

9-4-2013

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Recommended Citation

Reid, Pat and Attardo, Donalee, "Designing the Wheel: Built-in Instructional Technology" (2013). *IMPACT Publications*. Paper 1.
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Designing the Wheel: Built-in Instructional Technology

by [Pat Reid](#) and [Donalee Attardo](#)

Published on Wednesday, September 4, 2013 [1 Comment](#)

Key Takeaways

- Most faculty members are **not taught a systematic process to course design** and, despite their subject expertise, might **lack background in learning theory**.
- Faculty can best **adopt educational technology while designing or redesigning their course** rather than retrofitting an existing course to include technology.
- **A course design model** can include **practical application of theories**, including best practices for instructional technology use.

Like many higher education institutions, [Purdue University](#) struggles to provide faculty with the support they need to incorporate sound use of instructional technologies in their courses. Two years ago Provost Tim Sands made a commitment to both instructional technologies and active learning, which included \$100,000 funding for [Instruction Matters: Purdue Academic Course Transformation \(IMPACT\)](#). Goals of the IMPACT project include:



Develop a network of faculty knowledgeable in teaching and learning best practices and passionate about teaching through faculty learning communities

Base course redesign on best practices and sound research

Support faculty-led course redesign with campus-wide resources

IMPACT funding has been used primarily to incentivize faculty to participate in the program and complete the redesign and assessment of their courses. Each faculty member receives \$10,000, disbursed to them as they meet program milestones.

Figure 1. IMPACT support structure

IMPACT's strength derives from a commitment for support from Teaching & Learning Technologies ([ITaP](#), Purdue's central IT organization), the [Center for Instructional Excellence \(CIE\)](#), [Purdue Extended Campus \(PEC\)](#), the [Libraries](#), and the [Discovery Learning Research Center \(DLRC\)](#); see figure 1. All told, 21 staff participate as members of the IMPACT support team. The staff's time is contributed by their centrally-funded units, and they spend between 20–60 percent of their work time supporting IMPACT faculty redesign work. Additionally, several staff in the DLRC and CIE have spent the equivalent of one full-time staff member on assessment of the program.

In addition to funding, IMPACT incentivizes faculty to redesign their courses by providing two additional supports: (1) a team consisting of an educational technologist and either a CIE or library staff person and (2) a semester-long series of workshops, 1.5 hours per week, covering all aspects of course redesign.

During these workshops Pat Reid and Frank Dooley, members of the IMPACT management team, identified a need for a systematic model of course design specifically for higher education instructors. While developing the workshops, we identified specific areas critical to course design, which led to the development of "the wheel," an interactive course design model (see figure 2).

