model,” where students simply choose from a long list of courses to satisfy core requirements, the task force recommends adding integrative features such as capstone courses, cross-disciplinary courses, co-curricular experiences, and experiential learning opportunities, including study abroad.

The courses comprising a core curriculum will include many that Purdue already offers and some to be developed through collaborations between different academic units. Such courses will likely lead to increased interactions between students in different disciplines, and thus foster new partnerships among the University’s colleges and schools. These courses have the potential to exploit, in positive ways, synergies between diverse disciplines and related learning outcomes. One noteworthy example is a new course on “Great Issues” in science and society, recently developed by the College of Science for its core. This course and others like it are helping to bring synergistic, interdisciplinary connections into the learning environment for students.
Honors Programs

In July 2002, President Martin Jischke and Provost Sally Mason identified the creation of a University Honors Program (UHP) as a major priority, viewing this program as important to Purdue's commitment to preeminence in learning. An honors task force was established and charged with proposing a structure for the new UHP. The proposed program sought to attract high-potential students, engage imaginative faculty in a new learning adventure, and establish collaboration with the five existing college-based honors programs. The proposal was endorsed fully by the University administration and, in 2004, approved unanimously by the University Senate.

The UHP welcomed its inaugural class of 75 students in fall 2005 and graduated its first class in spring 2009 [4]. Average SAT scores of admitted cohorts hover at 1460, well above the total freshman class average. The one-year retention rate for UHP students has ranged from 86 to 96 percent, also above the overall student average. As planned, honors courses have attracted a cadre of award-winning teachers, and the program's leadership provides many other learning-centered activities such as study abroad, field trips, and community service.

Although the UHP has met the goals set forth when it was created, challenges remain. There is confusion among students and faculty regarding having both University- and college-based honors courses and programs, with some students belonging to programs at both levels. While the UHP attracts high ability students, the perception is that these students would come to Purdue regardless of honors program opportunities. This indicates that the UHP has not yet achieved a reputation that effectively recruits students to come to Purdue in lieu of pursuing opportunities at competing institutions. The 2009 yield for student applicants admitted to Purdue and invited to join the UHP was just 13 percent.

With the encouragement and support of the Office of the Provost, the University Honors Program invited an external review team to campus in October 2009 to assist in addressing several goals:

- attracting an even-higher caliber student;
- raising the program’s stature on campus and its reputation beyond campus, such that it successfully recruits talented students to Purdue;
- diversifying enrichment activities that define the honors program, thereby making UHP students more competitive for prestigious post-baccalaureate fellowships;
- establishing an honors cooperative house;
- expanding the UHP’s physical facilities to accommodate an increasing number of students;
- creating an endowment to provide scholarships and support for special UHP initiatives; and
- considering ways to work more synergistically with honors programs in the colleges and developing a shared, sustainable honors curriculum throughout the University.

Results of this review were not yet available when this self-study was published; however, the University looks forward to receiving the review team’s recommendations.
Establishing a University College and New Interdisciplinary Majors

The majority of undergraduate students coming to Purdue are admitted directly into programs within individual colleges and schools (for example, the School of Nursing). Of the 6,408 new freshmen that enrolled fall 2009, 460 (seven percent) were admitted without declaring a major or college. While direct admission to a college or program works well for many students, and aids in the recruitment of students who have chosen a field of study, in some cases this practice creates barriers for CODO students (those attempting to change majors). CODO barriers are often encountered when specialized courses from one major do not count toward the curricular requirements of another. Additionally, entrance requirements for programs are sometimes more stringent for CODO students than for entering freshmen. These students may also encounter enrollment limit barriers in high-demand programs. The University is focusing intently on reducing CODO barriers and assisting undecided students.

