Digital Education at Purdue University

Introduction

Purdue University is a leader in delivering effective, innovative education to nearly 40,000 students. Faculty at the University are taking a modern approach to teaching and learning by bringing technology to the classroom and rethinking the delivery of traditional classroom education. This paper will outline the current status of digital education at Purdue University including the online degree programs offered, online courses, existing tools and technologies, and resources available for faculty.

Education

Digital education encompasses online degree programs, online certificates, online courses, courses that have an online component, and courses that use technology in the classroom. Purdue offers all of these things in an effort to reach a broader audience and improve learning outcomes.

Degree Programs

Purdue University currently has only one undergraduate online degree offering; an Associate of Applied Science program in Veterinary Technology. A further 15 online graduate programs are offered. The majority are focused in STEM fields, with further offerings in Communication, Management, and Education. The following table lists the fully online degree programs currently offered.

Program	Degree
Veterinary Technology	Associate of Applied Science
Building Construction Management	Master of Science
Communication	Master of Science
Education in Learning Design and Technology	Master of Science
Special Education	Master of Science
Interdisciplinary Engineering	MSE
Engineering and Business Administration	Dual MSE/MBA (IU) or MS/MBA (IU)
Aeronautics and Astronautics Engineering	MSAAE
Computer Science	Master of Science
Electrical and Computer Engineering	MSECE
Industrial Engineering	MSIE
Mechanical Engineering	MSME
Information Technology Business Analysis	Master of Science
Aviation and Aerospace Management	Master of Science
Information Technology Project Management	Master of Science
Industrial Technology Biometrics	Master of Science

In addition to the fully online programs, 9 additional graduate programs are offered with some face to face component, but with at least half time online. They are as follows:

Program	Degree	Face to Face Time
Agriculture Economics	MS + Optional MBA (IU)	5 1-week sessions
Executive Master in Business Administration	MBA	6 2-week sessions
International Masters in Management	IMM	6 2-week sessions
Weekend MBA	MBA	Every other weekend
Economics	MS	1 year (1 year online)
Educational Leadership	PhD	Saturdays
Technology, Leadership, and Innovation with Biotechnology Innovation: Regulatory Science	MS	3 weekends/semester
Leadership	MS	3 weekends/semester
Technology	MS	3 weekends/semester

Online Courses

In addition to the online and partially online degree programs, Purdue has a growing number of courses offered online. During the 2015-2016 academic year there were 113, 119, and 172[i] fully online courses offered during the fall, spring, and summer sessions, respectively. This marks an 18% increase overall from the 2014-2015 school year. The online courses span many disciplines including Mathematics, Economics, History, Nursing, and several foreign languages with many targeting courses with traditionally high enrollment such as Stat 30100 and Psy 12000. During the 2015-2016 academic year 10,632 students enrolled in at least one online course with 4,044 taking more than one. In addition to the fully online courses, there were 91 course offerings that had a portion of the class online during the last school year.

Certificates

In addition to degree programs and online courses, the University offers many online non-credit certificate programs. These range from the Essentials of Agronomy to Central Service and Sterile Processing. Purdue Next offers certificates in technology subjects that hold a broad appeal. They are offered in 15 week courses, broken down into 3 week badges. Deltak Wiley helps in the marketing of these programs, which are utilize by companies like Wabash National and Boeing. The courses also fill common gaps within India's college curriculum, and students there are able to earn credit from their home institution by completing the courses.

Technology

Courses that are taught fully online, or that have a portion of the course online are in need of tools or technologies to aid in the administration of outside the classroom learning. However, these tools reach beyond the online world and into the classroom. Many are supported centrally by ITAP, and additional discipline specific ones are supported by college and departmental IT staff. The following utilization numbers were gathered via a survey sent to all instructors at Purdue.

ITAP Supported Tools

The following table shows a list of the tools that are supported at the University level by either ITAP or Libraries, a brief description of their function in teaching and learning and their utilization. Blackboard Learn, Boilercast, i>Clickers, Kaltura, Qualtrics, and WebEx all have high utilization, while Confluence, CrowdAsk, and the GIS Portal have not been widely adopted at the University. Utilization rates were gathered via a University wide survey of all instructors, and are taken as a percent of those who responded to the question[ii].