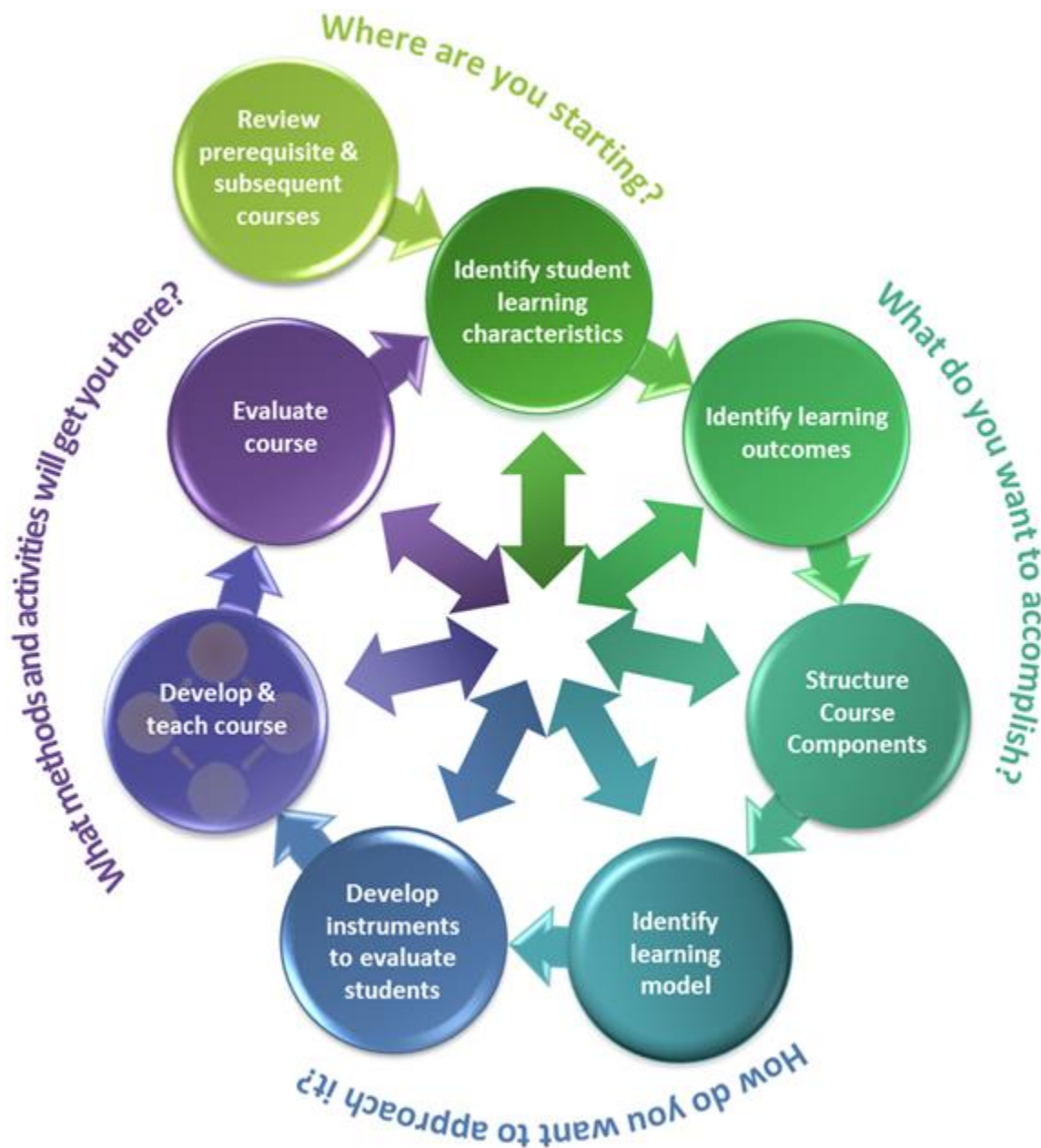


Figure 2. The "wheel of interactive course design" model

Rationale for a Course Design Model

A common concern about faculty development courses is that although faculty might be subject content experts, they often do not have a background in learning theory. Many experienced faculty members have developed a sense of what will and won't work within their discipline; however, when faced with developing a new course or redesigning a course to incorporate more active learning, instructional technologies, distance education, core curriculum demands, and the like, they struggle with how to approach the course design.

In business and industry, training facilitators have models such as ADDIE (analysis, design, development, implementation, evaluation) to lead them through the course design and development process. These are usually based on a "backward design" model, which provides a recommended methodology for designing a course based on desired end results — student outcomes — as opposed to a design based on what material must be covered. Their beginning point and some follow-up actions differ from higher education approaches for a variety of reasons, two primary ones being that (1) typically, the goal of training facilitators is to resolve a workplace problem, as opposed to providing education, and (2) training facilitators typically work in a much shorter time frame than a semester-long course. Some other approaches, such as Caffarella's, attempt to provide guidance to training facilitators and educators; however, these models target professional instructional designers and, as such, assume prior expertise in instructional design.¹

Another common higher education issue is that well-intentioned faculty sometimes try to use instructional technologies without sound pedagogical reasons,² which can adversely affect learning,³ student teaching evaluations,⁴ and technology use.⁵ Providing a single, faculty-focused course design model leverages the pedagogical purposes and uses of an instructional technology. The combination of theory and practical use offers more of a just-in-time application for faculty.