The New Synergies strategic plan calls for the consideration of a university college at Purdue. This college, described in a white paper [5] by Professor Dennis Minchella of the Department of Biological Sciences, would serve a wide range of students at various points in their academic careers, functioning generally as a home for students who are “between colleges.” It would support students who have not selected a major, who prefer a classically broad educational path, who do not initially succeed, or who change directions at Purdue. Students would have the opportunity to sample an array of disciplines in the first year, allowing them to explore their academic interests and better evaluate their talents. After deciding on their scholastic progression, students would have access to and seamlessly transfer into the various colleges on campus. The college would also be a source of counseling and support for students who are between majors.

Although the Undergraduate Studies Program [6] serves many of these students, it is neither sufficiently extensive nor is it designed to support all undecided students across campus. The “undecided stigma” attached to these students could be reduced if the current admissions model were changed to ease the need to choose a major at the time of admission. This would allow students wanting the flexibility to explore diverse disciplines in their first year to do so without penalty. Having the opportunity to more fully explore academic options before choosing a major could reduce the number of CODO students, decrease the time to degree, and improve student retention. An added benefit of this approach would be that students who are less prepared would have opportunities to develop academically. By delaying the declaration of a major, students may be able to improve in the academic skills required for them to succeed in a rigorous discipline. These students may have the ability and determination to succeed, but fail to thrive in gateway courses due to inadequate academic preparation. While there is currently no formal plan to create a university college, preliminary steps — such as the adoption of a University-wide core curriculum — could contribute significantly to forming such a unit. Other academic transformations that would set the stage for establishing the college include the upcoming reorganization of student services areas and the subsequent improved alignment between admissions processes, student success initiatives, and academic affairs in the Office of the Provost. It is anticipated that once these measures are in place, the feasibility and desirability of a university college will be addressed.
Consideration of a New College —
Aligning Synergies in Health and Human Sciences

The various fields of study, academic departments, and research activities associated with health and human sciences are currently scattered across the campus in at least three different colleges. Potential benefits from better organizational alignment of these disciplines include:

- attracting an increasingly talented and diverse student population,
- contributing to the quality of the student experience at Purdue,
- realizing efficiencies by centralizing resources,
- benefitting from research synergies enabled by closer interaction of faculty with related interests, and
- launching expanded engagement and global activities that will benefit from new collaborative partnerships among the faculty.

All of these initiatives stand to benefit from the greater visibility and synergies achieved by realignment into one college focused on health and human sciences. In July 2009, after gathering positive feedback from the campus, the provost charged a task force with developing a plan to create a new health and human sciences college. The charge stipulated that plans for the new college be linked to the New Synergies strategic plan, specifically, remaining consistent with the goals of enhancing student access and success, promoting discovery with delivery, and addressing global challenges. The provost requested the report be delivered by mid-September 2009, and that it include a plan for implementation of the new college in fall 2010.

The resulting report [7] recommended that the newly-formed unit be named the College of Health and Human Sciences, provided mission and vision statements, and summarized the opportunities and challenges associated with creation of a new academic college. It projected possible participating academic units; logical affiliations with other campus entities; its anticipated size in terms of faculty, staff, and students; and estimated the incremental cost of realignment. The report also included a suggested timeline for implementation, a decision-making sequence, and a list of specific actions needed to create the new college, such as creation of a college governance structure, consideration of faculty who are at the mid-point on their tenure clocks, and consolidation of support services found in existing departments and colleges involved in the realignment. The report has now been posted on the provost’s Web site for campus review and reaction; a decision by the provost is expected late fall 2009 and review by the University Senate in spring 2010.
Certificate Programs

The research centers in Discovery Park are highly interdisciplinary and provide opportunities for synergistic learning experiences. For example, the Certificate in Entrepreneurship and Innovation Program, initially housed in the Burton D. Morgan Center for Entrepreneurship and now directed by the Office of the Provost, was launched in fall 2005 to deliver entrepreneurship education to students in all disciplines. The program is designed to complement a student’s major by providing them with the knowledge and experience necessary to make entrepreneurship an accessible career option. The objectives of the program are:

- developing the necessary skills to research a prospective product, service, or technology and present a critical analysis of its potential;
- developing leadership and communication skills necessary to advocate for a prospective enterprise;
- enhancing student performance and marketability in their disciplines; and
- creating student awareness of entrepreneurship-related resources at Purdue.