Tool	Description	Utilization[iii]
Blackboard Learn	Learning management system	89%
Boilercast	Lecture capture and polling	13%
Camtasia	Desktop video capturing and video editing	9%
Classroom Video Recording	Central classroom video recording with camera operator, DVD, and web publishing	9%
Closed Captioning	Closed capturing of lecture capture, live streaming, and video recording	4%
Confluence	Wiki; collaborative web space creation	1%
CrowdAsk (Libraries)	Collaborative web based discussion tool	0%
Distance Learning Classroom	STEW G52 distance learning classroom with streaming video	5%
GIS Portal (Libraries)	Collaborative space for sharing and combining datasets and displaying geographic information	0%
Gradient	Calibrated peer review of student submitted work	2%
Hotseat	Back channel discussions and student polling	6%
i>Clickers	Student response systems to gauge student comprehension in-class	10%
Kaltura	Video streaming platform	10%
LibGuides (Libraries)	Instructional guides for courses, subjects, and research	5%
Live Video Streaming	Live video streaming from campus locations including ITaP Broadcast Studio (STEW B26), STEW G52 distance classroom, LOEB, FWLR, PFEN)	2%
Lon Capa	STEM-centric learning management system, focused on formula and diagrammatical based problems	2%
Mixable	Social network platform for course discussions	3%
Passport	Facilitate the creation and awarding of competency-based badging	3%
Pattern	Measure study habits, providing analytics and insights to become a better learner	2%
Qualtrics	Online survey tool	19%
Respondus	Test-question repository and test creation tool	3%
Software Remote	Remote software application delivery	5%
Video Conferencing	Video conferencing support in STEW 209, video conferencing codec support in departmental rooms	4%
Video Express Rooms	Green-screen rooms configured for quick high-quality video creation	4%
Voice Thread	Discussion platform incorporating audio and video	2%
WebEx	Web conferencing & teleconferencing	11%

College Supported Tools

The colleges fulfil the need for more specialized tools by providing support for certain, commonly used technologies. The following tables are not comprehensive, but show the most frequently used tools for several colleges.

Pharmacy Tool	Utilization [iv]
Pharmacy Lab DVR System	18%
Adobe Captivate	9%
Polycom HDX Videoconference Units	9%

Science Tool	Utilization [v]
Math Course Pages	14%
Biology BRC Photo System	8%
Turnin	7%

Vet Tool	Utilization [vi]
ExamSoft	22%
Filelocker	11%
Aperio	6%
Synplicity	6%
Active Lesson	6%

Liberal Arts Tool	Utilization [vii]
Cloud Storage	13%
Web ICS Folders	5%

Engineering Tool	Utilization [viii]
Matlab	41%
Labview	10%
Mathematica	7%
Python	7%
Solidworks	5%

Polytechnic Tool	Utilization [ix]
Catia	9%
Matlab	9%
Visual Studio	9%
Arduino	7%
Autodesk	7%
NX	7%
Autocad	5%
Creo	5%
Mendeley	5%
Python	5%

Rhinocerous	5%
SAS	5%
Teamcenter	5%
Wacom	5%
Photoshop	5%
Illustrator	5%

While several colleges don't have technologies that are utilized by a large number of faculty in their teaching, a wide variety of technologies are being used. For example, the College of Science has 20 tools that are used in at least one course and Purdue Polytechnic has over 50.

Other Tools

Instructors don't limit themselves to just the tools supported by the University. Many use online resources, such as YouTube, Google Docs, Dropbox, and TED Talks. Of those who completed the survey, 40% indicated that they utilize YouTube in teaching, and 12% use Google Docs[x].

Online Homework Platforms

The use of online homework platforms have been adopted in order to ease the burden of grading from teaching assistants and instructors, discourage cheating, and provide instant feedback to students. There are many systems that instructors choose to use, whether it be independent programs such as LON-CAPA or those provided by textbook companies such as Pearson and McGraw-Hill. While the below list of online homework platforms is not comprehensive, it provides a look at what systems are commonly used in Purdue courses. It should be noted that for those who responded, 77% do not use an online homework platform for their course, and several instructors indicated that they use multiple online platforms.