Applying the Wheel Model

The first cohort of faculty that went through the IMPACT program participated in workshops that covered many topics involved in course redesign/design, loosely based on a backward design model. About a year into the program, it became apparent that the workshops didn't provide a complete, consistent, and systematic approach to course design in the university setting. It also became evident that a more deliberate course design model, designed specifically for faculty, could help faculty by providing a systematic process.

Reframing the IMPACT workshops with the course design wheel has enabled the workshop leaders to stress active learning and the role that different instructional technologies can play. Faculty exposure to technologies takes two forms:

- Various technologies are used during the workshops to demonstrate how they can support teaching and learning.
- IMPACT participants bring in issues they are having, such as "How do I manage all my students' e-mail?" or "How can I better manage students working in groups?"

By providing the course design model to faculty, we have also been able to both systematically and spontaneously incorporate information about technologies they might find useful. For example, when faculty members are developing their lesson plans (during the Develop and Teach Course phase), we have a section on active learning techniques that ties to a grid of active learning techniques and possible technologies to support them (see figure 3).

	Adobe Captivate	Adobe Connect*	Adobe Presenter*	Blackboard	BoilerCast*	Camtasia Studio	Confluence*	Course Email List*	CourseEval*	Doubletake*	Facetime	Google Apps for Education*	Go Poll Go	Hotseat*	iClicker*
Assignments	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓
Brainstorming				✓			✓	✓			✓	✓	✓	✓	✓
Buzz Groups		✓		✓								✓	✓	✓	
Case Studies	✓			✓		✓	✓	✓		✓		✓	✓	✓	
Debate		✓		✓			✓					✓	✓	✓	
Demonstrations	✓	✓		✓		✓	✓			✓		✓	✓	✓	
Discussions		✓		✓			✓					✓	✓	✓	

Figure 3. Sample from activities and technologies grid

Flowcharts help faculty determine which tools they can use to help meet their instructional goals (see figure 4, for example). During other stages in the workshops we use technologies such as clickers, surveys, and online discussion groups to give participants experience using these technologies. Faculty also frequently ask questions about which technology can help with a specific issue, which often leads to impromptu explorations of various technology solutions.