There has been a strong demand for the Certificate in Entrepreneurship and Innovation Program from students across the campus. To date, over 1,600 students have participated in certificate program courses, with several hundred enrolled at all times. The program provides students with interdisciplinary and synergistic coursework and offers them opportunities to become involved in complementary Purdue programs, including the Entrepreneurial Learning Communities, the Interns for Indiana Program, and the Discovery Park Undergraduate Research Internship Program. Additional certificate program initiatives include providing students with real-world global entrepreneurship and innovative study abroad experiences, a women and leadership course, and networking opportunities.

Using Distance Education to Promote Synergies

In November 2008, the provost convened a task force to develop a plan to enhance distance learning. The task force sent a survey, created and supported by the Association of Public and Land Grant Universities and the Sloan Foundation, to the Purdue faculty. The survey explored faculty attitudes toward and beliefs about online learning. More than 600 individuals responded to the survey, which included questions about faculty members’ expectations for the technology, training, funding, and release time associated with distance learning. The task force recommended that the University expand online distance learning in two ways. First, additional undergraduate courses and programs should be developed to provide increased access for current students and to recruit new learners to the University. Secondly, the task force recommended that new online graduate and professional degree programs be created where significant demand exists. Additionally, they recommended that the stature of distance learning be elevated at the University by renaming the administrative unit and positioning it where it is more visible and more closely aligned with the academic colleges/schools. It is hoped that by taking these steps, distance learning can be better coordinated with the University’s evening course program, summer school, and educational technology initiatives to promote additional synergies for Purdue students, faculty, and departments.
Synergies in Discovery

Just as the 2000–2007 strategic plan emphasized interdisciplinary research, the 2008–2014 plan includes special emphasis on synergies in research. These synergies are particularly focused on grand challenges where collaboration is integral. The New Synergies plan states that the University will:

“[focus] on breakthrough multidisciplinary research with signature approaches for addressing societal grand challenges involving core strengths in life sciences, physical sciences, and engineering, while leveraging these strengths to develop synergies with the liberal arts, business, education, and other disciplines that lend special capabilities to such large-scale research and exploration, and their impact.”

The University’s interdisciplinary research hub, Discovery Park, grew out of the 2000–2007 strategic plan as a means for fostering interdisciplinary collaborations. Research and office space in the park is allocated to projects, rather than individuals, to emphasize the park as a hub for new creative and collaborative endeavors in discovery. Discovery Park buildings are designed with flexible office arrangements to enable a variety of working methods. Centers in the park facilitate collaboration between disciplines in many ways, including:

- The Burton D. Morgan Center for Entrepreneurship hosts several business plan competitions, including the Life Sciences Business Plan competition, which brings together business acumen with University-based life sciences research. Past winners of this competition have gone on to receive significant external funding and develop prototype devices.
- The Purdue Climate Change Research Center includes researchers from the sciences and liberal arts who complement the center’s scientific research with historical, cultural, sociological, and political research.
- Researchers at the Regenstrief Center for Healthcare Engineering provide new perspectives on issues in the healthcare system by applying concepts from academic research in the sciences, management, engineering, education, human sciences, and more.

Discovery Park maintains a strong connection with the Purdue Research Park, one of the country’s most successful university-based business incubation parks, which has facilitated 31 startup companies since its inception. This connection has been further strengthened with the New Synergies plan’s emphasis on discovery with delivery.

Developing synergies across disciplines also enables Purdue to compete for large external research grants. In May 2009, the Department of Energy funded a $20 million Energy Frontier Research Center at Purdue to pursue research into biomass fuels using the University’s expertise in agriculture, biology, chemistry, and engineering. “The interdisciplinary team was instrumental in being selected,” according to Maureen McCann, principal investigator for the project [8].