Homework System	Utilization[xi]
None	77%
Blackboard	1%
LON-CAPA	2%
MacMillan	1%
McGraw-Hill	5%
Pearson	4%
Perdisco	1%
WebAssign	2%
Wiley	2%
Other	6%

Faculty (Instructor) Resources

Beyond tools and technologies available to use in teaching, faculty and instructors also have resources to aid in designing and redesigning course instruction. These resources are centralized in three separate offices: Teaching and Learning Technologies, Digital Education, and the Center for Instructional Excellence. The offices have some overlap in function, have similar goals, and frequently collaborate on course

transformation initiatives. There exists no single centralized intake process by which faculty can request assistance in designing a course, redesigning a course, or moving a course online. The directors reported that faculty can have trouble distinguishing their individual areas of expertise and responsibility; however, internally, work is often readily assigned and completed across the groups. The following sections address the resources offered by each office, as well as their contact information. This information was gathered via interviews with the directors of the three offices, as well as an associate director.

Digital Education

The Digital Education office functions as a business office, handling the financial aspects of online education at Purdue.

All fully online degree programs go through an approval process involving paperwork and outlining a cash flow process. Revenue and expenditures for these programs flow through a separate Digital Education account, not general funds. Fully online degree programs, listed in the first section, are offered in conjunction with the Digital Education office. These programs are primarily Master's degrees in the College of Engineering and Purdue Polytechnic Institute. The Digital Education office also helps coordinate programs in conjunction with Deltak Wiley; 2 in education (approximate enrollment of 200) and 1 in communications (approximate enrollment of 400). Purdue has chosen to use Deltak Wiley in order to capitalize on their expertise in bringing online programs to scale. The company provides a market evaluation, aids in instructional design, and finds students with the potential to be successful. Work is underway for another graduate program with Deltak Wiley in Hospitality and Tourism Management. One strong benefit to offering graduate degrees in this manner is that traditional graduate students cost the University money, but these programs bring in revenue.

Online courses can be developed independently by faculty, but the option to work with the Digital Education office is available. Interested faculty can apply to get help offering a course online; the DE office takes on about 12 courses a year. There is a set of criteria by which they choose what is appropriate, always keeping the goal of improving graduation rates in mind. The hope is to work with courses that are introductory in nature and offered to a broad number of student and majors. The DE office provides a stipend of around $6000 to aid in the development of an online course with continued financial support on an ongoing basis. In addition to the financial incentive, they facilitate a partnership with Teaching and Learning Technologies for instructional development. They also assist in appropriate course set-up in banner.

Contact Information
To apply to develop an online course visit https://www.distance.purdue.edu/developer/default.asp.

Teaching and Learning Technologies

Teaching and Learning Technologies (TLT) is broken into four areas:

- Informatics – The focus of informatics is to develop custom tools that don't already exist in the market. Some of the tools they have developed include Hotseat and Gradient.
- Consulting and Training – Consulting and Training aid in responding to ITAP tickets and provide consulting and training for faculty, instructors, and staff to teach them about a particular tool. Consulting and Training also work with the Disability Resource Center on providing student accessibility solutions.

- Innovations in Teaching and Learning – Staff working in Innovations in Teaching and Learning work to find gaps in the University and provide solutions. They pilot new technologies and decide what should be done by working with faculty.
- Course Design and Development – Staff working in this area collaborate with individual faculty to design or redesign a course or set of courses. This spans from outcomes to assessment. They aid in building course content and caption video content. Much of the work done in this area is in conjunction with Digital Education and the CIE's IMPACT program.

TLT is technology focused and works primarily with faculty who desire to flip their course or move their course online. Typically, it takes around 16 weeks for course design or redesign, but depends on the level of involvement from the faculty. The design/redesign process works the best when there is a highly collaborative relationship between the TLT instructional designers and the faculty. Additionally, if there is a series of courses that are going through the design/redesign process, instructional designers with TLT will collaborate in order to align learning objectives and create a cohesive end product. While not well defined, the intake process for moving a course into an online format with the help of TLT will require a service level agreement that outlines expectations and serves as a tool to keep all parties on track. Agreements on who will pay the initial costs and who receives the revenue from the online courses is agreed upon upfront.