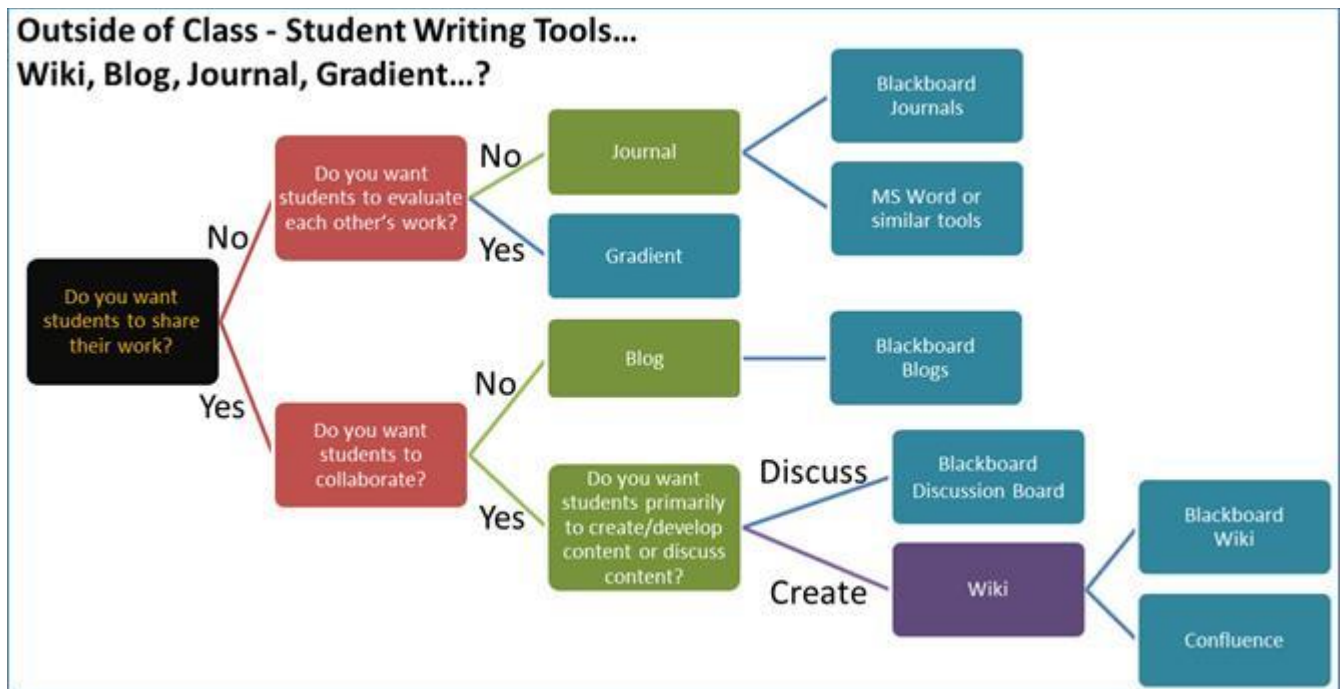


Figure 4. Draft writing assignment to technology flowchart

How the Model Supports Instructional Technology Adoption

Systematically incorporating instructional technologies into the IMPACT workshops lets participants experience the technologies as students would and then discuss best practices for using the technologies. The IMPACT support team can also discuss the fit of instructional technologies into the specific course and work with the faculty member to ensure that he or she is comfortable with using the technologies and has materials to assist students with them. The educational technologist working with the faculty member serves as a troubleshooter in case of difficulties or discomfort with the technology.

The questions that arise are used to develop faculty-centered guides on our website to help other faculty. Topics such as "I want the students to write a paper. What technology would be most appropriate?" inform decision-making flowcharts (see figure 5). Another document lists Chickering and Gamson's "Seven Principles for Good Practice in Undergraduate Education" and technologies that can support each principle.⁶ [Additional web pages](#) include "What technologies can help me control cheating and plagiarism?" "How can I manage students' e-mail?" and others based on questions identified by IMPACT faculty.