Creating synergies among disciplines is essential to the University’s focus on tackling many of the grand societal challenges. The Center for Education and Research in Information Assurance and Security (CERIAS) has leveraged a diverse array of talent and experience at Purdue to become one of the world’s leading centers in this area. Today, CERIAS faculty come from more than 20 departments, including computer science, communication, nuclear engineering,
and sociology. Executive Director Eugene Spafford has often provided congressional testimony and advice to the U.S. executive branch on information security issues [9].

The following are samples of other centers recently developed at Purdue in response to emerging challenges:

- The aging baby boomer population makes this a particularly opportune time to study the aging process. The Center on Aging and the Life Course [10] draws on expertise from the sciences, health sciences, liberal arts, and veterinary medicine to lead scientific inquiries of why humans age and how physical and mental functioning can be maintained and enhanced over the life course. In July 2009, graduate students from across campus were named trainees to a new program to stimulate research on aging, part of a grant from the National Institute on Aging entitled “Interdisciplinary Research on Aging and the Life Course.” The project will involve three students, from three different departments, working with an interdisciplinary team of scholars.

- The Envision Center is an interdisciplinary laboratory designed to foster creative works between researchers in the sciences and the arts. Envision researchers have collaborated with the Patti and Rusty Reuff School of Visual and Performing Arts to create an environment for choreographers to use visual design in developing dance pieces. The researchers use motion capture to record dancers’ movements and map the movements to characters for final rendering. Over 120 individual dance movements — including jazz, hip hop, and ballet styles — have been mapped to date, and a 30-second demonstration clip has been created [11].

**Synergies in Engagement — Meeting Global Challenges**

The third major focus area of the University’s strategic plan is Meeting Global Challenges. This goal extends and expands Purdue’s focus on engagement to include a more-global reach. Two of the characteristics of this goal are intimately connected with the University’s mission of engagement. As stated in the strategic plan, these characteristics are:

“[a] holistic approach for economic development as an integral part of large-scale research and globalization that serve as catalysts for the growth of economies around the world” and “[to inform] public policy and provide informed leadership to policy discussions by way of a public policy institute that conducts analyses and impact assessments, and promotes coordination between large-scale research and economic development, leading to increased investment funds and impact on regional, national, and global economies.”

**The Global Public Policy Institute [12]**

A key strategy identified to achieve this goal is to form a public policy institute. Through the work of a task force, a white paper was published in July 2009 [13] that outlines the characteristics, guiding principles, and action items needed to create the Global Public Policy Institute. The development of a public policy institute with a focus on global synergies is seen as an opportunity for Purdue to have a distinctive presence among those addressing the world’s grand challenges.
Solving real-world problems does not fall neatly within disciplinary boundaries, and it was quickly determined that an interdisciplinary-based structure would be critical to the formation of the Global Public Policy Institute. Other key components include:

- providing a venue for interdisciplinary, evidence-based collaboration in policy-relevant research and scholarship, leading to high-profile and in-depth information and contributions to public policy development;
- deriving widespread visibility from a global, multidisciplinary orientation, as well as a flexible orientation towards event-driven and user-driven inquires in public policy;
- creating cross-disciplinary research communities on broadly-defined topics in public and global affairs that encapsulate major challenges of our times, and bringing together faculty with shared interests; and
- developing flagship learning programs for students that include global experiences for policy-related projects.

The institute is envisioned to be a distinguished global resource that will focus on four areas where Purdue faculty are recognized as international experts: life/health and family, energy/environment and climate change, cyber/information technology and security issues, and civil society and leadership. The global, synergistic nature of the institute will be promulgated by leading public discussion, conducting relevant research, producing evidence-based information, and offering advanced learning programs. Funding options to support the institute and a physical location to house it have been identified.