Another function of TLT is working beside faculty as support team members for CIE's IMPACT program. As a result of their participation in the program, faculty report they are able to identify appropriate instructional technology for their course. TLT takes on course design/redesign projects in conjunction with CIE and independently. Likewise, they collaborate with the Digital Education office when moving courses online, but also work with faculty independently of the Digital Education office.

Whether a faculty member is moving a course online, designing a new course, or redesigning an existing course, instructional designers will aid in determining how instruction is structured and delivered. Depending on how faculty choose to assess, instructional designers will provide them with various methods of instruction. A major benefit of working with the instructional designers is that they are able to share lessons learned from other faculty across campus who have also transformed their teaching. When working with TLT, a faculty member is never on their own in the design/redesign/online change process, however it is the responsibility of the department to ensure that the online instruction being offered meets or exceeds that of a face to face classroom. Once a course is designed or redesigned, instructional designers will aid in making tweaks to their previously compiled materials and will generally have a refresh every 3 years. Projects are prioritized by the amount of fiscal and personnel resources a department is prepared to commit.

Each instructional designer with TLT works on 3-5 new course redesigns, designs, or online conversions per semester with dozens of small questions on the side. Most of their time is spent out on campus, working side-by-side with faculty.

Contact Information
To reach out to Teaching and Learning Technologies, visit their newly designed website http://www.itap.purdue.edu/learning/.

Center for Instructional Excellence
Another resource offered to Purdue instructors is the Center for Instructional Excellence. CIE is best known for its work with IMPACT. IMPACT started with the recruitment of faculty teaching large enrollment first and

second year courses. It's grown mostly by word of mouth, and now approximately 270 faculty have gone through the program. Participation is voluntary, and each semester approximately 30 faculty go through the program. Faculty are very rarely turned away, and it's usually because they teach a small course. Frequently the IMPACT program will work with whole departments.

The CIE is less concerned with what type of modifications are made during a course redesign process, but more about the way in which it is implemented, always keeping the focus on fostering student engagement. However, redesigns usually fall within one of three categories.

- Supplemental – still large lecture, but with some online components. This allows for traditional space to be utilized, and is easily accessible to students who are used to the environment. Unfortunately, professors may fall back on traditional lecturing style and students are still in rows.
- Hybrid – online lecture with face to face active learning. This allows students to watch videos online as frequently as they want. This can be especially valuable to non-native English speaking students. Consequences of the hybrid format are that introverts and international students often struggle with interaction. The CIE are working with advisors to ensure that students take courses that are most in line with their learning style.
- Online

Faculty are asked to choose what method they would like to employ and define learning objectives, and the CIE staff, in conjunction with instructional designers from TLT, will help add in technologies that will help foster student engagement.

In addition to their work with redesigning courses with IMPACT, the Center for Instructional Excellence conducts teaching workshops and is working on online teaching modules geared towards new faculty.

Contact Information
To apply for IMPACT visit http://www.purdue.edu/impact/

If you would like to participate in a teaching workshop, the schedule can be found at http://www.purdue.edu/cie/workshops/workshops1.html.

If you have general questions, you can contact faculty or staff at http://www.purdue.edu/cie/contact/index.html

[i] The number of online courses are as of census. These courses had students enrolled and schedule type DIS with no linked sections.
[ii] The response rate for those who complete the entire survey is 674/4930 = 13.7%. There were 160 additional surveys started, with varying rates of questions completed. As such, response rates have been reported for individual questions.
[iii] Sample size = 722, Response rate = 722/4930 = 14.6%
[iv] Sample size = 11
[v] Sample size = 74
[vi] Sample size = 18
[vii] Sample size = 77
[viii] Sample size = 59
[ix] Sample size = 44
[x] Sample size = 696, Response rate = 696/4930 = 14.1%
[xi] Sample size = 582, Response rate = 582/4930 = 11.8%