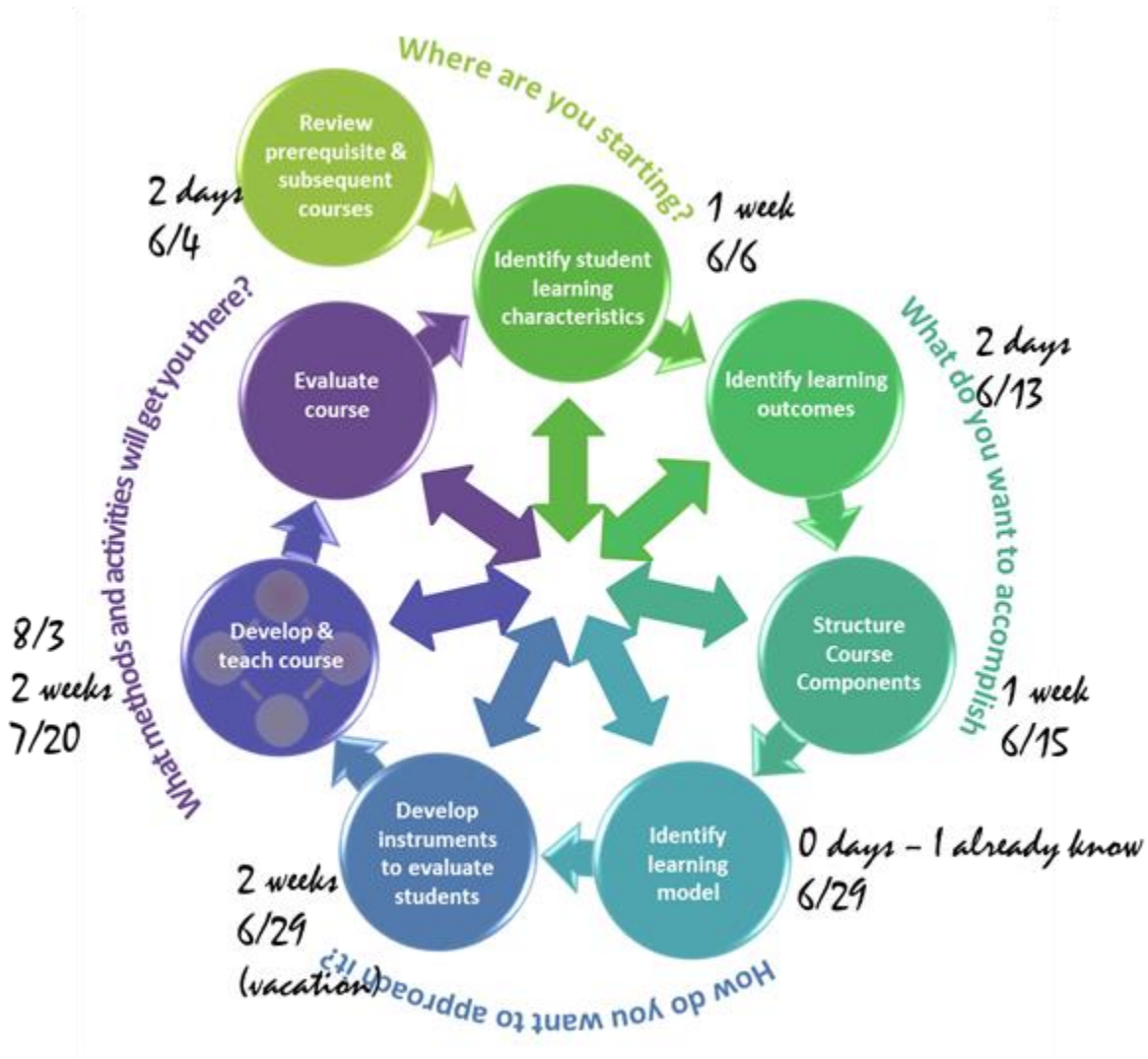


Figure 5. Planning the redesign

Has It Worked?

To evaluate the IMPACT program's success, we looked at the technologies adopted by faculty in their course (re)designs, sought their feedback, assessed differences in student evaluations of the courses, and estimated possible effects on learning.

Technologies Adopted

Within large lecture halls, instructors are using interactive technologies (such as clickers and Purdue's [Hotseat](#)) to support small group work as well as polling. One course is using lab login/logout data to analyze student lab time with assessment results, sharing these data early and often with the students. Some courses have been redesigned from large lecture to a variety of other models such as "flipped" (students watch videos of the lectures at home and class time is used for active learning) and supplemental (where students receive just-in-time instruction to support their course learning). Instructors have incorporated instructional technologies to provide:

- Online videotaped lectures (using [Blackboard Learn](#), [Adobe Connect](#), [Camtasia](#), [Captivate](#), [Kaltura](#), and other software)
- Interactive videos (using [Camtasia](#) and [Articulate](#))
- Discussion groups online (using [Blackboard Learn](#)) and in-class technology-based questions and answers (using [iClickers](#) or Purdue's [Hotseat](#))
- Virtual office hours (using Purdue's [Mixable](#), [Adobe Connect](#), wikis, and/or discussion boards)
- Peer-review assignments (using Purdue's [Gradient](#), [Confluence](#), and [Blackboard Learn](#) wikis)
- Team/group assignments (using [CATME](#) Team Maker, [Adobe Connect](#), [Blackboard Learn](#), and [Confluence wikis](#))

Some instructors have developed free online e-texts for their courses (using Purdue's [Jetpack/Skyepack](#)). Others are working with textbook publishers to tailor textbooks and online exercises to meet their course needs.