Other Synergistic Initiatives to Expand Engagement

Several other engagement activities now underway on campus embrace the synergies theme. Initiatives that build on Purdue’s expertise in the STEM (science, technology, engineering, mathematics) fields to develop innovative educational techniques may help attract and retain more students in these crucial disciplines. The Center for Research and Engagement in Science and Mathematics Education [14], led by the colleges of Science and Education, focuses on improving science and mathematics education from preschool to graduate school. Similarly, the Discovery Learning Research Center [15] studies innovative teaching and learning methodologies, with a specific focus on the STEM disciplines.

The I-STEM Resource Network [16] is an unprecedented partnership of public and private higher education institutions, K–12 schools, business, and government. Started as a collaboration among 15 institutions of higher education in 10 regions throughout Indiana, I-STEM includes committees of educational content experts and practitioners who come together to design and employ programs to address STEM issues. I-STEM supports K–12 teachers and leaders in implementing high academic standards to improve STEM literacy for all students and provides Indiana education leaders with new information about teaching and learning. The I-STEM vision is for Indiana to be a national leader in student academic achievement in STEM disciplines and to improve the quality of the workforce.

DiaGrid [17] is a large, high-throughput, distributed research computing network using the Condor system, centered at Purdue. The grid — a partnership with Indiana University, Indiana State University, the University of Notre Dame, and Purdue’s three regional campuses — is designed to accommodate computers at campuses across the nation as new members join. As of December 2008, it included more than 20,000 processors. The Purdue portion of
the pool, named BoilerGrid, is the largest academic system of its kind, processing 10 million hours of research computation in 2007. DiaGrid harvests and manages computing cycles from idle or underused high-performance computing cluster nodes, including machines in campus computer laboratories and office computers. Whenever a local user or scheduled job needs a given machine, the Condor job is stopped and sent to another Condor node as soon as possible. While this model limits the ability to do parallel processing and communications, the Condor pool can provide vast numbers of cycles to smaller, serial jobs in a very short amount of time. DiaGrid is managed by the Rosen Center for Advanced Computing, the research and discovery arm of Information Technology at Purdue (ITaP).

DiaGrid and BoilerGrid have been used by researchers at Purdue and elsewhere for projects such as imaging the structure of viruses at near-atomic resolutions, simulating the early stages of the solar system’s formation, projecting the reliability of Indiana’s electrical supply, modeling the spread of water pollutants, and identifying millions of potential new forms of zeolites, silicate minerals widely used to catalyze chemical reactions on an industrial scale. DiaGrid provides computational resources to researchers on both the Open Science Grid and the TeraGrid.

INDURE, the Indiana Database of University Research Expertise [18], is a publicly-accessible Web site that aggregates faculty research expertise at Purdue, Indiana University, Ball State, and Notre Dame into a single, searchable location. Developed by Purdue’s College of Science and ITaP in partnership with the Indiana Economic Development Commission, INDURE builds interdisciplinary synergies by crossing university, college, and departmental barriers. INDURE provides a fully-integrated database that allows faculty, students, and companies within and outside the state of Indiana to search for faculty research expertise. Potential students can search INDURE to identify faculty with whom they want to study. The site also enables multidisciplinary research by enabling faculty members to identify colleagues with compatible research interests, thereby spawning new research groups and partners in grant proposals. In addition, Indiana companies use INDURE to indentify faculty with whom to collaborate on future projects.

Summary

The identification and application of synergies between science, engineering, liberal arts, and the social sciences in addressing global needs is a key theme embedded throughout the University’s strategic plan. This theme will be central to many of Purdue’s activities in the coming years, affecting virtually everyone on campus. Many of these synergistic ideas and activities are at an early stage, and there is much to do as the University develops and refines these efforts. While the path ahead remains to be fully charted, benefits are already evident. Purdue’s synergistic endeavors will have a positive impact on learning and the student experience; on discovery, as students and faculty confront problems of national and international importance; and on engagement activities, as the University’s discoveries and human capital are applied to serve and solve societal needs. Indeed, synergies between all the disciplines are at the heart of the Purdue mission and are essential to the success of the University.
References


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