What Faculty Think

In IMPACT assessment surveys, faculty self-reported that their teaching and student learning was improved by IMPACT and the implementation of one or more instructional technologies.⁷

- Mechanical engineering professors Jeffrey Rhoads and Charles Krousgrill are using a new teaching approach for large classes that allows students to interact with each other and faculty online while accessing hundreds of instructional videos and animations. According to Krousgrill, "There's an old adage that the best way to learn is to teach, and we try to enforce that among all of our students. I was skeptical about the blog, but after a semester I firmly believed it was an excellent idea. The best way to learn is to try to explain it to your peers."⁸
- Alex Francis, who teaches courses on phonetics and acoustics related to speech production and hearing, uses clickers to gather student feedback. "Clickers give me flexibility in terms of how much detail I put into a particular topic," he says.⁹
- Biology professor David Bridges uses Echo³⁶⁰ to record his lectures: "[Students] can go back over the material as fast or slow as they want and go over particularly difficult parts as many times as they want. I think that's the real value.... A recent BoilerCast (Echo³⁶⁰) study found that 86% of student respondents reported viewing class recordings at least once a semester — with a quarter of those students indicating weekly usage."¹⁰
- Civil engineering professor Larry Nies has flipped his class using Camtasia and Kaltura to include his lectures in Blackboard. However, he also has students create, share, and view videos using Purdue's [Doubletake](#).¹¹
- Agronomy professors George Van Scoyoc and Darrell Schulze connected their students with faculty and students in South Africa and Kenya using Adobe Connect and Skype simultaneously. Students did group work using Google products.¹²

Influence on Student Course Evaluations

One instructor conducted extensive student evaluations of her course to determine IMPACT's effect. In a comparison of her hybrid flipped section to her traditional section, end-of-semester course evaluations showed these reactions to the technology incorporated in her redesign course:

"The students liked the redesigned lectures with the funny videos and stories (only one person thought there was too much "fluff"). They liked the incorporation of i>clicker questions for content and effort. They liked having the lectures

available online (and in shorter chunks) as backup resources. In sum, the hybrid students were generally happy with the format."¹³

Influence on Learning

Because of the variety of technologies used in each course, we cannot pin use of a specific technology to learning gains. Instead, we have evidence that redesigned courses that incorporate technology have positively influenced student learning. For example, in looking at our first cohort of courses, eight of the nine redesigned courses taught in fall 2011 demonstrated an increased course GPA; seven demonstrated the highest course grades in four years; and three showed statistically significant increases in student grades from the previous fall.¹⁴

What's Next?

In May 2013, Purdue President Mitch Daniels committed an additional \$2.5 million to IMPACT over the next three years to expand the program to include Purdue's core curriculum of 180 courses. The expansion provides for six additional staff and brings with it a number of challenges related to how to scale-up the program while still providing the customized and quality redesign experience for faculty that has made the program successful so far. We stress in IMPACT that course redesign is an iterative process, so we continue to meet with IMPACT faculty after their initial redesign to help them identify new technologies and techniques.

The provost has requested that we include [Course Signals](#), an early warning analytics system, in all IMPACT courses, which will enable us to talk further with faculty about how other instructional technologies can support them. We are also building a website focused on faculty needs for instructional technology to supplement our current website, which focuses on services we provide. This new website will include the full course design wheel with its supporting materials, as well as profiles of innovative faculty and descriptions of how they are using technology in their IMPACT courses. Providing support for faculty in course design and redesign using technology, a systematic model, and practical applications of learning theories is yielding evidence of the IMPACT program's value to student learning and engagement and persuading more Purdue faculty to participate.

For More Information

The IMPACT program is still a relatively young project. Assessment of the project is underway; for a copy of the assessment plan, see the [resources](#) available from the 2013 ELI meeting. EDUCAUSE presentations about IMPACT include:

- [Making an IM:PACT by Partnering with Faculty](#)
- [A Faculty-Focused Course Design/Redesign Process](#)
- [IM:PACT: Supporting Faculty in Course Redesign](#)

Notes

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Pat Reid, & Donalee Attardo. (2013a). Designing the Wheel: Built-in Instructional Technology. *EDUCAUSE Review*. Retrieved from <http://www.educause.edu/ero/article/designing-wheel-built-instructional-technology>